



GOLDEN GATE NATIONAL RECREATION AREA MUIR WOODS NATIONAL MONUMENT

DRAFT GENERAL MANAGEMENT PLAN/ENVIRONMENTAL IMPACT STATEMENT

VOLUME II

CONTENTS

PART 7: RESOURCES AND VALUES THAT COULD BE AFFECTED BY THE ALTERNATIVES (THE AFFECTED ENVIRONMENT)

<i>Introduction</i>	3
<i>Summary Table of Impact Topics</i>	4
<i>Natural Resources – Golden Gate National Recreation Area</i>	21
Introduction	21
Alcatraz Island	21
Physical Resources	22
Biological Resources	46
<i>Natural Resources – Muir Woods National Monument</i>	68
Introduction	68
Physical Resources	68
Biological Resources	72
<i>Cultural Resources – Golden Gate National Recreation Area</i>	83
Introduction	83
Area of Potential Effect (APE)	84
Cultural Resources Listed in or Eligible to be Listed in the National Register of Historic Places	92
Archeological Resources	106
Ethnographic Resources	107
Park Collections	110
<i>Cultural Resources – Muir Woods National Monument</i>	112
Introduction	112
National Register of Historic Places	112
Archeological Resources	114
Ethnographic Resources	115
Park Collections	115
<i>Visitor Use and Experience—Golden Gate National Recreation Area</i>	116
Diversity of Recreational Opportunities and National Park Experiences	116
Visitor Opportunities at Alcatraz Island	118
Visitor Use and Characteristics	118
Visitor Understanding, Education, and Interpretation	121
Safe and Enjoyable Access and Circulation to and within the Park	122
Visitor Safety	123
<i>Visitor Use and Experience – Muir Woods National Monument</i>	124
Diversity of Recreational Opportunities and National Park Experiences	124
Visitor Use and Characteristics	124
Visitor Understanding, Education, and Interpretation	126
Safe and Enjoyable Access and Circulation to and within the Park (see also transportation section)	127
Visitor Safety	127
<i>Social and Economic Environment (Including both Golden Gate National Recreation Area and Muir Woods National Monument)</i>	128
Introduction	128

CONTENTS

The Importance of Parks to a Community	128
Population and Community Trends	131
Economic Effects of the Park on the Community	142

Transportation (Including both Golden Gate National Recreation Area and Muir Woods National Monument) 149

Regional Transportation Context	149
Park Transportation Network	152

Park Management, Operations, and Facilities (Including Both Golden Gate National Recreation Area and Muir Woods National Monument) 179

Staffing	179
Partners and Other Entities	182
Park Facilities	183
Asset Management	188

PART 8: POTENTIAL ENVIRONMENTAL CONSEQUENCES

Introduction 193

Methods and Assumptions for Analyzing Potential Impacts 195

Natural Resources	196
Cultural Resources	202
Visitor Use and Experience	206
Social and Economic Environment	207
Transportation	208
Park Management, Operations, and Facilities	210

Impairment of Park Resources 211

Common to All Alternatives at Golden Gate National Recreation Area and Muir Woods National Monument 212

Natural Resources	212
Cultural Resources	213
Visitor Use and Experience	215
Social and Economic Environment	216
Transportation	218
Park Management, Operations, and Facilities	220

Golden Gate National Recreation Area, Including Alcatraz Island 223

Natural Resources – Physical Resources	223
Natural Resources – Biological Resources	237
Cultural Resources	261
Visitor Use and Experience	297
Social and Economic Environment	308
Transportation	319
Park Management, Operations, and Facilities	328

Muir Woods National Monument 335

Natural Resources – Physical Resources	335
Natural Resources – Biological Resources	345
Cultural Resources – Historic Structures, Historic Districts, and Cultural Landscapes	356
Cultural Resources – Archeological Resources	362
Cultural Resources – Ethnographic Resources / Traditional Cultural Properties	365

Cultural Resources – Park Collections	366
Visitor Use and Experience	367
Social and Economic Environment	372
Transportation	378
Park Management, Operations, and Facilities	388

INDEX

<i>Index to Volume II</i>	395

TABLES

Table 1: Impact Topics Retained For or Dismissed From Detailed Analysis	4
Table 2: County Variation in Attainment Status, Demonstrated by Monitoring Station Data, 2001-2003	24
Table 3: Emission Statistics for Golden Gate National Recreation Area	27
Table 4: Impaired Water Bodies within Point Reyes National Seashore and Golden Gate National Recreation Area as Indicated from the 2006 303d List	42
Table 5: Area of Potential Effect	85
Table 6: Percentage of 2007 Population (25 or older) Reaching Various Levels of Education	140
Table 7: Percentage of 2007 Housing Stock, Detached and Attached Housing	141
Table 8: Percentage of 2007 Housing Stock, Owner-occupied and Renter-occupied Housing	141
Table 9: 2003 Visits and Estimated Spending, by Visitation Type	143
Table 10: 2003 Estimated Economic Contributions of Golden Gate National Recreation Area Visitor Spending, By Sector	144
Table 11: 2009 National Park Service Jobs and Salaries, By Location of Residence	145
Table 12: The Golden Gate National Recreation Area Portfolio Summarized by Record Count for Various Asset Types	184
Table 13: Maintenance Facilities	186
Table 14: Golden Gate National Recreation Areas Operation and Maintenance Planned Funding Summary	189
Table 15: Project Funding and Deferred Maintenance	190
Table 16: Potential Impacts to Special Status Species of Golden Gate National Recreation Area, No-action Alternative	250
Table 17: Potential Impacts to Special Status Species of Golden Gate National Recreation Area, Alternative 1	254
Table 18: Potential Impacts to Special Status Species of Golden Gate National Recreation Area, Alternative 2	257

CONTENTS

Table 19: Potential Impacts to Special Status Species of Golden Gate National Recreation Area, Alternative 3	260
Table 20: Parking Capacity at Stinson Beach, 2002 & 2023	325
Table 21: Potential Impacts to Special Status Species of Muir Woods National Monument, No-action Alternative	351
Table 22: Potential Impacts to Special Status Species of Muir Woods National Monument, Alternative 1	352
Table 23: Potential Impacts to Special Status Species of Muir Woods National Monument, Alternative 2	354
Table 24: Potential Impacts to Special Status Species of Muir Woods National Monument, Alternative 3	356
Table 25: Parking Demand at Muir Woods National Monument, 2002 & 2023	383
Table 26: Estimated Annual Cost of Shuttle, 75% Parking at Muir Woods National Monument	384
Table 27: Estimated Annual Cost of Shuttle Operations, No Parking at Muir Woods National Monument	386

FIGURES

Figure 1: Gross Emissions for Golden Gate National Recreation Area	26
Figure 2: 2006 Gross Park Emissions by Sector, Excluding Visitors	26
Figure 3: 2006 Gross Park Emissions by Sector, Including Visitors	27
Figure 4: Sea Level Rise	31
Figure 5: Coastal Vulnerability	34
Figure 6: Golden Gate National Recreation Area Watersheds	35
Figure 7: Vegetation Communities	55
Figure 8: Potentially Affected Historic Sites	93
Figure 9: Golden Gate National Recreation Area Recreational Visitors by Year 1999–2009	119
Figure 10: Golden Gate National Recreation Area Visitor Use by Month, 2004–2008	120
Figure 11: Muir Woods National Monument Recreation Visitors by Year, 1999–2009	125
Figure 12: Muir Woods National Monument Visitor Use by Month, 2004–2008	126
Figure 13: 2006 Estimated Populations of Gateway Counties	132
Figure 14: Past and Projected Population Growth of Golden Gate National Recreation Area Gateway Counties	132
Figure 15: Past and Projected Population Growth of Golden Gate National Recreation Area Gateway Counties Relative to Overall Bay Area	133

Figure 16: 2007 Population Estimates in Bay Area, by Race	135
Figure 17: 2007 Population Estimates in Marin County, by Race	135
Figure 18: 2007 Population Estimates in San Francisco, by Race	136
Figure 19: 2007 Population Estimates in San Mateo County, by Race	136
Figure 20: 2030 Population Estimate in Bay Area, by Race	137
Figure 21: Population Estimate by Race in Marin County in 2007 and 2030	138
Figure 22: Population Estimate by Race in City & County of San Francisco in 2007 and 2030	138
Figure 23: Population Estimate by Race in San Mateo County in 2007 and 2030	139
Figure 24: 2005 Bay Area Jobs, by Sector	147
Figure 25: 2005 – 2030 Bay Area Employment Projections, by Sector	148
Figure 26: Marin County Transportation Network: Muir Woods, Stinson Beach	163
Figure 27: Marin County Transportation Network: Marin Headlands	165
Figure 28: San Francisco Transportation Network: Fort Mason, Alcatraz	167
Figure 29: San Francisco Transportation Network: Baker Beach, Presidio, Crissy Field	169
Figure 30: San Francisco Transportation Network: Lands End, Sutro Heights	171
Figure 31: San Francisco Transportation Network: Ocean Beach, Fort Funston	173
Figure 32: San Mateo County Transportation Network: Northern San Mateo County	175
Figure 33: San Mateo County Transportation Network: Phleger Estate, SFPUC Watershed	177

CONTENTS OF VOLUME I

PART 1: BACKGROUND

Introduction

Purpose and Need

Guiding Principles for Park Management

The Planning Area

Foundation Statements: Guidance for Planning

Foundation Statements for Golden Gate National Recreation Area

Foundation Statements for Muir Woods National Monument

Special Mandates and Administrative Commitments Related to Golden Gate National Recreation Area

Planning Issues

Relationship of This Plan to Other Plans

Related Laws and National Park Service Policies

PART 2: BUILDING THE MANAGEMENT ALTERNATIVES

Introduction

Concepts for Future Management

Actions and Alternatives Considered but Dismissed From Further Consideration

Selection of the National Park Service Preferred Alternatives

Management Zones

PART 3: ELEMENTS COMMON TO ALL ACTION ALTERNATIVES

Introduction

Boundary Adjustments

Climate Change

Facilities for Maintenance, Public Safety, and Collections Storage

Facilities Not Directly Related to the Park Mission

Native American Engagement

Ocean Stewardship

Park Collections

Partnerships

Trails

Transportation

PART 4: THE ALTERNATIVES FOR ALCATRAZ ISLAND

No-action Alternative

Alternative 1: Connecting People with the Parks

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Alternative 3: Focusing on National Treasures The Preferred Alternative

Summary Cost Estimates for Alcatraz Island

Deferred Maintenance

Environmentally Preferable Alternative for Alcatraz Island

Summary Tables of the Alternatives for Alcatraz Island

**PART 5: THE ALTERNATIVES FOR PARK LANDS IN MARIN, SAN FRANCISCO,
AND SAN MATEO COUNTIES**

No-action Alternative

Alternative 1: Connecting People with the Parks The Preferred Alternative

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Alternative 3: Focusing on National Treasures

*Summary Costs Estimates for Park Lands in Marin, San Francisco, and San Mateo
Counties*

Deferred Maintenance

*Environmentally Preferable Alternative for Park Lands in Marin, San Francisco, and
San Mateo Counties*

*Summary Tables of the Alternatives for Park Lands in Marin, San Francisco, and San
Mateo Counties*

PART 6: THE ALTERNATIVES FOR MUIR WOODS NATIONAL MONUMENT x

No-action Alternative

Alternative 1: Connecting People with the Parks

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Alternative 3: Focusing on National Treasures The Preferred Alternative

Summary of Costs Estimates for Muir Woods National Monument

Deferred Maintenance

Environmentally Preferable Alternative for Muir Woods National Monument

Summary Tables for Muir Woods National Monument

CONTENTS OF VOLUME III

PART 9: USER CAPACITY

Introduction

Golden Gate National Recreation Area

Muir Woods National Monument

PART 10: IMPLEMENTATION PLANNING AND MITIGATIVE MEASURES

Implementation Planning

Mitigative Measures

PART 11: OTHER ANALYSES AND STATUTORY CONSIDERATIONS

Introduction and Methodology

Cumulative Impact Analysis at Golden Gate National Recreation Area, Including Alcatraz Island

Cumulative Impact Analysis at Muir Woods National Monument

Additional Analyses

PART 12: CONSULTATION, COORDINATION, AND PREPARATION

Public Involvement

Consultation with Other Agencies, Officials, and Organizations

Agencies, Organizations, and Individuals Receiving A Copy of this Document

Preparers and Consultants

APPENDIXES

Appendix A: Legislation

Appendix B: Description of Management Plans Related to This Plan

Appendix C: Relevant NPS Policies

Appendix D: Table of Special Status Species (including Threatened and Endangered Species and Candidate Species)

Appendix E: Descriptions of Local Transit Service

Appendix F: Description of San Mateo County Trails

GLOSSARY AND REFERENCES

Glossary

References

Resources and Values that Could be Affected by the Alternatives (The Affected Environment)

7



INTRODUCTION

This part of the document describes the existing environment of Golden Gate National Recreation Area and Muir Woods National Monument. This discussion serves to identify the current conditions in the park that could be affected by the implementation of any of the alternatives in this plan. The information is organized around six general topics: natural resources, cultural resources, visitor use and experience, social and economic environment, transportation, and park operations, although there is some overlap between social and economic environment and transportation.

Regarding the discussion of the first three topics—natural resources, cultural resources, and visitor use and experience—differences between the two units are distinct enough to warrant separate discussions for Golden Gate National Recreation Area and Muir Woods National Monument. However, because of the proximity of the two units, and their similar relationships to the urban centers within the planning area, combined discussions that incorporate information about both units are presented for the last three topics.

Table 1, beginning on the next page, presents more detailed information on specific impact topics and the reasons that each was retained or dismissed from further evaluation.

SUMMARY TABLE OF IMPACT TOPICS

Table 1: Impact Topics Retained For or Dismissed From Detailed Analysis

Impact Topic (Retained or Dismissed from further analysis)	Rationale	Relevant Law, Regulation, or Policy
Natural Resources		
Carbon Footprint and Air Quality Retained	Retained as an impact topic for further detailed analysis because of the interest in minimizing greenhouse gas emissions and reducing the carbon footprint of the park and monument, the Bay Area, and the state of California. The focus of the analysis is on greenhouse gas emissions related to NPS operational activities and how that would vary among the alternatives included in the plan. The park and monument are within the Class II air quality areas under the Clean Air Act, as amended. A Class II designation indicates the maximum allowable increase in concentrations of pollutants over baseline concentrations of sulfur dioxide and particulate matter as specified in Section 163 of the Clean Air Act. The California Clean Air Act of 1988, as amended, sets ambient air quality standards that are stricter than the federal standards and requires local air districts to promulgate and implement rules and regulations to attain those standards. Under the act, California Ambient Air Quality Standards are set for all pollutants covered under national standards, as well as vinyl chloride, hydrogen sulfide, sulfates, and visibility-reducing particulates. If an area does not meet the California standards, it is designated as a state nonattainment area. Golden Gate National Recreation Area and Muir Woods National Monument are in the San Francisco Bay Area Air Basin, which consists of San Francisco, San Mateo, Santa Clara, Alameda, Contra Costa, Napa, and Marin Counties, as well as portions of Sonoma and Solano counties. The Bay Area	Clean Air Act; Executive Order 13423; DOI Secretarial Order 3226, Amendment No.1; California Global Warming Solutions Act of 2006 (AB32); NPS <i>Management Policies</i> 2006; NPS Pacific West Region Directive PW-047

Impact Topic (Retained or Dismissed from further analysis)	Rationale	Relevant Law, Regulation, or Policy
	Air Quality Management District is the air quality agency responsible for the entire basin. The San Francisco Bay Area is designated a federal nonattainment area for ozone and a state nonattainment area for ozone and inhalable particulate matter. Dust and exhaust emissions would be produced by development activities and the potential for increased vehicular traffic to the park and monument; however, these activities would not be expected to cause national ambient air quality standards to be exceeded because visitation increases would be relatively small and the level of new development proposed is minimal. Air quality impacts from the use of prescribed fire were analyzed in the park's <i>Fire Management Plan / Environmental Impact Statement</i>. Any amount of pollutants added because of the actions proposed in this general management plan would be negligible compared to existing levels. None of the actions described in this plan would violate any air quality standard or result in a cumulatively considerable net increase of any criteria pollutant for which the Bay Area is in nonattainment under federal or state ambient air quality standards. Implementation of any of the alternatives described in the plan would have negligible effects on air quality and the Class II air quality status of the park and monument would be unaffected.	
Soils and Geologic Resources and Processes (including natural shoreline and coastal processes) Retained	Soils and geologic resources and processes are an important component of maintaining the ecological integrity of the park and monument. Actions included in the plan, such as recreational facility development, changes in visitor use, and restoration, could affect soils and natural coastal processes. Any impacts that would adversely affect soils or geologic processes would be of concern to NPS managers and the public. Therefore, this topic was retained for detailed analysis.	NPS <i>Management Policies 2006</i>

PART 7: THE AFFECTED ENVIRONMENT

Impact Topic (Retained or Dismissed from further analysis)	Rationale	Relevant Law, Regulation, or Policy
Water Resources and Hydrologic Processes (including stream character, water quantity and quality, watershed processes, wetlands, floodplains, and marine/estuarine resources) Retained	Water resources and hydrologic processes are an important component of the ecological communities of the park and monument. Development can alter, and has altered in the past, natural surface flows and watershed processes, with subsequent effects on the natural environment. Actions included in the plan, such as recreational facility development and stream/habitat restoration could affect water quality, wetlands, floodplains, and watershed processes. Therefore, water resources and hydrologic processes were retained for detailed analysis.	Clean Water Act; Executive Order 12088; Executive Order 11990; Executive Order 11988; NPS <i>Management Policies 2006</i>; Director's Order 77-1; Director's Order 77-2
Habitat (Vegetation and Wildlife) Retained	Terrestrial and aquatic habitat is an important resource that defines the natural environment. The park and monument contain a diversity of plant and animal habitats. Actions included in the plan, such as recreational facility development, changes in visitor use, and restoration, could affect natural habitat values. Proposed actions could beneficially or adversely affect these resources, which would be of concern to NPS managers and the public. Therefore, this topic was retained for detailed analysis.	NPS Organic Act; NPS <i>Management Policies 2006</i>
Special Status Species: Federal Threatened and Endangered Retained	The park and monument host a variety of federal listed species. Actions included in the plan, such as recreational facility development, changes in visitor use, and habitat restoration, could affect the quality of habitat preferred by many of these species, as well as the behavior of certain species. Therefore, the following federal listed species were retained for detailed analysis: northern spotted owl, coho salmon, steelhead trout, California red-legged frog, Mission blue butterfly, tidewater goby, western snowy plover, San Francisco lessingia, San Francisco garter snake, and San Bruno elfin butterfly.	Endangered Species Act; Migratory Bird Treaty Act; NPS <i>Management Policies 2006</i>

Impact Topic (Retained or Dismissed from further analysis)	Rationale	Relevant Law, Regulation, or Policy
	See appendix D for a listing of all special status species considered. All species that have been retained for analysis are identified in the appendix table.	
Special Status Species: State Threatened and Endangered Retained	The park and monument host a number of state listed species. Actions included in the plan, such as recreational facility development, changes in visitor use, and habitat restoration, could affect the quality of habitat preferred by one of these species, as well as the behavior of the species. Therefore, the following state listed species was retained for detailed analysis: bank swallow	Endangered Species Act; California Endangered Species Act; NPS <i>Management Policies 2006</i>
Special Status Species: Other Federal and State listed Species Dismissed	Several other federal and state listed species that are known to occur in the area were dismissed because 1) these species are typically not found in the park or monument, 2) their preferred habitat would not be physically disturbed by any of the GMP alternatives, or 3) the effects of actions included in the alternatives on these species would be negligible. See appendix D for a listing of all special status species considered. All species that have not been identified as "Retained" were dismissed for one or more of the above reasons.	Endangered Species Act; Bald and Golden Eagle Protection Act; Migratory Bird Treaty Act; Marine Mammal Protection Act; National Environmental Policy Act; California Endangered Species Act; NPS <i>Management Policies 2006</i>
Essential Fish Habitat Dismissed	In accordance with the 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act, federal agencies that fund, permit, or carry out activities that may adversely impact essential fish habitat are required to consult with the National Marine Fisheries Service regarding the potential adverse effects of their actions on essential	Magnuson-Stevens Fishery Conservation and Management Act

PART 7: THE AFFECTED ENVIRONMENT

Impact Topic (Retained or Dismissed from further analysis)	Rationale	Relevant Law, Regulation, or Policy
	fish habitat; such agencies must also respond in writing to National Marine Fisheries Service recommendations. Essential fish habitat is defined as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” Waters include aquatic areas and their associated physical, chemical, and biological properties. Substrate includes sediment underlying the waters. “Necessary” means the habitat required to support a sustainable fishery and the species’ contribution to a healthy ecosystem. Spawning, breeding, feeding, or growth to maturity covers all habitat types used by a species throughout its life cycle. The conservation of essential fish habitat is an important component of building and maintaining sustainable fisheries. Loss or degradation of essential fish habitat is primarily the result of activities such as point and nonpoint water pollution, livestock grazing, mining, road construction, estuarine or marine habitat alteration, creation of migration barriers or hazards, increases or decreases in sediment delivery, and alteration of stream banks, shorelines, wetlands, and floodplains. The San Francisco Bay, a migratory corridor between riverine habitat and the Pacific Ocean, is designated critical habitat for several listed fish species. Habitat loss and degradation is primarily the result of overfishing, timber harvest, point and nonpoint water pollution, livestock grazing, mining, road construction, diking and stream bank stabilization, and dredge and fill activities. None of the actions proposed in the GMP alternatives would contribute to essential fish habitat loss or degradation. Some of the actions described in this plan would contribute to improvements in the quality or quantity of essential fish habitat; however, additional environmental compliance and	

Impact Topic (Retained or Dismissed from further analysis)	Rationale	Relevant Law, Regulation, or Policy
	consultation with National Marine Fisheries Service would take place prior to implementation of these specific projects. Therefore, the topic of essential fish habitat was dismissed from further analysis.	
Marine Protected Areas Retained	Executive Order 13158, "Marine Protected Areas," defines marine protected areas as any area of the marine environment that has been reserved by federal, state, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein. The executive order requires every federal agency to identify its actions that affect the natural or cultural resources that are protected by a marine protected area and, to the extent permitted by law and the maximum extent practicable, to avoid harming these resources. There are several federal- and state-designated marine protected areas near the park. The marine and estuarine area of Golden Gate National Recreation Area was designated a federal marine protected area under the national system of marine protected areas on May 25, 2010. Impacts to the natural and cultural resources protected by these marine protected areas are analyzed under their respective topics and marine protected areas are not included as a separate impact topic.	Executive Order 13158
Prime and Unique Farmlands Dismissed	In August 1980, the Council on Environmental Quality (CEQ) directed that federal agencies assess the effects of their actions on farmland soils classified as prime or unique by the U.S. Department of Agriculture's Natural Resource Conservation Service. Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops (e.g., citrus, tree nuts, olives,	Farmland Protection Policy Act; Council on Environmental Quality 1980 memorandum

PART 7: THE AFFECTED ENVIRONMENT

Impact Topic (Retained or Dismissed from further analysis)	Rationale	Relevant Law, Regulation, or Policy
	cranberries, fruit, and vegetables). The Farmland Protection Policy Act (7 USC 4201 <i>et seq.</i>) and the U.S. Department of the Interior (Environmental Statement Memorandum No. ESM94-7 – Prime and Unique Agricultural Lands) require an evaluation of impacts on prime or unique agricultural lands. According to Natural Resource Conservation Service soils data, prime and unique farmlands do exist within the jurisdictional boundaries of Golden Gate National Recreation Area in San Mateo County at and adjacent to the Rancho Corral de Tierra property. All of these farmlands (with one small exception) are in private ownership and will not be acquired or managed by the National Park Service as part of the future land transfer with the Peninsula Open Space Trust. The one exception is an approximately 5-acre piece of farmland (adjacent to the privately owned Aenlle property) that contains prime soils and is scheduled to be acquired by the National Park Service as part of the land transfer. Once acquired, the National Park Service intends to use the land for native plant production supporting landscape restoration projects in the park. Consequently, no loss of prime soils or their potential for agricultural production would occur. However, the management zone used in the preferred alternative and in one or more of the other alternatives (Diverse Visitor Opportunities zone) allows for facility development, diverse visitor uses, and ecosystem restoration. Should the National Park Service decide to discontinue the agricultural use of the prime farmland and convert it to a nonagricultural use that could adversely impact its soil resources and its use and potential for agricultural production, then the National Park Service would be required to evaluate the impacts on prime farmland and consult with the NRCS. Within Golden Gate National Recreation Area	

Impact Topic (Retained or Dismissed from further analysis)	Rationale	Relevant Law, Regulation, or Policy
	in Marin County, only Farmland of Statewide Importance exists—there are no prime and unique farmlands. Based on a determination by Natural Resource Conservation Service in 2007, soils and farmland in the vicinity of the Lower Redwood Creek property are not classified as prime or unique farmland (Parson 2007). In addition, there are no prime and unique farmlands within the boundaries of Muir Woods National Monument. Therefore, this topic was dismissed from further analysis.	
Natural or Depletable Resource Requirements and Conservation Potential Dismissed	None of the alternatives being considered would result in the extraction of new resources from Golden Gate National Recreation Area or Muir Woods National Monument. In all of the alternatives, ecological principles would be applied to ensure that the natural resources of the park and monument were maintained and protected. Certain resources could continue to be collected for scientific and educational purposes, and the specimens would be stored in the NPS collection. Agricultural operations on NPS lands would continue to result in the harvesting of crops, which assist in meeting cultural landscape objectives. The fields would be managed to sustain this harvest. Implementation of the alternatives would result in the use of limited natural resources and energy for construction and operation of new recreational facilities and for restoration activities. New development would be designed to be sustainable to the maximum extent practicable. The use and consumption of fuel and other nonrenewable resources for NPS operations, activities, and development associated with the alternatives would be very small in comparison to that of the region. Overall, the impact on this topic would likely be negligible and thus it was dismissed from detailed analysis.	National Environmental Policy Act; Council on Environmental Quality

Impact Topic (Retained or Dismissed from further analysis)	Rationale	Relevant Law, Regulation, or Policy
Energy Requirements and Conservation Potential Dismissed	Council on Environmental Quality guidelines for implementing the National Environmental Policy Act (NEPA) require examination of energy requirements and conservation potential in environmental impact statements. NPS staff strive to incorporate the principles of sustainable design and development into all facilities and park operations. Sustainability can be described as the result achieved by doing things in ways that do not compromise the environment or its capacity to provide for present and future generations. Sustainable practices minimize the short-term and long-term environmental impacts of developments and other activities through resource conservation, recycling, waste minimization, and the use of energy efficient and ecologically responsible materials and techniques. The NPS <i>Guiding Principles of Sustainable Design</i> (1993) provides a basis for achieving sustainability in facility planning and design, emphasizes the importance of bio-diversity, and encourages responsible decisions. The guidebook describes principles to be used in the design and management of visitor facilities that emphasize environmental sensitivity in construction, use of nontoxic materials, resource conservation, recycling, and integration of visitors within natural and cultural settings. The National Park Service would minimize energy costs, eliminate waste, and conserve energy resources by using energy efficient and cost effective technology wherever possible. Recent examples include projects to install photovoltaic panels on the NPS Headquarters building at Upper Fort Mason and projects to pursue alternative energy options at Alcatraz Island. Energy efficiency would also be incorporated into any decision-making process during the design or acquisition of facilities, as well as all decisions affecting park operations. The use of value analysis and value	National Environmental Policy Act; Council on Environmental Quality

Impact Topic (Retained or Dismissed from further analysis)	Rationale	Relevant Law, Regulation, or Policy
	engineering, including life cycle cost analysis, would be performed to examine energy, environmental, and economic implications of proposed NPS development. National Park Service staff would encourage suppliers, permittees, and contractors to follow sustainable practices and would address sustainable park and park partner practices in interpretive programs. Consequently, any adverse impacts relating to energy use, availability, or conservation would be negligible. Therefore, energy requirements and conservation potential was dismissed from further analysis.	
Cultural Resources		
Archeological Resources Retained	Actions included in the plan, such as recreational facility development, changes in visitor use, and ecosystem restoration, could result in impacts to archeological resources. Therefore, this topic has been retained for detailed analysis.	National Historic Preservation Act; National Environmental Policy Act; Secretarial Order 13007; Director's Order 28; <i>NPS Management Policies 2006</i> ; NPS-28A, "Archeological Resources Management"
Cultural Landscapes Retained	Actions included in the plan, such as recreational facility development, changes in visitor use, and ecosystem restoration, could result in impacts to the integrity and function of identified or potential cultural landscapes. Therefore, this topic has been retained for detailed analysis.	<i>NPS Management Policies 2006</i> ; NPS-28, "Cultural Resources Management"
Ethnographic Resources Retained (for	No identified ethnographic resources exist in the park and monument, except for resources at Alcatraz Island that may have ethnographic significance to certain American	National Environmental Policy Act;

PART 7: THE AFFECTED ENVIRONMENT

Impact Topic (Retained or Dismissed from further analysis)	Rationale	Relevant Law, Regulation, or Policy
Alcatraz Island only)	Indians. Actions included in the plan, such as recreational facility development, changes in visitor use, and restoration, could result in impacts to potential ethnographic resources at Alcatraz Island. Therefore, this topic has been retained for detailed analysis.	Secretarial Order 13007; Director's Order 28; NPS Management Policies 2006; NPS-28, "Cultural Resources Management"
Historic Structures Retained	Many of the structures in the park and monument are listed or have been determined eligible for listing in the National Register of Historic Places. Actions included in the plan, such as adaptive reuse of structures and changes in visitor use, could result in impacts to historic structures. Therefore, this topic has been retained for detailed analysis.	National Historic Preservation Act; NPS Management Policies 2006; NPS-28, "Cultural Resources Management"
Park Collections Retained	Actions included in the plan, such as options for the use, curation, and storage of park collections, could result in impacts to park collections. Therefore, this topic has been retained for detailed analysis.	National Historic Preservation Act; NPS Management Policies 2006; Director's Order 24, "Museum Collections Management"
Indian Trust Resources Dismissed	Secretarial Order 3175 requires that any anticipated impacts on Indian trust resources from a proposed project or action by Department of the Interior agencies be explicitly addressed in environmental documents. The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes. There are no Indian trust resources or sacred sites in the park or monument; therefore, this	Secretarial Order 3175

Impact Topic (Retained or Dismissed from further analysis)	Rationale	Relevant Law, Regulation, or Policy
	topic was dismissed from further consideration.	
Visitor Use and Experience		
Visitor Use and Experience (including diversity of recreation opportunities; visitor access; experience of the park setting; visitor understanding, education, and interpretation; and visitor safety) Retained	Enjoyment of the park resources by visitors is part of the fundamental purpose of a national park unit. The visitor experience is an important issue that could be appreciably affected under the alternatives. The Organic Act and <i>NPS Management Policies 2006</i> direct the National Park Service to provide enjoyment opportunities that are uniquely suited and appropriate to the resources found in the park and monument. The types and levels of access are important components of visitor use and experience and are of concern to many people as well as NPS managers. Therefore, this topic was retained for detailed analysis.	Enabling legislation; <i>NPS Management Policies 2006</i>
Lightscape (Dark Night Sky Preservation) Dismissed	Due to its urban setting, light pollution is present in many areas of Golden Gate National Recreation Area and Muir Woods National Monument, although some areas retain a high degree of natural darkness. The National Park Service strives to minimize the intrusion of artificial light into the night scene by limiting the use of artificial outdoor lighting to basic safety requirements, shielding the lights when possible, and using minimal impact lighting techniques. Any new facilities proposed in the alternatives that would necessitate new nighttime lighting would be constructed with down lighting that would minimize light pollution. Furthermore, the level and type of new development and lighting proposed in the plan is minimal and dispersed. The effects of actions contained in this plan on natural lightscapes would be negligible to minor. Therefore, lightscape was dismissed from further analysis.	NPS Organic Act; Enabling legislation; <i>NPS Management Policies 2006</i>

PART 7: THE AFFECTED ENVIRONMENT

Impact Topic (Retained or Dismissed from further analysis)	Rationale	Relevant Law, Regulation, or Policy
Public Health and Safety Dismissed	The proposed developments and actions included as part of the GMP alternatives would not result in any identifiable adverse impacts on human health or safety. Furthermore, visitor safety is addressed under the topic of visitor use and experience. Therefore, public health and safety was dismissed from further analysis.	Council on Environmental Quality regulations; Director's Order 12 Handbook
Soundscape (Natural Sound Preservation) Dismissed	An important part of the NPS mission is the preservation of 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 a park unit, 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 frequencies, magnitudes, and durations of human-caused sound considered acceptable varies among national park system units, as well as potentially throughout each park unit; generally acceptable levels are greater in developed areas and less in undeveloped areas. Unnatural sounds, often a byproduct of recreational activities, can be intrusive and can impact natural soundscape conditions that affect visitor experience and use and wildlife. The National Park Service has taken significant steps to preserve natural soundscapes and manage human-caused noise, especially at Muir Woods National Monument where data collection, research, and management actions have improved the natural soundscape and successfully led to improved visitor experiences. Actions included in the plan would not substantially change visitor use and the generation of human-caused noise compared to current conditions; consequently, sound conditions in the park and monument would not be expected to be substantially affected—the	NPS Organic Act; NPS <i>Management Policies 2006</i> ; Director's Order 47

Impact Topic (Retained or Dismissed from further analysis)	Rationale	Relevant Law, Regulation, or Policy
	impact to the natural soundscape would be negligible to minor. Therefore, this topic was dismissed from further analysis.	
Social and Economic Environment		
Social and Economic Retained	The social and economic conditions of the Bay Area and the gateway counties of Marin, San Francisco, and San Mateo influence Golden Gate National Recreation Area and Muir Woods National Monument and how they are managed. Conversely, the park and monument directly contributes to the social and economic conditions of these three counties and the Bay Area as a whole. This section describes the potential beneficial and adverse impacts related to this relationship by highlighting the park's quality of life benefits as well as the Bay Area's demographic and economic trends.	National Environmental Policy Act
Conformity with Local Land Use Plans Dismissed	The basic land use of the park and monument as a public recreation and resource management area is in conformance with local land use plans. The creation of additional recreation and visitor service opportunities in the park and monument as proposed in the alternatives would be consistent with existing park land uses or local (non-NPS) land use plans, policies, or controls for the area. Therefore, this topic was dismissed from detailed analysis.	Council on Environmental Quality regulations; Director's Order 12 Handbook
Urban Quality and Design of the Built Environment Dismissed	The quality of urban areas would be addressed by design guidelines used to guide new development and the rehabilitation of existing structures, as well as project review processes that the National Park Service has in place, all of which are part of standard operating procedures. Throughout the park and monument, vernacular architecture and compatible design would be considered for new structures built (or modifications to existing structures) under all of the alternatives. Emphasis would be placed	40 CFR 1 502.16

PART 7: THE AFFECTED ENVIRONMENT

Impact Topic (Retained or Dismissed from further analysis)	Rationale	Relevant Law, Regulation, or Policy
	on designs, materials, and colors that blend in and do not detract from the natural and built environment. Consequently, adverse impacts to the quality of urban areas are anticipated to be negligible. Therefore, this topic was dismissed from detailed analysis.	
Environmental Justice Dismissed	Executive Order 12898 requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing the disproportionately high or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. According to the Environmental Protection Agency (EPA), environmental justice is the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations and policies. Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies. Marin, San Francisco, and San Mateo Counties, where the park and monument are located, contain minority and low-income populations; however, environmental justice is dismissed as an impact topic for the following reasons: NPS staff and planning team actively solicited public participation as part of the planning process and gave equal consideration to input from all persons regardless of age, race, income status, or other socioeconomic or demographic factors. Implementation of any of the alternatives would not result in any disproportionate human health or environmental effects on	Executive Order 12898, "General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations"

Impact Topic (Retained or Dismissed from further analysis)	Rationale	Relevant Law, Regulation, or Policy
	minorities or low-income populations and communities. The impacts associated with implementation of the alternatives would not result in any effects that would be specific to any minority or low-income community. Any anticipated impacts, such as traffic, would not disproportionately affect minority or low-income populations.	
Transportation		
Visitor Connections to Park Sites and Communities Retained	Actions included in the plan, such as changes in visitor opportunities and access, as well as improvements to alternative transportation, could result in impacts to visitor connections to park sites and communities. Therefore, this topic was retained for detailed analysis.	National Environmental Policy Act
Functionality of the Transportation System Retained	Actions included in the plan, such as changes in visitor access, alternate modes of transportation, and transportation system assets, could result in impacts to the functionality of the parks' transportation system. Therefore, this topic was retained for detailed analysis.	National Environmental Policy Act
Park Management, Operations, and Facilities		
NPS Operations Facilities Retained	Support facilities necessary to house, transport, inform, and serve visitors and staff require proper planning, design, programming, construction, operation and maintenance. Facilities should be cost-effective, integrate sustainable design, and consider impacts on the landscape, environs, and resources of the park and monument. Actions included in the plan, such as the type and location of NPS operations facilities for maintenance and law enforcement, could result in impacts to NPS operations and management. Therefore, this topic was retained for detailed analysis.	NPS Organic Act; DOI Departmental Manual; NPS <i>Management Policies</i> 2006; Director's Order 80

PART 7: THE AFFECTED ENVIRONMENT

Impact Topic (<i>Retained or Dismissed</i> from further analysis)	Rationale	Relevant Law, Regulation, or Policy
Staffing Retained	Actions included in the plan, such as changes in visitor opportunities, facility use, resource management, and interpretation/education, could result in impacts to NPS staffing. Therefore, this topic was retained for detailed analysis.	NPS Organic Act; DOI Departmental Manual; <i>NPS Management Policies 2006</i> ; Director's Order 80

NATURAL RESOURCES – GOLDEN GATE NATIONAL RECREATION AREA

INTRODUCTION

Golden Gate National Recreation Area is one of the largest urban national parks in the world. The park's 80,500 acres of land and water extend from Tomales Bay in Marin County south into San Mateo County, encompassing 59 miles of bay and ocean shoreline. Golden Gate National Recreation Area is rich in natural resources; it is comprised of 19 separate ecosystems and is home to more than 1,250 plant and animal species. With 80 sensitive, rare, threatened, or endangered species, Golden Gate National Recreation Area ranks fourth among all units in the national park system in the number of federally protected and threatened species found within the park.

Numerous special status designations emphasize the collective importance of Golden Gate National Recreation Area and Point Reyes National Seashore as areas of biological significance. The Nature Conservancy has listed this region as one of the six most biologically significant areas in the United States; it is a biodiversity "hot spot" recognized by The Nature Conservancy and targeted by the global conservation community as key to preserving the world's ecosystems. Conservation International describes this portion of central California as one of the top 25 hotspots and the most threatened of all biologically rich terrestrial regions in the world. Point Reyes National Seashore and Golden Gate National Recreation Area are jointly designated as a Biosphere Reserve, one of 411 reserves designated by the United Nations Educational, Scientific, and Cultural Organization's (UNESCO) Man and the Biosphere Program to provide a global network representing the world's major ecosystem types (NPS 2007a).

Golden Gate National Recreation Area is part of the California Floristic Province (characterized by Mediterranean vegetation) and a zone of overlap of marine provinces (Californian and Oregonian) leading to a wide diversity of terrestrial and aquatic habitats. From the tip of Tomales Point to the southernmost areas of Sweeney Ridge and Phleger Estate, the natural communities of the park support a diversity of habitats: marine environments, coastline, sea cliffs and sand dunes, mud flats and salt marshes, chaparral and coastal scrub, grasslands, redwood forests, and oak woodlands. The recreation area spans two of the largest estuaries on the West Coast: Tomales Bay and San Francisco Bay. Aquatic associated habitats include ephemeral and perennial freshwater streams, groundwater seeps and springs, seasonal wetlands, tidal and brackish saline wetlands grading into estuaries, and the marine environment (NPS 2007a).

ALCATRAZ ISLAND

Alcatraz Island is a unique part of Golden Gate National Recreation Area. Accounts of early explorers describe the island as having little plant life and covered with bird guano. Construction of the Civil War military fort and later the federal penitentiary changed the landscape significantly, sharpening the incline of the cliffs and flattening the slopes. Few plants are native to Alcatraz Island and most of the existing plants are a result of prison

gardens or other means of importation, including soils brought from Angel Island during the fort construction. Since the closure of the prison, many bird species have made the island home.

PHYSICAL RESOURCES

Air Quality

Section 118 of the 1963 Clean Air Act (42 U.S.C. 7401 et seq.) requires a national park unit to meet all federal, state, and local air pollution standards. Golden Gate National Recreation Area and Muir Woods National Monument are in a Class II air quality area under the Clean Air Act, as amended. A Class II designation indicates the maximum allowable increase in concentrations of pollutants over baseline concentrations of sulfur dioxide and particulate matter as specified in Section 163 of the Clean Air Act. Further, the Clean Air Act provides that the federal land manager has an affirmative responsibility to protect air quality-related values (including visibility, plants, animals, soils, water quality, cultural resources, and visitor health) from adverse pollution impacts.

The Clean Air Act requires the Environmental Protection Agency to identify national ambient air quality standards to protect public health and welfare. Standards were set for the following pollutants: ozone (O₃), carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), inhalable particulate matter less than 10 microns (PM₁₀) and less than 2.5 microns (PM_{2.5}), and lead (Pb). These pollutants are designated criteria pollutants because the standards satisfy criteria specified in the act. An area where a standard is exceeded more than three times in three years can be considered a nonattainment area.

The California Clean Air Act of 1988, as amended, sets ambient air quality standards that are stricter than the federal standards and requires local air districts to promulgate and implement rules and regulations to attain those standards. Under the act, California Ambient Air Quality Standards are set for all pollutants covered under national standards, as well as vinyl chloride, hydrogen sulfide, sulfates, and visibility-reducing particulates. If an area does not meet the California standards, it is designated as a state nonattainment area.

In 1993, the Environmental Protection Agency adopted regulations implementing Section 176 of the Clean Air Act as amended. Section 176 requires that federal actions conform to state implementation plans for achieving and maintaining the national standards. Federal actions must not cause or contribute to new violations of any standard, increase the frequency or severity of any existing violation, interfere with timely attainment or maintenance of any standard, delay emission reduction milestones, or contradict state implementation plan requirements. Federal actions that are subject to the general conformity regulations are required to mitigate or fully offset the emissions caused by the action, including both direct and indirect emissions over which the federal agency has some control.

Golden Gate National Recreation Area and Muir Woods National Monument are in the San Francisco Bay Area Air Basin, which consists of San Francisco, San Mateo, Santa Clara, Alameda, Contra Costa, Napa, and Marin counties, as well as portions of Sonoma

and Solano counties. The Bay Area Air Quality Management District is the air quality agency responsible for the entire basin. The agency monitors criteria pollutants continuously at stations throughout the Bay Area.

Overall, air quality in the basin is better than in other urban areas of California despite widespread urbanization and extensive industrial and mobile source (vehicular) emissions. The Bay Area's coastal location and favorable meteorological conditions help keep pollution levels low much of the year, primarily due to the area's relatively cooler temperatures and better ventilation. However, when temperatures are hot and there are no ocean breezes, levels of ozone and other pollutants can exceed federal and state air quality standards.

The San Francisco Bay Area is designated a federal nonattainment area for ozone and a state nonattainment area for ozone and inhalable particulate matter (PM₁₀ and PM_{2.5}). Ozone is a principal component of smog. It is caused by the photochemical reaction of ozone precursors (reactive organic compounds and nitrogen oxides). Ozone levels are highest in the Bay Area during days in late spring through summer when meteorological conditions are favorable for the photochemical reactions to occur, i.e., clear warm days and light winds.

An air emissions inventory was conducted in 1999 to determine the origins, compositions, and rates of emission of pollutants affecting park lands and resources. In addition to Golden Gate National Recreation Area activities, the inventory included air emissions associated with park partners and concession operations and visitor activities to the extent that data were available. Standardized emission factors and air quality models from the California Air Resources Board and the Environmental Protection Agency were used to develop emission levels for the range of activities and facilities that can emit pollutants in Golden Gate National Recreation Area (NPS 2005a).

Sources of air emission within Golden Gate National Recreation Area include all three types identified by the Clean Air Act: stationary sources, area sources, and mobile sources. Stationary sources can include fossil-fuel-fired space and water heating equipment, backup generators, fuel storage tanks, paint and chemical usage, and woodworking equipment. Area sources may include prescribed burning, campfires, and bonfires. Mobile sources may include vehicles and other equipment operated within the park by visitors, tour operators, Golden Gate National Recreation Area employees, and concession employees.

The emissions inventory included all lands and uses within the GMP planning area. Included in the inventory were all structures, vehicles, boats, and equipment used by the park, park partners, or concessions, such as the Hornblower that operates the ferry service to Alcatraz Island.

Table 2: County Variation in Attainment Status, Demonstrated by Monitoring Station Data, 2001-2003

Pollutant	Redwood City San Mateo County		San Francisco San Francisco County		San Rafael Marin County	
	State Standard	Federal Standard	State Standard	Federal Standard	State Standard	Federal Standard
Ozone (1-hour)*	N	NA	A	NA	A	NA
Ozone (8-hour)	NA	NA	NA	NA	NA	NA
Carbon monoxide	A	A	A	A	A	A
Nitrogen dioxide	A	A	A	A	A	A
Sulfur dioxide	ND	ND	A	A	ND	ND
Particulate matter (PM ₁₀) (Max. 24-hour)	NA	A	N	A	NA	A

Source: Bay Area Air Quality Management District Annual Bay Area Air Quality Summary

Notes:

A = Attainment, N = Nonattainment, U = Unclassified, NA = Not Applicable, ND = No data

*Attainment status is assigned only on an air-basin level. Though specific county monitors indicate attainment with NAAQS, all counties are included in the San Francisco Bay Area Air Basin, which is designated as nonattainment for 1-hour and 8-hour ozone national standards and for state standards for PM₁₀.

There are no air quality monitoring stations in operation for the coastal areas of the Bay Area Air Basin that are certain to represent air quality conditions within the park. A monitoring station at Fort Cronkhite in the Marin Headlands records levels of toxins present in the air as a by-product of manufacturing, such as acetone and benzene, and does not monitor for criteria pollutants. The closest monitoring stations to park lands that record levels of criteria pollutants are in the cities of San Rafael, Redwood City, and eastern San Francisco. The levels recorded at these stations, which are located in the midst of urban development, would be more representative of the cumulative levels of air pollutants in urbanized areas that contain heavily used roadways, urban and residential sources, and existing stationary sources throughout the air basin. Data collected at these stations can serve as very conservative estimates of ambient air quality affecting the park lands, which are largely coastal and generally upwind (based on prevailing wind direction) of local sources of Bay Area air emissions, but are still subject to pollutant problems, such as ozone, that have a more regional effect on air quality. However, the actual ambient pollutant concentrations within the park lands are anticipated to have lower background levels of these pollutants because the project area and surroundings are more remote and generally upwind of roadways and other emission sources (NPS 2005a).

Carbon Footprint

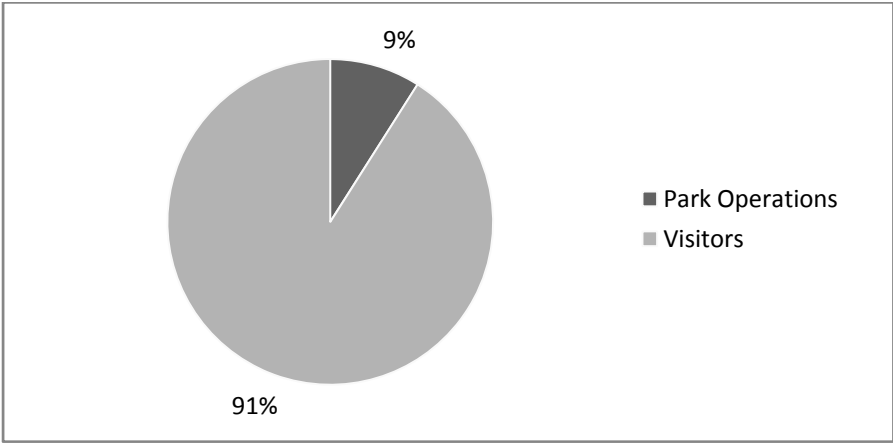
A “carbon footprint” is a measure of the impact human activities have on the environment in terms of the amount of greenhouse gases produced, and is measured in units of carbon dioxide. The greenhouse effect is a natural phenomenon that keeps the earth’s temperature stable at an average of 60° F. Without this natural warming effect, our planet would be uninhabitable at an average temperature of 14° F. However, human actions are disturbing this balance through over-production of large amounts of two main greenhouse gases, carbon dioxide (CO₂) and methane (CH₄). The increase in greenhouse gases is causing an overall warming of the planet, commonly referred to as *global warming*. The term *climate change* describes the variable consequences of global warming over time.

The National Park Service has a goal of reducing its contribution to global warming and climate change through the reduction of emissions. To begin tracking the results of their efforts, the park staff inventoried its emissions in 2006 using the Climate Leadership in Parks (CLIP) tool developed by the National Park Service and the Environmental Protection Agency. The CLIP tool converts emissions of various greenhouse gases into a common “metric tons of carbon equivalent” (MTCE) unit, which provides a basis for comparison among gases and simplifies reduction tracking. The conversion of a greenhouse gas to an MTCE unit is based on how strongly that particular gas contributes to the greenhouse effect, and how many tons of carbon emission would have the same effect.

The emissions inventory (NPS 2007c) then looked at the relative input of various sectors: stationary combustion (building furnaces, dryers, electrical generators, hot water heaters), purchased electricity, mobile combustion (vehicles, buses, heavy equipment), wastewater treatment, and solid waste disposal (garbage transportation and decomposition) for Golden Gate National Recreation Area and Muir Woods National Monument. Based on the emissions inventory completed in 2006, emissions from visitors (mobile combustion primarily from personal automobile use) represents 91% of gross emissions and emissions from park operations represents 9% (see figure 1). Figure 2 shows how the National Park Service’s emissions from park operational activities are distributed among sectors when visitor emissions are excluded.

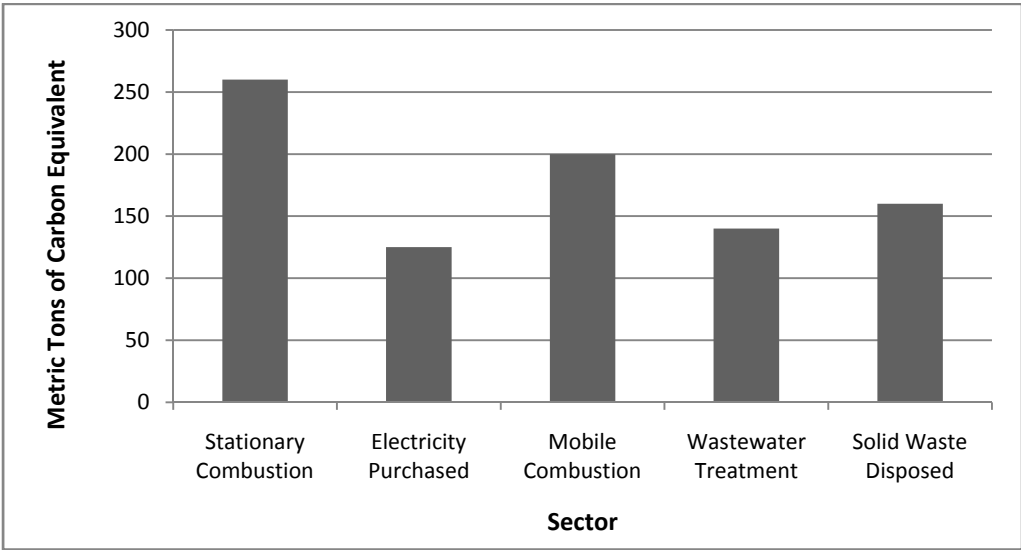
Visitor emission totals consist of an approximation of how much gasoline is consumed while driving to various park locations. Using annual visitor vehicle counts to many of the different locations in the park, the total number of miles driven by visitors was approximated (based on the assumption that they were driving from somewhere in the Bay Area). The resulting total vehicle miles driven by visitors was put into the CLIP tool. The CLIP tool then used assumptions about the different types of cars and the miles per gallon capacity of each to determine approximate fuel consumption.

Figure 1: Gross Emissions for Golden Gate National Recreation Area



Source: *Climate Change Action Plan for Golden Gate National Recreation Area*, August 2007

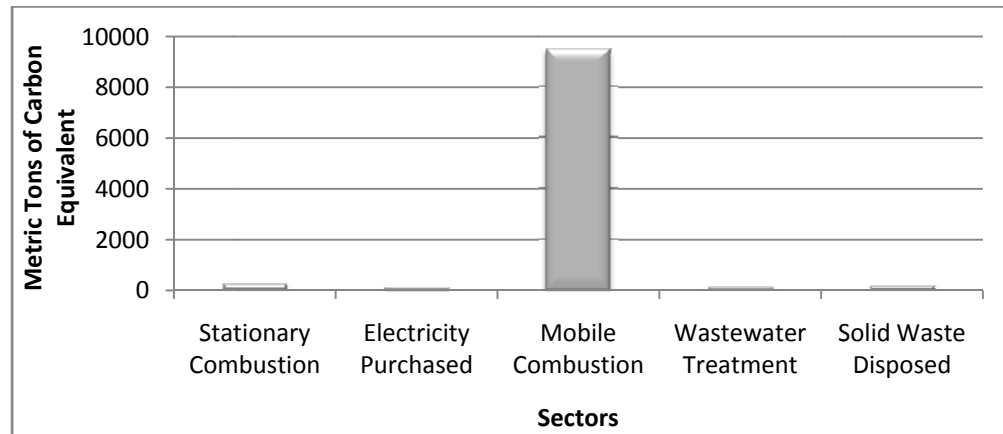
Figure 2: 2006 Gross Park Emissions by Sector, Excluding Visitors



Source: *Climate Change Action Plan for Golden Gate National Recreation Area*, August 2007

Figure 3 shows how the sectors of emissions are distributed when visitor emissions are included. The vast majority of emissions at Golden Gate National Recreation Area are attributable to visitor mobile combustion (vehicles).

Figure 3: 2006 Gross Park Emissions by Sector, Including Visitors



Source: *Climate Change Action Plan for Golden Gate National Recreation Area*, August 2007

In 2008, Golden Gate National Recreation Area's emissions inventory was updated and included the following emissions statistics for Golden Gate National Recreation Area (including park lands in the three-county area and Alcatraz Island) and Muir Woods National Monument. These data represent existing baseline conditions.

Table 3: Emission Statistics for Golden Gate National Recreation Area

	Marin County	San Francisco County	San Mateo County	Alcatraz Island	Muir Woods
Statutory combustion	523	148	No Data Available	632	5
Purchased electricity	385	382	No Data Available	0	17
Mobile combustion	1047	1419	No Data Available	1167	4873
Wastewater treatment	263	0	No Data Available	31	1
Solid waste	332	472	No Data Available	0	50
Gross emissions	2551	2422	No Data Available	1830	4946

Soils and Geologic Resources and Processes

Geology

The majority of the lands within Golden Gate National Recreation Area are located on the North American Tectonic plate. The more recently acquired lands in San Mateo are located on the Pacific plate. The boundary between these two plates is a transform fault (the plates are sliding past each other) and is formed by what is perhaps the best known geologic feature of California: the San Andreas fault zone. Movement along the San Andreas and its subsidiary faults, the Hayward and Calaveras, is infamous for producing the large earthquakes that periodically shake California and result in the area's rugged terrain. Older rocks of coastal California indicate that, before the Pacific Plate started slipping northward past the North American Plate on the San Andreas fault system, the Pacific ocean floor was subducted (moved) beneath the western edge of the North American Plate. The distinctive rocks of the world-famous Franciscan Complex, named at San Francisco and underlying much of coastal Northern California, formed in this subduction zone.

In the Bay Area, rocks of the Franciscan Complex form the basement for the Coast Ranges east of the San Andreas Fault. The Franciscan primarily consists of graywacke sandstone and argillite, but also contains lesser amounts of greenstone (altered submarine basalt), radiolarian ribbon chert, limestone, serpentinite (altered mantle material), and a variety of high-grade metamorphic rocks such as blueschist (high-pressure), amphibolites and eclogite (high-temperature). These rocks are typically highly fractured and disrupted and may be mixed together on a local scale to create what is called a *mélange* (French for "mixture" or "blend").

Because serpentinite is altered mantle rock, its chemistry is unlike most other continental rocks. Serpentinite is low in potassium and calcium, which are important plant nutrients. It also contains high levels of magnesium, nickel, and chromium that are potentially toxic to plants. Therefore, plants living on serpentine soils are specially adapted to these unusual chemical conditions, and serpentinite areas can often be mapped based on the abrupt vegetation change that occurs at their boundaries.

Serpentinite outcrops in California and throughout the world are known to support rare and endangered plant species (Kruckenberg 1984). Some species are confined to just one or a few outcrop areas. Eight of the twelve rare plants found at the Presidio grow on serpentinite, including the federally endangered Presidio clarkia and Raven's manzanita. (Elder n.d.)

Soils

Most of the soils within Golden Gate National Recreation Area belong to the following complexes: Blucher-Cole, Centissima-Barnabe, Cronkhite-Barnabe, Dipsea-Barnabe, Felton Variant-SoulaJule, Franciscan, Gilroy-Gilroy Variant-Bonnydoon Variant, Henneke stony clay loam, Kehoe, Rodeo Clay Loam, and Tamalpais-Barnabe Variant (USDA, Soil Surveys for Marin, San Francisco, and San Mateo counties). All of these soils are susceptible to sheet and rill erosion when disturbed or exposed. The susceptibility to wind erosion is generally low. In general, these soils are characterized by slow to moderate permeability, rapid stormwater runoff, and a high hazard of soil erosion, soil creep, and occasional land sliding. An aerial view of the park area landscape

makes clear the threats posed by erosion. Coastal waves rhythmically crash against the shoreline; deep, long gullies originate at old roads; heavily used areas are devoid of vegetation; undesignated social trails crisscross through the natural areas; and landslides or slumps exist in the small valleys (NPS 2005a).

Alcatraz Island is composed of consolidated sandstone sediments, and is the remainder of a mountain that has been highly eroded. Much of the soil on the island is a result of importation from Angel Island during the fort construction or soil amendments added over the years to support the various gardens and landscape areas.

Paleontological Resources

Fossils of tropical and subtropical species of zooplankton (radiolarian) have been found in chert of the Marin Headlands. Mollusk fossils (ammonite, belemnite, bivalve) have also been found here. Bivalve mollusk fossils are found on Alcatraz Island, and Mori Point is a source of zooplankton (radiolarian, foraminifera). The area near Devil's Slide includes zooplankton (foraminifera), mollusk (gastropod, bivalve), crustacean, and sea star-like (echinoid) fossils. Fort Funston includes mollusk (gastropod, bivalve), sand dollar, crustacean, marine worm (polychaete), woolly mammoth, giant ground sloth, mastodon, horse, camel, canid and split-toed ungulate fossils. Fossils found on the Phleger Estate include mollusk (freshwater gastropod, bivalve), unnamed vertebrates, and plants.

Shoreline Processes

The park's coastal shoreline along the Marin Headlands, Golden Gate Strait, and San Francisco peninsula comprise a diverse mixture of rocky shorelines, fine-grained sand beaches, and artificial structures (e.g., piers), as well as sites with a mixture of fine-grained and larger substrates. As the name implies, the Marin Headlands are steep rocky headlands such as Tennessee Point and Point Bonita that are unprotected and exposed to high wave erosion and strong currents. In sheltered areas, large beaches, such as Rodeo and Muir beaches, form bars that create lagoonal features behind them. Small pocket beaches are often characterized by steep slopes and a mixture of small and large substrates. The Golden Gate strait is characterized by rocky headlands, smaller sand and gravel beaches, and strong tidal currents. Within the Golden Gate strait, the shorelines have a higher percentage of artificial structures such as rubble breakwaters (Fort Baker), seawalls (Alcatraz, Fort Point, and Presidio), piers, and riprap bank protection. Much of the San Francisco peninsula shoreline within the park is dominated by Ocean Beach, the park's largest sand beach resource (NPS 2007a).

Alcatraz Island is composed of fractured sandstone and is somewhat susceptible to wave-generated erosion.

Sea Level Rise and Coastal Vulnerability

While the effect of climate change on sea level has shocking global implications of inundating low-lying islands and threatening coastal cities and harbors, it also raises serious concerns for many U.S. national parks. Golden Gate National Recreation Area is

no exception, given its extensive shorelines along the Pacific Ocean and San Francisco Bay. Although there is general consensus in the scientific community that notable sea level rise will occur over the next 100 years, the predicted degree of sea level rise varies considerably depending on which assumptions are incorporated into the prediction. For example, scientists who factor in the melting of the Greenland ice sheets predict that sea levels could rise 13 to 20 feet (approx. four to six meters) over the next 100 years as a result of global warming (Overpeck et al. 2006). If this occurs, the coastal areas of the park and the Bay Area will experience extraordinary change. This prediction is probably at the upper end of the range of sea level rise forecasts.

Other sea level rise projections incorporate only a partial contribution from the melting of the Greenland and Antarctic ice sheets. The Intergovernmental Panel on Climate Change (IPCC) is an international scientific body established by the United Nations Environment Programme and the World Meteorological Organization to provide a scientific view of the current state of climate change and its effects. In its latest assessment report, *Climate Change 2007*, the IPCC indicated that sea level rise by the year 2100 could range from 0.18 to 0.59 meters (seven inches to about 2 feet), depending on the climate change scenario that occurs over this time (IPCC 2007). However, the IPCC report was very clear in noting that these projections do not factor in uncertainties in climate-carbon cycle feedbacks nor the full effects of changes in ice sheet flow or melting. Therefore, the report states that the upper value of this range should not be considered the potential upper bounds for sea level rise (IPCC 2007).

More recent research was conducted for the California Energy Commission's Climate Change Research Program to assess the effects of climate change and sea level rise on California over the next 90 years. Using a set of climate change scenarios of medium to medium-high emissions, researchers projected that the mean sea level will rise 1.0 to 1.4 meters (3.3 to 4.6 feet) along California's coast by the year 2100 (Cayan et. al. 2009, Heberger et. al. 2009). This is the most commonly used sea level rise forecast in the park's planning area. However, these respective climate change reports quickly clarify that most climate models do not include ice-melt contributions from the Greenland and Antarctic ice sheets. Thus, the potential sea level rise could be much higher than these figures (Heberger et al. 2009).

Predictions of sea level rise are useful in determining what resources and facilities could be affected. Figure 4 illustrates the likely effect of the projected 1.4 meter sea level rise on the coastal corridors of the park by combining the effects of the sea level rise with a modeled 100-year flood (Heberger et al. 2009).

Also, the U.S. Geological Survey, in cooperation with the National Park Service, completed an assessment in 2005 (Pendleton, Thieler, and Williams 2005) of Golden Gate National Recreation Area's vulnerability to sea level rise using a tool called the Coastal Vulnerability Index. The Coastal Vulnerability Index provides insight into the relative potential of coastal change due to future sea level rise.

The Coastal Vulnerability Index allows six variables (geomorphology, shoreline change, regional coastal slope, relative sea level rise, mean significant wave height, and mean tidal range) to be related in a quantifiable manner that expresses the relative vulnerability of the coast to physical changes due to future sea level rise. The index highlights those regions where the physical effects of sea level rise might be the greatest.

Sea Level Rise: Golden Gate National Recreation Area



The most influential variables in the Coastal Vulnerability Index are geomorphology, coastal slope, and mean significant wave height; therefore, these may be considered the dominant factors controlling how Golden Gate National Recreation Area will evolve as sea level rises.

While climate change data reflect long-term increases in sea levels, there may be specific sites within Golden Gate National Recreation Area that could be more vulnerable to rising sea levels even within the lifespan of this general management plan, particularly if the melting of the polar ice caps increases more rapidly than expected.

The colored shoreline depicted in figure 5 represents the relative Coastal Vulnerability Index determined from the six variables. The very high vulnerability shoreline is generally located along sandy beaches where significant wave heights are highest and regional coastal slope is shallow; these areas include sites like Ocean Beach, Fort Mason, Land's End, and Fort Funston. The lower vulnerability shoreline is located along rock cliffs mostly along the northern part of Golden Gate National Recreation Area where wave heights are lower and coastal slope is steep.

Of the 59 miles evaluated at the park, 50% of them were classified as having high (26%) or very high (24%) vulnerability, with another 26% classified as having moderate vulnerability (Pendleton, Thieler and Williams 2005). This information raises serious concern, because the most vulnerable shorelines are located on the southern peninsula where the largest concentration of humans and built facilities exist. This area also includes heavily visited beaches such as Ocean Beach, China Beach, and Baker Beach.

Water Resources and Hydrologic Processes

Water resources in Golden Gate National Recreation Area include springs, streams, ponds, lakes, wetlands, lagoons, the San Francisco Bay, and the Pacific Ocean. Many significant watersheds are located wholly or partially within the park. From north to south, the major watersheds are Bolinas Lagoon, Redwood Creek, Tennessee Valley (Elk Creek), Rodeo Lagoon (including Gerbode Valley subwatershed), Nyhan Creek, Lobos Creek, Milagra and Sweeney Ridges, San Pedro Creek, West Union Creek, San Pedro Creek, Martini Creek, Denniston Creek, San Vicente Creek, and the San Francisco watershed lands in San Mateo County (see figure 6). Many smaller watersheds drain the steep coastal bluffs directly into the San Francisco Bay or Pacific Ocean.

The National Park Service has been monitoring water quality and quantity in varying degrees within these aquatic systems. Most water quality sampling to date has focused on specific sites with known or suspected water quality impacts, including beach water quality monitoring. The National Park Service is presently designing a more comprehensive monitoring program that should identify any existing impacts and serve as baseline data to determine future impacts. For the lands in the southern part of the park (San Francisco and San Mateo counties), this work will also include an inventory of the largely unknown water resources. The monitoring will be coordinated through the San Francisco Bay Area network of regional national park sites (NPS 2005b). The National Park Service is currently participating in a streamflow monitoring program with stations on Lobos Creek, Redwood Creek, and Easkoot Creek.

Figure 5: Coastal Vulnerability





Freshwater Resources

Surface Water

Watersheds in southern Marin County, such as Rodeo Lagoon and Tennessee Valley, are dominated by scrub and grassland vegetation with the majority of the trees in the riparian zone. These watersheds also have extensive stream and wetland complexes throughout their valley floors. Other watersheds, such as the Redwood Creek watershed, Bolinas Lagoon watershed, and the San Pedro Creek watershed, have denser forests beyond the riparian zone. These watersheds have steeper slopes and narrower valleys, and thus restrict the extent of wetlands (NPS 2005a).

Freshwater resources include streams, lakes, and freshwater wetlands. Most of the streams in the park are not large and their tributaries are frequently ephemeral. The overall condition of these resources results from more than a century of intensive human uses, combined with the instability associated with soil types and the highly active San Andreas Fault. The effects of past land use practices (development, logging, agriculture, and grazing) have changed watershed conditions and reduced habitat for many aquatic invertebrates, fish, and amphibians. Loss of native perennial vegetation, soil compaction and loss, hillside trailing, gulying, and incision of swales and meadows have changed the runoff patterns and reduced the capacity of the watershed to attenuate pollutant loading and surface runoff to streams. Dam construction, channelization, water diversions, and the increased water demands of growing urban areas have impaired fish passage, reduced available habitats, and reduced streamflows during summer-fall of dry years. Although land use practices having lesser impacts are being increasingly adopted by landowners, present land use continues to influence water quality conditions within many watersheds (NPS 2007a).

Macroinvertebrates are commonly used as indicators of water quality and functional status of freshwater streams, but to date macroinvertebrate sampling has been infrequent and inconsistent across sites. Coho salmon have been more consistently monitored and their use as an indicator of stream condition is being evaluated (NPS 2007a).

Ponds and swales are also extremely important aquatic resources. As mentioned earlier, some of the largest endangered red-legged frog populations are in Point Reyes National Seashore and northern Golden Gate National Recreation Area where there are more than 120 breeding sites with a total adult population of several thousand frogs. Most of the breeding sites are artificial stock ponds constructed on lands that have been grazed by cattle for 150 years. There are also fairly large populations in some of the coastal drainages in San Mateo County just south of San Francisco in Golden Gate National Recreation Area (NPS 2007a).

The U.S. Geological Survey also monitored sediment and stream flow in Audubon Canyon and Morses Creek (near Bolinas) between 1967 and 1969. University of California Berkeley staff monitored Lone Tree Creek (south of Stinson Beach) between 1972 and 1974. Stream gauges were installed by the National Park Service at Redwood Creek (State Route 1 Bridge) and Easkoot Creek. Because of high toxic nutrient loads, algal blooms have occurred in Rodeo Lagoon. In addition to nutrient issues, Rodeo Lagoon sediments may contain elevated amounts of copper from copper sulfate (algaecide) treatment. Rodeo Lagoon sediments may contain elevated amounts of metals from past and current activities (NPS 2005a).

Due to its relatively small size, Alcatraz Island does not have streams—only ephemeral drainages that flow during rainfall.

Marin County Watersheds. Most Marin County watersheds drain to the Pacific Ocean. watersheds relevant to park lands include Bolinas Lagoon, Redwood Creek, Marin Highlands, and others. The Bolinas Lagoon watershed extends from the Bolinas Ridges west to Inverness Ridge. Two-thirds of this watershed is in public ownership. Streams within this watershed are steep and flow through the highly erodible Franciscan Complex. The Redwood Creek watershed extends from the peaks of Mount Tamalpais, through Muir Woods National Monument, to the Pacific Ocean at Muir Beach. Ninety-five percent of the watershed is owned and managed by public agencies. Several threatened animal species also occur in the watershed, including coho salmon, steelhead, California red-legged frog, and the northern spotted owl (*Strix occidentalis caurina*).

In addition to draining into the Pacific Ocean and San Francisco Bay, the Marin Headlands drain into Rodeo Lagoon, which provides marine habitat, water recreation, saltwater habitat, and wildlife habitat. Rodeo Lagoon is a significant wetland/estuarine resource that provides important habitat for marine birds and other species including red-legged frog and tidewater goby (NPS 2005a).

San Francisco City and County Watersheds. The majority of the watersheds in San Francisco are highly urbanized, and their boundaries have been modified by storm drainage projects and other urban infrastructure. The Park Service manages lands in San Francisco draining to San Francisco Bay, the Golden Gate Channel, and the Pacific Ocean. Tennessee Hollow and Lobos Creek, both of which are within Golden Gate National Recreation Area and the Presidio of San Francisco (Presidio), remain in a relatively nonurban state and are significant water resources in the park. The Tennessee Hollow stream, in the Presidio East watershed, is the main fresh water source for the Crissy Field marsh, a recently completed wetland restoration project. Lobos Creek, in the Presidio West watershed, is the main water supply for the Presidio (NPS 2005a). Although small, this spring-fed creek has the highest summer baseflows in the park.

San Mateo County Watersheds. The watersheds in San Mateo County have not been comprehensively studied due to piecemeal land management by various agencies and private holdings. The watersheds that wholly or partly contain park land include Milagra, between Sweeney and Milagra; Sweeney; San Pedro Creek; Crystal Springs (part of the larger San Francisco watershed); and West Union / San Francisquito Creek. The 23-square-mile San Francisco watershed is owned and managed by the San Francisco Public Utilities Commission and is part of the water supply storage for the City and County of San Francisco. This watershed includes San Andreas Lake, Crystal Springs, Pilarcitos Lake, and a portion of the Pilarcitos Creek watershed. The San Pedro Creek watershed drains portions of the San Francisco watershed lands, Picardo Ranch, and portions of Devil's Slide. The West Union Creek watershed contains a tributary to the Searsville Lake that drains the Phleger Estate at the south end of Golden Gate National Recreation Area (NPS 2005a).

Groundwater

Marin County. The underlying Franciscan bedrock is relatively impermeable in Marin County, creating a perched water table. Numerous springs throughout the watershed feed Rodeo Creek well into the summer months. The total volume of water stored in the aquifer is unknown. No wells are in operation within NPS-managed lands in Marin

County. The water table is tidally influenced in the lower areas such as Fort Baker (NPS 2007b).

San Francisco County. Groundwater sources in San Francisco County are made up of shallow unconsolidated alluvium underlain by less permeable bedrock of the Franciscan Complex. Average precipitation is approximately 24 inches per year, but due to high impervious cover rates, little infiltration occurs. The primary water-bearing formations are comprised of unconsolidated sediments and include alluvial fan deposits, beach and dune sands, undifferentiated alluvium, and artificial fill. Groundwater within San Francisco County is subject to high concentrations of nitrates and elevated chloride, boron, and total dissolved solids concentrations. High nitrate levels are attributed to groundwater recharge from sewer pipe leakage and possibly to fertilizer introduced by irrigation return flows. Elevated chloride and total dissolved solids levels are most likely due to a combination of leaky sewer pipes, historic and current seawater intrusion, and connate water. Current groundwater usage in the City of San Francisco is primarily for irrigation of parks and golf courses.

San Mateo County. Much of San Mateo County is part of the Santa Clara Valley Groundwater Basin, with portions in the San Francisco basin. Santa Clara Valley groundwater sources include coastal marine terrace or stream valley alluvial deposits where groundwater is stored in loose, unconsolidated, coarse-grained sand, and upland granitic bedrock of the Santa Clara Formation, where groundwater is stored in weathered rock openings and in rock fractures. The granite bedrock has limited storage capacity, but the alluvial deposits are good sources of groundwater. Over the long term, the marine terraces appear to be in hydrological balance; however, in dry years, pumping has reduced the water table to near sea level—increasing the risk of salt water intrusion. The water is slightly alkaline with a mean pH value of 7.3 based on 20 samples. Hardness for the 20 wells sampled averaged 471 milligrams per liter (mg/L) as calcium carbonate (CaCO_3), in excess of the 180 mg/L minimum value for water to be classified as very hard (CWA 2004).

Floodplains

Floodplains exist along streams and creeks throughout Golden Gate National Recreation Area and Muir Woods National Monument. In Marin County, 100-year floodplains are located along Redwood Creek and Rodeo Creek. Park facilities at Stinson Beach (parking lots and picnic areas) and Muir Beach (parking lot and Pacific Way) are in the 100-year floodplain.

In San Mateo County, 100-year floodplains are located along Denniston Creek, San Vicente Creek, and the Middle Fork of San Pedro Creek. The lower stables at the Rancho Corral de Tierra property are located in the San Vicente Creek 100-year floodplain.

Water Quality

The size and nature of the park (including high visitor use, the urban interface, and multitude of land uses) create several issues related to water quality. Accelerated erosion due to roads, trails, and other uses and developments threatens the sediment balance and ecological health of several watersheds. Grazing is no longer allowed on NPS-managed lands in Golden Gate National Recreation Area (NPS 1999b), but some of the impacts remain. Bacteria and nutrient inputs from equestrian operations, pet waste, agricultural operations, and potentially from sewer and septic systems can affect wildlife and public health as well as the overall ecological balance of water resources. Alteration of channels

(including dams and culverts) affects the ecological health of park watersheds. These primary issues occur to varying extents within multiple park watersheds (NPS 2005a).

Many park water quality issues are related to facilities and structures. A roads and trails inventory exists and many structures are documented in the maintenance division's facilities database. However, a comprehensive inventory of park facilities and structures (including dams, culverts, and outfalls) has not been conducted (NPS 2005a).

Work is in progress to document facilities, roads and trails, and other water quality threats more thoroughly. For example, for the Redwood Creek watershed, a sediment budget study and a report of all sediment sources in the watershed were completed. Trail maps are being updated for the park and erosion surveys continue throughout the Marin Headlands. A dam inventory will be included in an upcoming "Water Quality Data Inventory and Analysis Report." Culvert mapping has occurred in Rodeo Valley (NPS 2005a).

Golden Gate National Recreation Area has a long history of water quality problems due to its proximity to urban and rural land uses. The park's surface waters and groundwater provide important beneficial uses that serve as a basis for establishing water quality objectives and discharge prohibitions by the California State Water Quality Control Board and the Environmental Protection Agency (EPA). These "beneficial" uses include agricultural supply, cold freshwater habitat, fish migration, municipal and domestic water supply, preservation of rare and endangered species, contact water recreation, noncontact water recreation, shellfish harvesting, fish spawning, warm freshwater habitat, and wildlife habitat. Additional beneficial uses for the Pacific Ocean include commercial and sport fishing, industrial service supply, and marine habitat. Some of the external issues facing the park have to do with balancing the historical and cultural traditions of ranching and dairy establishments with the very high water quality needed for endangered species such as coho salmon, steelhead trout, California freshwater shrimp, and California red-legged frogs. In the park, particularly in areas south of the Golden Gate, the primary issues are stormwater discharge and legacy contaminants from abandoned military installations (NPS 2007a).

According to the California State Water Quality Control Board, eight areas (three creeks, three bays, and two beaches within the park) are listed as impaired according to the EPA's list of impaired waters (the 303d List) (see table 3). The San Francisco Regional Water Quality Control Board has established a timeline for the development of total maximum daily loads associated with the highest priority impairment listings. The National Park Service is currently working with the state and local agencies to develop and implement monitoring and enhancement efforts to address additional impairment issues. Additional water quality programs are associated with the three counties within Region 2: Marin, San Francisco, and San Mateo. Water districts and some watershed groups also monitor water quality (NPS 2007a). Water quality monitoring in coastal areas at Rancho Corral De Tierra has also been done by San Mateo County Resources District (Critical Coastal Areas) through volunteers and tenants over the years.

Near-shore water quality has rarely been monitored by the parks, while freshwater and beach resources are measured principally in areas where problems have been identified. This lack of a probabilistic (randomized) water sampling program means that generalizations should be made with care; a broad summary of park water quality, or

even watershed water quality, is likely to overstate problems and overemphasize freshwater resources (NPS 2007a).

Marin Headlands / Redwood Creek / Stinson Beach / Bolinas Lagoon Areas. Short-term data sets also exist for Rodeo Creek and Tennessee Valley (1994–1996). Rodeo Creek and Tennessee Valley were monitored along with Green Gulch between 1998 and 2001 as part of intensive sampling related to stable operations and other potential sources of bacteria and nutrients. Parameters typically monitored included flow (though flow data has been sporadic), pH, temperature, dissolved oxygen, conductivity, biochemical oxygen demand (BOD), salinity, total suspended solids (TSS), fecal and total coliforms, nitrates, ammonia, phosphates, total phosphorus (Total P), metals (emphasis on copper), methylene blue active substance (MBAS), and chloride. Not all parameters were monitored at all sites (NPS 2005a).

Water quality monitoring has been conducted in Redwood Creek and tributaries (including Kent Creek, Camino del Canyon, Banducci Tributary, Green Gulch, and Golden Gate Dairy Tributary) at numerous locations throughout the years. Several data sets exist for discrete (i.e., short-term, focused) monitoring projects. For example, monitoring by the National Park Service in the Redwood Creek watershed was conducted in 1986, 1988, 1990 to 1991, and 1993 to 1996. Much of the water quality monitoring within the park has focused on lower Redwood Creek due to concerns related to nutrient and bacteria inputs in this locale, including recent data related to the Golden Gate Dairy and Big Lagoon (NPS 2005a).

The U.S. Geological Survey also monitored sediment and stream flow in Audubon Canyon and Morses Creek (near Bolinas) between 1967 and 1969. UC Berkeley monitored Lone Tree Creek (south of Stinson Beach) between 1972 and 1974. Stream gauges were installed by the National Park Service at Redwood Creek (State Route 1 Bridge) and Easkoot Creek (NPS 2005a).

Consultants, universities, the U.S. Geological Survey, and other entities have also conducted monitoring. For example, the Stinson Beach County Water Agency currently monitors Easkoot Creek for fecal coliform bacteria. Limited monitoring has been conducted in Oakwood Valley and Nyhan Creek as part of an overall stormwater monitoring project that includes Redwood Creek, Tennessee Valley, and Rodeo Creek (NPS 2005a).

Flow monitoring by various entities, including the National Park Service, the U.S. Geological Survey, local universities, and consultants, has also been conducted. Flow monitoring sites have typically corresponded with water quality monitoring sites and include the Redwood Creek watershed (including Camino del Canyon, Kent Creek, Banducci Tributary, and Green Gulch Creek) as well as Easkoot Creek, Rodeo Creek, and Tennessee Valley.

Table 4: Impaired Water Bodies within Point Reyes National Seashore and Golden Gate National Recreation Area as Indicated from the 2006 303d List

Water Body	Park Unit	Pollutant
Lagunitas Creek	Point Reyes NS, Golden Gate NRA	Sediment, Nutrients
Richardson Bay*	Golden Gate NRA	High Coliform, Chlordane, DDT, Dieldrin, Dioxin, Furan compounds, Mercury, Polychlorinated Biphenyls (PCBs), Exotic Species
San Francisco Bay	Golden Gate NRA	Chlordane, DDT, Dieldrin, Mercury, PCBs, Polycyclic Aromatic Hydrocarbon (PAHs), Nickel, Furan compounds, Exotic Species, Dioxin, Selenium
San Francisquito Creek	Golden Gate NRA	Sediment
San Pedro Creek	Golden Gate NRA	High Coliform
Tomales Bay	Point Reyes NS, Golden Gate NRA	Sediment, Nutrients, Mercury
Pacific Ocean at Baker Beach	Golden Gate NRA	Indicator Bacteria
Pacific Ocean at Muir Beach	Golden Gate NRA	Indicator Bacteria

Source: San Francisco Water Quality Control Board 2009 adapted from 2006 Clean Water Act Section 303d List.

* Note: Richardson Bay is not within Golden Gate NRA, although it does receive a relatively small volume of surface water run-off from the park.

San Francisco and San Mateo Counties. Water quality monitoring has been conducted periodically at the Presidio for several years. Until very recently, however, no monitoring of surface water had been conducted by the National Park Service in the southern Golden Gate National Recreation Area lands.

At Lobos Creek in the Presidio, the Urban Watershed Project, a nonprofit group, has conducted fecal coliform monitoring through a contract with the Presidio. The City and County of San Francisco also recently conducted monitoring in Lobos Creek. Limited

sampling of Lobos Creek was also conducted through the Environmental Remediation Program. Likewise, basic water quality parameters have been collected in Tennessee Hollow by the Urban Watershed Project, and by the National Park Service at the Crissy Field marsh. Some limited water quality monitoring has been conducted within the West Union / San Francisquito Creek watershed (West Union Creek is located within this watershed), but no monitoring has been conducted on NPS lands. The San Francisquito Creek Watershed Council is actively involved in management and monitoring of this watershed. Through the watershed council, consultants have monitored the Bear Creek watershed (including West Union Creek). However, no sites have been located within Phleger Estate or the adjacent county park (NPS 2005a). San Francisquito Creek is listed on the Section 303d list as being impaired by sediment. Concerns in West Union Creek, a San Francisquito Creek tributary within Phleger Estate, include erosion and runoff from trails. Landslides and significant bank erosion have been observed (NPS 2005a).

Issues in Milagra, Sanchez, and Calera creeks are mostly unknown due to the lack of water quality data. However, suspected issues in these urban creeks include fertilizer or pesticide runoff from lawns and a golf course. In addition, pet waste, oil and chemical runoff from roads, and bacteria and nutrient inputs from leaky sewer pipes are also suspected concerns (NPS 2005a).

Marine Resources

Marine Environment – Regional Overview

The Golden Gate National Recreation Area coastal waters include coastal and marine habitats of central and northern California, which overlap with portions of the Gulf of the Farallones National Marine Sanctuary and Monterey Bay National Marine Sanctuary. The area shares many other features with the sanctuaries due to its proximity and the influence of similar currents, seasonal upwelling, and weather patterns. Geological features include a broad continental shelf; rocky shores; sandy beaches; coastal estuaries such as San Francisco Bay, Elkhorn Slough, and Tomales Bay; offshore banks; and the sloping edges of the continental shelf, dissected by deepwater canyons such as the Monterey Submarine Canyon (NMS and NOAA 2006).

This unique combination of oceanographic conditions and undersea topography make the area rich and diverse in a variety of marine species, including a wide array of temperate cold-water species and occasional influxes of warm-water species. The species diversity is directly related to the diversity of habitats and oceanic conditions, which are described in the following section, and the location of the sanctuaries within a broad transition zone providing a complex gradient of changing environments in which the relative proportions of species changes from north to south (NMS and NOAA 2006).

The species north of Point Conception, an area encompassing the entire study region and extending right up through Washington State, are part of the Oregonian biogeographic province. The relative amount and location of upwelling and downwelling and, consequently, the amount of productivity seen along the coast, are affected by seasonal weather patterns and the influence of the California and Davidson currents. The distribution of each species in the ocean is determined by a multitude of factors, including temperature, salinity, oxygen content, nutrient availability, current speed and direction, species interaction, frequency of perturbation, and food availability (NMS and NOAA 2006).

Habitats

The nearshore marine environment includes bay and estuarine habitats created by mudflats, tidal wetlands, and rocky shorelines; it extends through the intertidal to the subtidal zone of the continental shelf. This shelf extends far from the coast; because upwelling occurs near shore, the coastal zone offers a relatively shallow, highly productive habitat for fish, invertebrates, marine mammals, and seabirds. Many portions of the park's subtidal zone overlap with the federally protected Gulf of the Farallones National Marine Sanctuary to the north and the Monterey Bay National Marine Sanctuary to the south. The area is considered a biological hot spot; data that is available for some species (seals, invertebrates (abalone), fish (rockfish), and shorebirds) indicate that most populations are slowly recovering from historic declines. Rocky and sandy substrates predominate with kelp communities occurring in scattered areas predominantly along the Point Reyes National Seashore and Golden Gate National Recreation Area coastlines north of San Francisco Bay. Research on physical processes is underway with promising new approaches for coastal benthic mapping, such as multibeam sonar, helping to elucidate nearshore habitat complexity. This knowledge is important for resource assessments as an aid to locate and predict species distributions (NPS 2007a).

Along the open coast, intertidal habitats are likely the most heavily impacted aquatic areas. Despite park protection, these habitats are impacted by recreational activities including boating, fishing, and hiking; park operations (beach cleaning); and nonpark facilities and activities (sand movement by City of San Francisco). Significant impacts also occur from previously constructed facilities and loss of marine/estuarine habitats from filling (e.g., historic Crissy marsh filled, riprap and seawalls along San Francisco shoreline, and Fort Baker marsh). The principal water quality threats include bacterial and nutrient pollution (ranches, dairies, septic and stormwater discharges), occasional oil spills from offshore tankers, and legacy military landfills. Though beach sampling and damage incident reports have identified many of these problems, the extent of these impacts on intertidal organisms is not well studied (NPS 2007a).

Estuarine Resources. Approximately 59 miles of ocean and bay coastline are included in Golden Gate National Recreation Area (NPS 2007a). Coastal and bay resources comprise biologically diverse and complex ecosystems that contain a rich array of marine invertebrates and algae. Intertidal communities within or adjacent to the boundaries include islands, islets, reefs, rocks, straits, lagoons, mudflats, beaches, piers, wharves, the Gulf of the Farallones, and the San Francisco Bay Estuary (NPS 1999b).

Golden Gate National Recreation Area estuaries, bays, and lagoons have endured considerable physical disturbance and pollution due to their proximity to the highly urbanized City of San Francisco. Some areas were heavily modified in past eras, causing major changes in habitat structure, including Big Lagoon at Redwood Creek, Horseshoe Bay, and Crissy Field. Restoration is either planned or already accomplished in these areas. In the recent past, the San Francisco Peninsula experienced significant bacterial pollution from stormwater runoff; however, treatment since the 1990s has significantly reduced pollution levels. High levels of PCBs, PAHs and heavy metals are still major issues facing San Francisco Bay coastal waters, and continued restoration is likely to improve local water quality conditions in some areas like the nearshore Presidio (NPS 2007a).

While active restoration efforts are reclaiming wetlands, some bays are accumulating too much sediment. Though sedimentation is a natural process, Tomales Bay, Drakes Bay, and Bolinas Lagoon appear to be experiencing higher than normal sedimentation rates. The evaluation of these complex tidal system dynamics and the possible impacts due to climate change will depend on accurate habitat mapping procedures. Currently, there is significant emphasis in Point Reyes National Seashore and Golden Gate National Recreation Area on mapping wetland extent and quality; however, these efforts are not yet completed and historical information on wetland habitats is limited. Where efforts are being made to restore tidal marsh habitat, such as at Redwood Creek and the Giacomini Ranch, understanding of these systems is improving (NPS 2007a).

Intertidal Zone. Intertidal habitat, by definition, is found between the lowest and highest tidal level. This transitional area between sea and land is the strip of shore between the uppermost surfaces exposed to wave action during high tides and the lowermost areas exposed to air during low tides. Intertidal habitats vary in type of material and the degree of exposure to surf. Bottom habitat types include those of fine mud, sand, gravel, shale, cobble, boulders, and bedrock. Intertidal habitat within Golden Gate National Recreation Area includes rocky and sandy beaches (NMS and NOAA 2006).

The south side of Alcatraz Island contains a sheer rock wall that terminates on a narrow rock reef about 30 to 50 feet wide. This narrow intertidal reef extends for only a short distance (about 660 feet) but represents one of the few rocky reefs within the San Francisco Bay. Other rocky intertidal portions of the island are comprised of riprap and rubble similar to the shorelines of much of the San Francisco Bay.

Subtidal and Nearshore Waters. Subtidal and nearshore waters refer to the area from the lowest low tide line to the point where the seafloor drops and the deeper offshore waters begin. This is on the land side of the continental shelf slope transition. The substrate can be sand, mud, or rock, providing essential habitat for various algae, zooplankton, and phytoplankton species (NMS and NOAA 2006). The nearshore coastal environment is highly variable along the park's shorelines, with a complex spatial distribution of marine resources due to diverse lithologies, active tectonic and geomorphic processes, topographic relief, and dynamic nearshore currents. This physical diversity coupled with high productivity results in an equally diverse distribution of organisms (NPS 2007a).

Because the continental shelf extends far from the coast and upwelling occurs nearshore, the coastal portion of the park offers a shallow, highly productive habitat for sea birds, fish, and marine mammals. Currents, bathymetry (depth), and substrate determine the distribution of marine communities in the subtidal zone. These factors in turn affect more inland habitats, such as the intertidal zone, bays, and estuaries, to varying degrees. Though much of this discussion focuses on coastal subtidal areas, it should be noted that estuarine areas also include subtidal areas. Subtidal habitats are particularly threatened in San Francisco Bay and the surrounding coastline due to intense coastal development and expansion of marine transportation systems. Dredging for port modernization, sand mining, and alteration of rocky reef habitats near navigation channels can severely impact subtidal habitats (NPS 2007a).

Continental Shelf and Slope. The continental slope, which is still considered part of the continent, together with the continental shelf, is called the continental margin. Large areas of the Golden Gate National Recreation Area waters (and state lands lease waters)

overlap with Gulf of the Farallones National Marine Sanctuary and Monterey Bay National Marine Sactuary; these waters cover both the continental shelf and slope. The overlap occurs in Tomales Bay, and from Stinson Beach to Point Bonita. From the shoreline to a depth of about 328 to 492 feet, the shelf is nearly horizontal, with rocky outcrops, gravel, sand, clay, silt, and deposits of broken shells covering it. About 25 miles from the coast, the seafloor drops off, creating the continental slope with a grade of about 3 degrees. The slope extends to about 2 miles deep and is covered with uniform sandy sediment (NMS and NOAA 2006).

BIOLOGICAL RESOURCES

Habitat (Vegetation and Wildlife)

Marine and Estuarine

Intertidal Zone

The intertidal habitat (the area between high tide and low tide lines) is biologically rich, supporting diverse assemblages of organisms. It is characterized by extreme conditions caused by wind, waves, and the fluctuation of tides. The animals inhabiting intertidal zones are subject to periodic immersion in water, followed by exposure to air. They must withstand varying degrees of wave shock, dramatic temperature changes, changes in moisture, attacks from both marine and terrestrial predators, and human-caused effects, such as trampling and collecting (NMS and NOAA 2006).

Four zones of rocky intertidal organisms are traditionally associated with different tidal heights: splash, high intertidal, mid-intertidal, and low intertidal. Species distributions are restricted according to physiological tolerance along the thermal and moisture gradient in the intertidal zone. The splash zone is almost always exposed to air, and has relatively few species. The high intertidal zone is exposed to air for long periods twice a day. The mid-intertidal zone is exposed to air briefly once or twice a day, and the low intertidal zone is exposed only during the lowest tides (NMS and NOAA 2006).

On unconsolidated muddy or sandy shores, algae are rare; benthic diatoms are the only marine algae that may be present. On sandy beaches, much of the invertebrate life—such as worms, crustaceans, snails, and clams—dwell under unconsolidated substrate. Common crustaceans and mollusks include the beach hopper (*Megalorchestia californiana*), spiny mole crab (*Blepharipoda occidentalis*), and sand crab (*Emerita analoga*). Common marine worms include *Anatides groenlandica*, *Eteone dilate*, and *Euzonus* spp. (NMS and NOAA 2006).

Rocky shores support a richer assortment of plants and animals. Algae include numerous species of green, brown, and red algae, as well as beds of surfgrass. A wide variety of invertebrates, including anemones, barnacles, limpets, and mussels, compete for space with the algae in the intertidal zone. Mobile invertebrates, such as sea stars, snails, and crabs, often hide in crevices or under rocks, emerging to graze on algae or prey on other animals. Small fishes may also live in the small pools of water that fill up with each tidal cycle. Typical intertidal invertebrate species of central and northern California include lined shore crab (*Pachygrapsus crassipes*), purple shore crab (*Hemigrapsus nudus*), isopods (*Idotea* spp.), California mussels (*Mytilus californianus*), periwinkles (*Littorina*

spp.), lemon nudibranch (*Anisodoris nobilis*), troglodyte chiton (*Nuttallina californica*), bat star (*Patiria miniata*), black turban snail (*Chlorostoma funebris*), the giant green anemone (*Anthopleura xanthogrammica*), aggregating anemone (*Anthopleura elegantissima*), and other species of bryozoans, nudibranchs, sponges, and tunicates. Intertidal fishes, such as the crevice kelpfish (*Gibbonsia montereyensis*) and the tide pool sculpin (*Oligocottus maculosus*), are limited to tide pools or to passing through the intertidal zone at high tide (NMS and NOAA 2006).

Birds forage in the intertidal zone at low tide or roost in the cliffs just above the shore. There are a great many species of shorebirds along the beaches, including sanderlings (*Calidris alba*), short-billed dowitchers (*Limnodromus griseus*), western gulls (*Larus occidentalis*), glaucous-winged gulls (*Larus glaucescens*), and California gulls (*Larus californicus*). Shorebirds, such as sanderlings and dowitchers, routinely forage in the receding surf, an indication that there are sand-dwelling crustaceans available. Another bird found in this area is the snowy plover (*Charadrius alexandrinus nivosus*), whose threatened status has resulted in some significant resource management actions in central California, including restrictions on access or types of use in some shoreline areas. In addition to the snowy plover, typical shorebird breeders in this habitat include the black oystercatcher (*Haematopus bachmani*), killdeer (*Charadrius vociferus*), sanderlings, willets (*Catoptrophorus semipalmatus*), and marbled godwits (*Limosa fedoa*). Brown pelicans (*Pelecanus occidentalis*), surf scoters (*Melanitta perspicillata*), grebes (family *Podicipedidae*), cormorants (*Phalacrocorax* spp.), and many other seabird species can be found in water beyond the breaking waves or flying through the area. Caspian terns (*Sterna caspia*), Forster terns (*Sterna forsteri*), and whimbrels (*Numenius phaeopus*) are some of the summer migrants that forage along the coastal beaches. Winter migrants include loons (*Gavia* spp.), willets, black-bellied plovers (*Pluvialis squatarola*), godwits (*Limosa* spp.), and turnstones (*Arenaria melanocephala*) (NMS and NOAA 2006).

Marine mammals are also found in this habitat. Pacific harbor seals (*Phoca vitulina*), and California sea lions (*Zalophus californianus*) are frequently seen seaward of the surf zone; sea otters (*Enhydra lutris*) and Steller sea lions (*Eumetopias jubatus*) are occasional visitors. Seals and sea lions haul out on intertidal shores for warming and breeding (NMS and NOAA 2006).

At Alcatraz Island, the rocky intertidal community on the Alcatraz reef is characterized by attached flora and fauna such as rockweed (*Fucus gairdneri*), turfweed (*Endocladia muricata*), and barnacles. Areas with crevices and overhangs often harbor mobile species such as shore crabs and seastars.

Subtidal and Nearshore Waters

Subtidal habitats (depths below mean low water) and nearshore waters (shallow inshore waters of the continental shelf) support many different species. Krill (*euphausiids*) is a crucial or “keystone” species in the area. They are small, shrimp-like crustaceans that congregate in large dense masses called swarms or clouds. Two krill species form the primary forage for upper trophic levels in the adjacent sanctuary. Krill feed on phytoplankton and are very important in the food web because many other species feed on krill. Krill form a key trophic link in coastal upwelling systems between primary production and higher trophic level consumers. Most marine predators subsist at least part of the year on krill, which is the primary prey of seven of the ten most important

commercial fishes on the central California coast. Krill are also very important food sources for baleen whales and seabirds (NMS and NOAA 2006).

The nutrient-rich sanctuary waters near Golden Gate National Recreation Area provide forage for the largest concentration of breeding seabirds in the continental United States. More than 120 species of birds use these three sanctuaries for shelter, food, or as a migration corridor. Of these, over 40 species are known to use the sanctuary during their breeding season (NMS and NOAA 2006).

These same productive waters also support a variety of marine mammals, including gray whales (*Eschrichtius robustus*), humpback whales (*Megaptera novaeangliae*), blue whales (*Balaenoptera musculus*), Dall's porpoise (*Phocoenoides dalli*), harbor porpoise (*Phocoena sinus*), Pacific white-sided dolphins (*Lagenorhynchus obliquidens*), northern right whale dolphins (*Lissodelphis borealis*), Risso's dolphins (*Grampus griseus*) and killer whales (*Orcinus orca*). Some species, such as the gray whale, are only seasonal migrants; others, such as the blue, humpback, and killer whale, travel to the area to feed. Other marine mammals, such as harbor seals and sea lions, can be found in these areas year round (NMS and NOAA 2006).

Six species of pinnipeds, some of which are federal listed, are found in the waters offshore of the park. Pinnipeds spend a large amount of time in offshore waters or on offshore islands, but some of the rookeries (breeding places or breeding colonies usually crowded with the same species) and haul-out areas occur in this habitat. Species found in the area are California sea lion, Pacific harbor seal, Steller sea lion, northern elephant seal (*Mirounga angustirostris*), northern fur seal (*Callorhinus ursinus*), and on occasion, the Guadalupe fur seal (*Arctocephalus townsendi*). The various species have numerous seal rookeries or colonies and are found at different times of the year, feeding on the abundant fish and invertebrate resources of the island shelves or hauling out on rocks and beaches (NMS and NOAA 2006).

A variety of fish species occur within these habitats, including rockfishes, cabezon, surfperch (family *Embiotocidae*), wrasses (family *Labridae*), and señorita, (*Oxyjulus californica*). Commercially harvested species include salmon, tuna, crab, squid, and various rockfish. Salmon and crab fisheries are the most important fisheries in the sanctuaries. The West Coast Dungeness crab fishery is considered the most sustainable large-scale commercial crab fishery in the world. Both chinook and coho salmon are coastal migrants. (NMS and NOAA 2006).

Kelp forests support a variety of species, including sea otters and sea urchins. Other marine mammals, such as harbor seals and California sea lions, are common in and around kelp forests, as are a variety of fishes, such as the señorita, the kelp surfperch (*Brachyistius frenatus*), blue rockfish (*Sebastes mystinus*), blacksmith (*Chromis punctipinnis*), and olive rockfish (*S. serranoides*). The kelp canopy, stipes, and holdfasts increase the available habitat for nearshore species and offer protection to juvenile finfish. Bat star (*Asterina miniata*), sea lemon (*Anisidoris nobilis*), barnacles (*Balanus spp.*), red volcano sponge (*Acarinus erithacus*), and urchin are a few of the many types of invertebrates that inhabit the kelp forest and rocky subtidal habitats (NMS and NOAA 2006).

Golden Gate National Recreation Area contains areas of sandy beaches, some barely accessible narrow strips along the shoreline while others are large expanses readily

accessed and heavily used by visitors. Beach wrack—a thick tangle of kelp and sea grass that washes ashore during high tides—supports an intricate food web and community. Until recently, beach wrack was removed from many park beaches; now this practice has been discontinued. Recreational activities on park beaches, unleashed dogs, and kayaks impact both shorebird and pinniped populations. Efforts to minimize disturbance during the past 5 to 10 years appear to have met with some success and certain species such as snowy plover and harbor seal populations seem stable after years of decline (NPS 2007a).

Although local data are not comprehensive, notable trends and observations for key indicators in California nearshore marine and estuarine habitats likely to occur in the parks include the following:

- a decline in populations of all California abalone
- northward spread of the rickettsial-like bacteria responsible for withering syndrome in black abalone which was recently observed just south of Golden Gate National Recreation Area
- a decline in rockfish species such as bocaccio (*Sebastes paucispinus*)
- a decline in the extent of kelp forests caused by pollution, wave damage due to storms, and El Niño warming
- stable Dungeness crab populations as a result of successful fisheries management
- an increase in dune- and beach-dependent snowy plovers after significant declines observed in the mid 1990s resulted in protective management
- stable population levels of harbor and elephant seals
- a decline in pelagic sea birds due to climate regime shifts and human disturbance including bycatch, nest disturbance, and oil spills
- an increase in tidal marsh lands due to restoration activities and protective measures (NPS 2007a)

Estuarine and Lagoon

Estuaries and lagoons serve as important habitats for many fishes, birds, and mammals. They provide suitable habitat for reproduction, feeding, resting, and cover. Estuaries and lagoons support unique biological communities with both aquatic and terrestrial characteristics. Halophytic vegetation, such as pickleweed (*Allenrolfea occidentalis*), grows higher in the marsh where flooding occurs less frequently and salt may become concentrated. However, little vegetation can grow in areas characterized by high evaporation and high soil salinity. A diverse assemblage of wetland plants grows in areas near tidal creeks where fresh water input is high. As the plant matter breaks down into detritus, it is consumed by various filter feeders, deposit feeders, and other omnivores and scavengers. These species, in turn, provide abundant food resources for other species of fish, birds, and mammals. Brackish water supports a distinctive assemblage of invertebrate and fish species, including the endangered tidewater goby (*Eucyclogobius newberryi*). Other estuarine species can include jacksmelt (*Atherinopsis californiensis*), Pacific sardine (*Sardinops sagax caerulea*), Pacific herring (*Clupea pallasii*), staghorn sculpins (*Leptocottus armatus*), several rockfishes, salmonids, and clupeids (*Clupeonella* spp.) (NMS and NOAA 2006).

The estuaries and bays of coastal California are part of the Pacific Flyway, one of the four principal bird migration routes in North America. San Francisco Bay supports a large number of migratory and resident birds. Also important for birds are Tomales Bay, Bolinas Lagoon, Pescadero Marsh, and Elkhorn Slough. Bolinas Lagoon and Tomales Bay are designated wetlands of significant international importance under the Convention on Wetlands. Marine mammals, including harbor seal, harbor porpoise, and sea otter, occur in these bays (NMS and NOAA 2006).

Seagrass beds, which occur in the bays and lagoons, are highly productive habitats that support a unique assemblage of invertebrates and fishes. Many fishes, including Pacific herring, spawn in seagrass beds among other habitats. The structure of seagrass beds provides protection from predation for juvenile invertebrates and fishes. Large numbers of shorebirds and waterfowl are attracted to seagrass beds, where they feed on the seagrass, fishes, and invertebrate eggs and young (NMS and NOAA 2006).

The marine environment around Slide Ranch includes exposed outer coastlands with a rich display of sponges, hydroids, bryozoans, and tunicates. Muir Beach is also home to a variety of submarine sponges, hydroids, bryozoans, and tunicates. Tennessee Cove contains unique geological features including the only California central coast display of highly polished and fossilized shells of *Collisella digitalis*. Sea caves contain unusually large isopod (*Ligia occidentalis*) specimens. Kirby Cove contains giant isopods of unusually large size and high densities of starfish (*Pisaster ochraceous* and *Patiria miniata*). Bird Island, with its guano-covered sea stack, produces abnormally sized marine invertebrates and plants, including large California mussels and surfgrass, marine kelp and giant kelp, sea anemones and purple seastar, as well as high densities of marine copepod (*Tigriopus californica*). The underwater marine life is abundant and includes high densities of sponges, hydroids, bryozoans, and tunicates. The Alcatraz intertidal zone ranks high in its abundance and diversity of marine algae (NPS 1999b).

Estuaries, bays, and lagoons provide rich habitats including subtidal seagrasses, tidal mudflats, and marshes that support a rich diversity of wildlife. Past shoreline modifications, including wetland fill and seawalls, dramatically reduced the extent of tidal marsh within the park. Inherently lower rates of hydrologic mixing in estuaries and especially in lagoons, enhances their vulnerability to pollution and invasive species (NPS 2007a).

Although at much lower levels and not as well studied as in San Francisco Bay, invasive species are established in estuaries and lagoons in northern coastal areas of the park. Despite these threats, Tomales Bay and Drakes Estero are considered relatively pristine and support variable but healthy biological communities. Wetland restoration projects, such as the Muir Beach / Big Lagoon restoration project will further enhance resource condition (NPS 2007a).

Due to its favorable currents and nearshore foraging areas, the waters around Alcatraz Island provide rich sources of food for the colonial waterbirds that nest on the island (NPS 2001). These waters are subject to the same influences as the rest of San Francisco Bay.

Benthic Communities

The benthic community is made up of organisms that live in and on the bottom of the ocean floor. Benthic species include worms, clams, crabs, lobsters, sponges, and other

tiny organisms that live in the bottom sediments. Benthic species are divided into the filter feeders and the deposit feeders. Filter feeders filter their food by siphoning particles out of the water.

Various benthic habitats and substrates are found within the waters off Golden Gate National Recreation Area. In addition, benthic communities occur in a variety of the habitats described in this section, including subtidal rocky reefs, kelp forests, soft bottom habitats, and deep ocean floor habitats. The continental shelf descends gradually from the coast to the shelf break. Benthic communities along the continental shelf are covered in part by a layer of mud. Outcropping bedrock and sand cover the continental shelf at depths greater than 295 feet. Benthic organisms play a critical role and make up a diverse group that is a major link in the food chain (NMS and NOAA 2006).

Terrestrial/Freshwater

Plant Communities

The vegetation of Golden Gate National Recreation Area is a result of the juxtaposition of physical landforms and water masses, and associated geology, climate, and history. The moist maritime climate along the coastline is a dominant influence, while the park's east-facing sites are subject to drier inland conditions. Distinct changes in soils from the rich conditions of the Franciscan melange to the unique chemistry of serpentinitic outcrops have created a diverse mosaic of vegetation communities. Natural processes, including landslides, rainfall patterns, and fires, affect these patterns and add another layer of complexity to the system. Golden Gate National Recreation Area is known to support 572 native species, including 336 nonnative terrestrial plant species (NPS 2005a).

Alcatraz Island generally consists of grasses, shrubs, historic gardens, nonnative trees, and cliffs and other barren areas, along with buildings and other paved areas. The landscape vegetation consists of a diverse group of nonnative ornamental shrubs and trees, which provide the vegetative structure and habitat for wildlife on the island (NPS 2001).

Coastal Scrub and Chaparral. The coastal scrub community is dominated by coyote brush (*Baccharis pilularis*), California sagebrush (*Artemisia californica*), bush lupine (*Lupinus arboreus*), and poison oak (*Toxicodendron diversilobum*), with variations in dominant species based on moisture levels, soil types and slopes, and past land use history. This community intergrades and creates a mosaic with the grassland community, and is found throughout the park from near sea level to 2,500 feet in elevation. The coastal scrub community includes a wide variety of native perennial forbs (*Lupinus albifrons* and others) and large numbers of nonnative species; at times it is dominated by nonnative shrubs such as French broom (*Genista monspessulana*) and thoroughwort (*Ageratina adenophora*). Chaparral stands exist within the park, but are not all that abundant. Small communities of chaparral exist in Muir Woods National Monument and the Marin Headlands, as well as larger areas on Bolinas Ridge. There are several types of chaparral in the park, including chamise chaparral, ceanothus chaparral, and manzanita chaparral (NPS 2005a).

Grasslands. The grassland community at Golden Gate National Recreation Area extends from sea level to nearly 2,600 feet in elevation. It forms a mosaic with the coastal scrub community and mixed evergreen forests. The coastal prairie areas appear to have evolved

under light seasonal grazing pressure from native tule elk and other herbivores with occasional fire (NPS 2005a).

Pristine grassland was thought to have been composed of evenly spaced bunchgrasses with annual forbs occupying areas between tussocks. It has been shown that purple needlegrass (*Nasella pulchra*)—the California state grass—was a major dominant of that grassland type along with other perennial grasses. These grasslands have had the greatest disturbance of any natural habitat in this area. Four main factors have contributed to this disturbance: 1) an increase in grazing pressures from nonnative cattle, sheep, and horses, 2) the introduction of highly competitive nonnative plants, 3) cultivation, and 4) the elimination of fire (NPS 2005a). Today, the grasslands are dominated by nonnative annual grasses and forbs adapted to Mediterranean conditions. (NPS 2005a).

The extirpation of large native mammals, exclusion of grazing by native herbivores, and suppression of wildfires have caused a marked increase in acreage covered by coyote brush and the resulting coastal scrub community in the Bay Area. It should be noted that grassland and coastal scrub communities are a dynamic mosaic with changes in dominance over time, and in some areas these two communities are in equilibrium with no invasion occurring (NPS 2005a).

Riparian Forest and Scrub. These streamside forests and shrub lands are dominated by broad-leaved deciduous trees or shrubs, most commonly willows (*Salix lasiolepis* or *S. lucida* ssp. *lasiandra*) and occasionally red alder (*Alnus rubra*). The understory is typically dense, with a variety of shrubs including native berries—native salmonberry (*Rubus spectabilis*), thimbleberry (*R. parviflorus*), and California blackberry (*R. ursinus*)—as well as nonnative Himalayan blackberry and cape ivy. Numerous herbaceous species, including ferns, rushes, and sedges, dominate the shrub understory. Nonnative trees, including eucalypts (*Eucalyptus* spp.) and Monterey cypress (*Cupressus macrocarpa*), have become successfully established within the riparian forest strands in the park (NPS 2005a).

Douglas-fir and Coast Redwood. The majestic old-growth redwood forest at Muir Woods National Monument, with Redwood Creek peacefully flowing through groves of tall trees, attracts much visitor attention. This tranquil scene is a rare sight close to a large metropolitan area. Many species contribute to this ecosystem. Major overstory and understory trees include coast redwood (*Sequoia sempervirens*), Douglas-fir (*Pseudotsuga menziesii*), California bay laurel (*Umbellularia californica*), tanoak (*Lithocarpus densiflorus*), California hazel (*Corylus californica*), and madrone (*Arbutus menziesii*) (NPS 2005a). Douglas-fir communities are found on Bolinas Ridge and within Muir Woods National Monument. The communities on Bolinas Ridge have been previously logged.

Nonnative Evergreen Forest. Many nonnative tree species have become established in Golden Gate National Recreation Area through both intentional and unintentional introductions, including ornamental plantings, plantings for windbreaks or shade for pastures, and escapes from cultivated and developed areas. Many of these trees—including a number of eucalypts (*Eucalyptus* spp.), acacia (*Acacia* spp.), Monterey pine (*Pinus radiata*), and Monterey cypress (*Cupressus macrocarpa*)—have invaded native communities. Most are very flammable, or significantly change the fire potential in areas that otherwise would support low-intensity or minimal fires, such as the coastal scrub and grassland areas of the park (NPS 2005a).

Plant Communities of Alcatraz Island. Before occupation by Europeans, Alcatraz Island was sparsely vegetated. Trees and shrubs were planted as part of military fort and penitentiary life on the island. Soils brought from the mainland and surrounding islands in the bay contained seeds of native plants, including coyote brush, California poppy (*Eschscholzia californica*), and California blackberry (*Rubus ursinus*), which have become established on the island. Only about 5% of the island has native grasses or coastal scrub species; the rest is dominated by nonnative species (NPS 2001).

The landscape vegetation is nonnative, but it provides significant shelter and habitat on the island. Shrubs are common and include nonnative rose, mirrorbush, fig, blackberry, agave, Australian tea ivy, mimosa, plume acacia, Monterey cypress, and native coyote brush. A small stand of native grasses dominated by creeping wildrye (*Leymus triticoides*) is located on the Northeast Perimeter Trail near the Power House complex. Another smaller stand is present in the Cistern area. Ruderal vegetation occurs along the edges of walkways, buildings, and building remains. Dominant species in these areas are wild oats, wild radish, mustard, and cheeseweed. Rocky cliffs and bluffs are found primarily along the island perimeter. The southwestern cliffs support various succulents, agave, sourgrass, sweet alyssum, wild radish, and large shrubs in areas where Brandt's cormorants, western gulls, and pigeon guillemots nest. These plants provide nesting material and protection for the birds (NPS 2001).

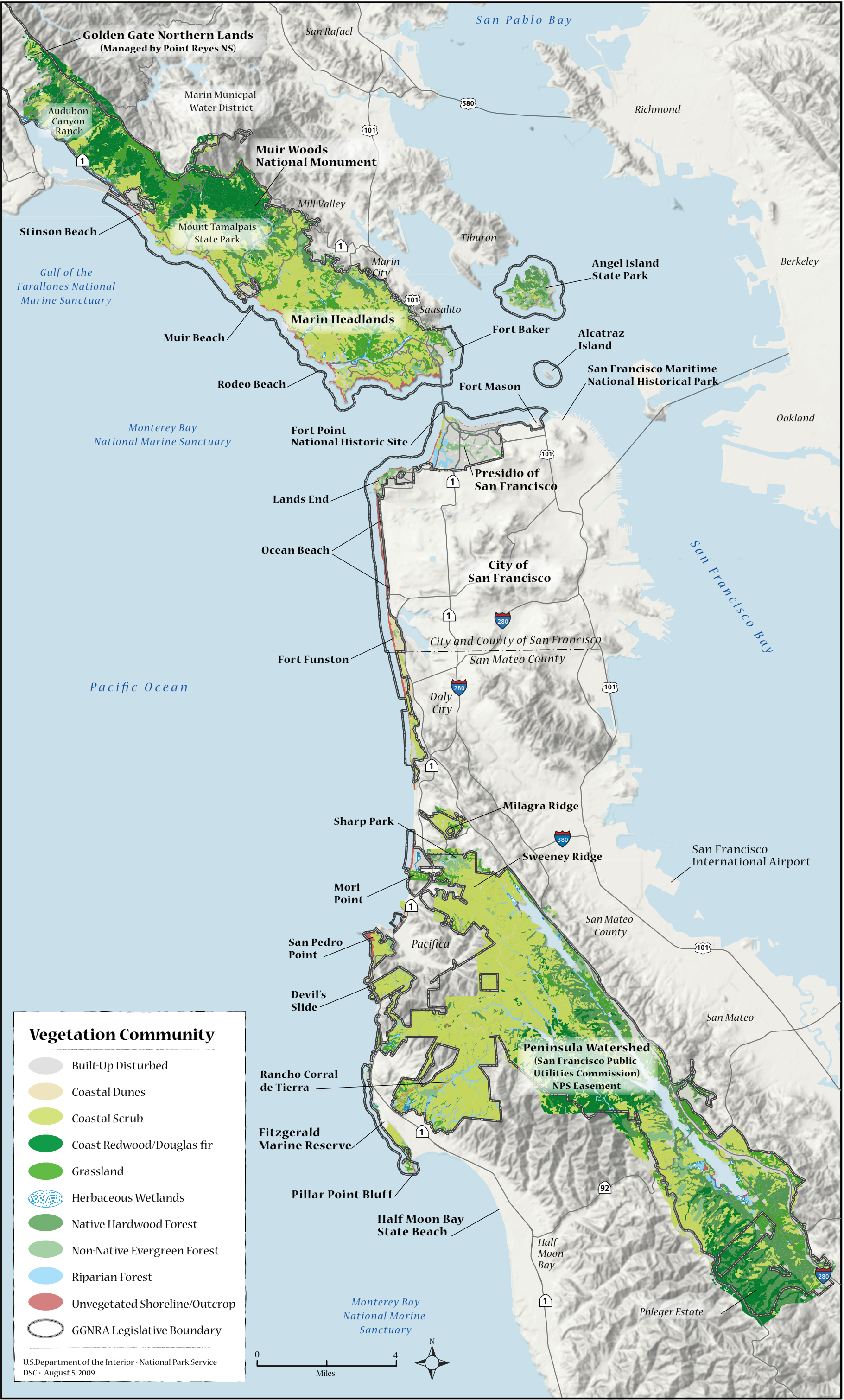
Wetlands. Herbaceous wetlands are known as emergent wetlands in the Cowardin wetlands classification. They consist of a mix of low-growing species of native sedges (*Carex* spp.), rushes (*Juncus* spp.), and other wetland-dependent species (*Scirpus microcarpus*, *Typha* spp. *Cyperus eragrostis*, *Equisetum* spp.), as well as some nonnative species of grasses and forbs. The nonnative grasses include velvet grass (*Holcus lanatus*) and harding grass (*phalaris aquatica*) and the forbs include cape ivy (*Delairea odorata*) and vinca (*Vinca major* and *V. minor*). Also included are areas covered with various reeds along the shores of lagoons and ponds, herbaceous strips of vegetation along perennial and ephemeral stream courses, and isolated wetland patches where seeps spring from the hill slopes. Some special status plant species—locally to regionally rare—occur within this community (NPS 2005a).

Golden Gate National Recreation Area has abundant wetland resources, including wet meadows, seeps, streams, riparian forests, lakes, ponds, and lagoons. Wetlands, according to the definition developed by the U.S. Fish and Wildlife Service and adopted by the National Park Service, are lands transitional between terrestrial and aquatic systems, where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands generally include marshes, riparian zones, mudflats, rocky intertidal zones, and gravel beaches. Deepwater habitats such as rivers, lakes, and estuaries are not technically wetlands but are classified as aquatic sites using the same classification system. Wetland ecosystems act to buffer hydrologic and erosional cycles, control and regulate cycles of nitrogen and other key nutrients, and create valuable habitat for animal species.

The wetlands in Golden Gate National Recreation Area have been field-mapped in several watersheds, including the Rodeo Creek watershed, the Presidio of San Francisco, and portions of the Redwood Creek and Bolinas Lagoon watersheds. The remainder of the park has not been field-mapped, but likely contains areas of wetland vegetation based on parkwide vegetation mapping results that need field verification. The majority of

PART 7: THE AFFECTED ENVIRONMENT

wetlands in Golden Gate National Recreation Area are located in the valley bottoms, with seeps and small intermittent streams reaching into the higher portions of the watersheds (NPS 2005a).



Wildlife

The entire park is included within the Central California Coast International Biosphere Region. The park's diverse habitats support a rich assemblage of wildlife. At least 387 vertebrate species are known to occur within the park boundaries. Species lists compiled from a variety of sources and incomplete inventories include 11 amphibians, 20 reptiles, 53 fish, 53 mammals, and 250 birds. Terrestrial invertebrates in the park are less well known; however, two areas of the park, Marin Headlands and Milagra Ridge, support diverse butterfly populations. Wildlife habitats within the park include introduced eucalyptus and closed-cone Monterey pine and cypress forests; hardwood, mixed evergreen, Douglas-fir, redwood, and riparian forests; coastal scrub; annual and perennial grasslands; freshwater and saline wetlands and wet meadows; and estuarine, lacustrine, marine, and riverine aquatic habitats (NPS 2005a).

Alcatraz Island is a valuable natural habitat for colonial waterbirds due to favorable currents and nearshore foraging areas. The island supports a diverse assembly of marine and estuarine colonial nesting birds. Species of particular interest are black-crowned night herons, pigeon guillemots, Brandt's and pelagic cormorants, and western gulls (NPS 2001).

Mammals. Terrestrial habitats within the planning area support a diversity of mammals. Meso-carnivores, including the gray fox (*Urocyon cinereoargenteus*), bobcat (*Felis rufus*), and the recently reestablished coyote (*Canis latrans*), inhabit coastal scrub and grasslands. Mountain lions (*Felis concolor*) have been sighted in some undeveloped areas of the park. These carnivores feed on a variety of small and large mammals such as the Pacific black-tailed deer (*Odocoileus hemionus columbianus*), broad-footed mole (*Scapanus larimamus*), pocket gopher (*Thomomys bottae*), deer mouse (*Peromyscus maniculatus*), western harvest mouse (*Reithrodontomys megalotis*), California vole (*Microtus californicus*), and brush rabbit (*Sylvilagus bachmani*). Badgers (*Taxidea taxus*) are also infrequently encountered. Some species, such as the western harvest mouse, appear to be restricted to areas where native perennial grasses persist (NPS 2005a).

In addition to many of the aforementioned mammals, Muir Woods National Monument and other forested areas within the planning area support vagrant shrew (*Sorex vagrans*), Trowbridge's shrew (*Sorex trowbridgii*), Sonoma chipmunk (*Tamias sonomae*), western gray squirrel (*Sciurus griseus*), opossum (*Didelphis virginiana*), and dusky-footed woodrats (*Neotoma fuscipes*). Other mammalian carnivores include the raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), and spotted skunk (*Spilogale gracilis*), long-tailed weasel (*Mustela frenata*), and the recently returned river otter (*Lontra Canadensis*) (NPS 2005a).

Seventeen species of bats have been detected within the park. Ten species of bats have been documented in Muir Woods National Monument, including four at-risk species: Townsend's western big-eared bat (*Corynorhinus townsendii townsendii*), fringed myotis (*Myotis thysanodes*), long-legged myotis (*Myotis volans*), and Yuma myotis (*Myotis yumanensis*). Many of the bats have been observed using redwood fire-scar cavities for roosting. At the Marin Headlands, several historic World War II structures were found to be occupied by the Townsend's western big-eared bat and the Yuma myotis. The Brazilian free-tailed bat (*Tadarida brasiliensis*) forages over coastal scrub habitat within the Marin Headlands (NPS 2005a).

Isolated coastal rocks, beaches, and lagoon sand flats in the park serve as haul-outs for harbor seals (*Phoca vitulina*) and California sea lions (*Zalophus californianus*). Up to 250 harbor seals haul out in Point Bonita Cove along the slopes of the Marin Headlands. As the northern elephant seal (*Mirounga angustirostris*) population rapidly increases, the seals are encountered more frequently on sandy beaches throughout the region. California gray whales (*Eschrichtius robustus*), humpback whales (*Megaptera novaeangliae*), and harbor porpoises (*Phocoena phocoena*) use offshore waters; young whales occasionally wander into San Francisco Bay. Southern sea otters (*Enhydra lutris nereis*) are infrequently seen offshore with numbers increasing as the population spreads north (NPS 2005a).

Alcatraz Island is home to deer mice and several bat species. Small numbers of seals and sea lions haul out on the island's rocky areas (NPS 2001).

Birds. Located along the Pacific Flyway, Golden Gate National Recreation Area provides habitat for a great diversity of breeding, overwintering, and migratory birds. Nineteen species of diurnal raptors have been detected in migration over the ridges of the Marin Headlands. Red-tailed hawks (*Buteo jamaicensis*), red-shouldered hawks (*Buteo lineatus*), and great horned owls (*Bubo virginianus*) nest in many of the large nonnative eucalyptus trees in the park. A wide range of other raptors and at least ten owl species occur within the planning area. Numerous species of waterbirds also occur within the park in marine and rocky intertidal habitats, cliffs, beaches, and tidal and wetland areas (NPS 2005a).

Point Reyes Bird Observatory (now Point Reyes Bird Observatory Conservation Science) encountered 83 bird species during 1997 breeding landbird censuses in coastal grassland, coastal scrub, riparian, and mixed hardwood habitats. From point count censuses in 1999 and 2000, white-crowned sparrows (*Zonotrichia leucophrys*), red-winged blackbirds (*Agelaius phoeniceus*), savannah sparrows (*Passerculus sandwichensis*), and song sparrows (*Melospiza melodia*) were the most commonly detected species in grasslands. The most abundant species in coastal scrub were white-crowned sparrows, spotted towhees (*Pipilo maculatus*), and wrentits (*Chamaea fasciata*). In forested habitats, bushtits (*Psaltiriparus minimus*), chestnut-backed chickadees (*Poecile rufescens*), dark eyed juncos (*Junco hyemalis*), Pacific-slope flycatchers (*Empidonax difficilis*), and winter wrens (*Troglodytes troglodytes*) were commonly detected. Based on songbird nest monitoring in riparian habitats along Redwood and Lagunitas creeks, the song sparrow, Swainson's thrush (*Catharus ustulatus*), warbling vireo (*Vireo gilvus*), and Wilson's warbler (*Wilsonia pusilla*) were the most commonly observed nesters. The brown-headed cowbird (*Molothrus ater*) is a nest parasite that negatively affects the reproductive success of open-cup nesting songbirds and occurs throughout the planning area. Many of the landbirds in the planning area are Neotropical migrants, with others identified as species of management concern and riparian species of conservation priority by California Partners in Flight (NPS 2005a).

Alcatraz Island is a particularly important site for birds. A number of colonial waterbird species inhabit Alcatraz Island. Waterbird species of interest include Brandt's cormorants (*Phalacrocorax penicillatus*), pelagic cormorants (*P. pelagicus*), western gulls (*Larus occidentalis*), pigeon Guillemots (*Cephus columba*), black oystercatchers (*Haematopus bachmani*), black-crowned night herons (*Nycticorax nycticorax*), snowy egrets (*Egretta thula*), great egrets (*Casmerodius albus*), great blue herons (*Ardea herodias*), and

California gulls (*Larus californicus*). The Brandt's cormorant colony on Alcatraz Island is one of the few known estuarine breeding sites for this species. Pigeon Guillemots breed nowhere else in the San Francisco Bay, and the western gull and black-crowned night heron colonies are among the largest in the Bay (Acosta et al. 2008). None of the waterbird species on Alcatraz Island are special status species.

This diversity of species exists in a delicate balance with the considerable human presence both on and around Alcatraz Island. Colonial waterbird populations on the island experience substantial disturbance from a number of different sources. A large number of visitors tour the island annually, and associated historic preservation and safety construction projects, public access to breeding areas, gardening activities that are part of a historic garden restoration program, and special events could disrupt the breeding efforts of Alcatraz Island seabirds. Encroachment near the Alcatraz Island shoreline by large numbers of commercial or recreational boaters (e.g., tour boats, anglers, kayakers), and uncontrolled aircraft overflights (e.g., air tour operators), may have similar effects. In addition, dredging and other projects that disturb and alter the subtidal environment are potentially disruptive to seabird populations, as these activities may remobilize contaminants, increase turbidity, and destroy essential foraging habitat (Acosta et al. 2008).

In 1993, Golden Gate National Recreation Area completed a management plan for Alcatraz Island, which included provisions for maintaining breeding populations of colonial waterbirds. This plan emphasized protection of the island's natural resources, while maintaining opportunities for visitor access, special events, and other island uses. The plan called for natural resource monitoring and the development of protocols to determine baseline information for key wildlife populations (Acosta et al. 2008).

Amphibians and Reptiles. Small populations of the federal listed threatened California red-legged frog (*Rana aurora draytonii*) occur within the planning area.

Within San Mateo County, historic and current records indicate the presence of the federal listed endangered San Francisco garter snake (*Thamnophis sirtalis tetrataenia*). More common terrestrial amphibians in the planning area include ensatina (*Ensatina eschscholtzii*) and California slender salamander (*Batrachoseps attenuatus*). Common species spending a substantial amount of time at streams or ponds for breeding or rearing purposes include California newts (*Taricha torosa*), rough-skinned newts (*Taricha granulosa*), Pacific treefrog (*Hyla regilla*), and California giant salamander (*Dicamptodon ensatus*). Common reptiles include the Western fence lizard (*Sceloporus occidentalis*), northern alligator lizard (*Gerrhonotus coemleus*), Pacific gopher snake (*Pituophis melanoleucus*), and western terrestrial garter snake (*Thamnophis elegans*) (NPS 2005a).

Alcatraz Island has large populations of California slender salamanders, which are small lungless salamanders that do not require water for breeding. The northern end of the island has moist substrate, which supports the salamanders. Neither the eggs nor the salamanders can tolerate salt spray, so they are limited to upland areas of the island (NPS 2001).

Fish. The planning area includes both resident and transitory fish species that occupy marine, estuarine, and freshwater habitats. Common, nearshore resident estuarine and marine fish include Pacific staghorn sculpin, arrow goby (*Clevelandia ios*), and topsmelt

(*Atherinops affinis*). The brackish Rodeo Lagoon in the Marin Headlands supports a large population of the federal listed endangered tidewater goby (*Eucyclogobius newberryi*) (NPS 2005a).

Freshwater streams within the planning area are characterized by naturally low species diversity. Perennial streams may include resident fish such as threespine stickleback (*Gasterosteus aculeatus*) and prickly sculpin (*Cottus asper*). Several important anadromous fish species are present in the creeks and watersheds within the planning area. Anadromous species are those that spawn or breed in streams and rivers and then migrate to and mature in the ocean. Anadromous species that breed and rear in streams within the planning area include endangered coho salmon (*Oncorhynchus kisutch*) and steelhead trout (*Oncorhynchus mykiss*). Coho salmon are listed as endangered and steelhead trout are listed as threatened under the Endangered Species Act. Intermittent streams or the intermittent headwater streams may support only steelhead trout (NPS 2005a).

Invertebrates. Two coastal grassland/scrub areas in the park are known for their high numbers and diversity of butterflies: Marin Headlands and Milagra Ridge. The federal listed endangered mission blue butterfly (*Icaricia icarioides missionensis*) occurs at both sites, while the San Bruno elfin butterfly (*Euphydryas editha bayensis*) is found at Milagra Ridge, where it inhabits rocky outcrops. At least 44 species of butterflies occur in the Marin Headlands and 34 species occur at Milagra Ridge, illustrating the importance of habitat fragments within largely developed landscapes. Various species of skippers, swallowtails, hairstreaks, blues, ladies, admirals, and crescents inhabit these areas. Monarch butterflies (*Danaus plexippus*) are found in clusters overwintering in many areas of the park, often in groves of nonnative trees. Other terrestrial invertebrates have not been well documented (NPS 2005a).

Limited information is available regarding the freshwater invertebrates that are present within the planning area. Targeted inventories have been conducted in streams such as Redwood Creek. Two hundred twenty-three freshwater species are known. The only federal listed species is the endangered California freshwater shrimp, which is found within the Lagunitas Creek watershed, an area managed by Point Reyes National Seashore. Limited information is also available regarding invertebrates from marine and estuarine habitats within the planning area. Two hundred seventy-nine marine and estuarine species are known (NPS 2005a).

Alcatraz Island includes a small but significant site used briefly by Monarch butterflies in their fall migration. The butterflies are usually on the island for one to five days during this period and have been reported on vines on the east side of the island and near the chapel (NPS 2001).

Nonnative Wildlife. Many species of nonnative wildlife have been identified as problem species within the park. These species negatively affect populations of native animals through competition for resources, predation, and as vectors for disease. Nonnative terrestrial mammals include fallow deer (*Cervus dama*), feral hogs (*Sus scrofa*), red fox (*Vulpes vulpes*), opossum, house cats (*Felis domestiells*), and Norway and black rats (*Rattus norvegicus* and *R. rattus*). Nonnative birds found in the planning area include wild turkeys (*Meleagris gallopavo*), European starlings (*Sturnus vulgaris*), peewees (*Pavo eristatus*), house sparrows (*Passer domesticus*), and rock doves (*Columba livia*). Nonnative invertebrates present in the planning area include Argentine ant (*Iridomyrmex*

humilis). Nonnative fish present within various human-made ponds include mosquitofish (*Gambusia affinis*) and various sunfish, while estuarine areas may support yellowfin goby (*Acanthogobius flavimanus*). Nonnative amphibian and reptile species include bullfrog (*Rana catesbeiana*), red-eared slider (*Chrysemys pieta*), and the occasional caiman (NPS 2005a).

Norway rats have been observed on Alcatraz Island since 1998. The Norway rats are a concern because of their potential as predators of waterbird eggs and chicks on the island. These rats have been known to reduce native rodent populations (NPS 2001).

Special Status Wildlife Species

Habitat for numerous rare or special status wildlife species (i.e., federal and state listed species, species of special concern, and candidate species) exists within the lands and waters of the park's legislative boundary. These special status species are permanent residents of the park, seasonal residents of the park, or rely on the land and waters of the park for migration. Twenty-seven wildlife species that occupy the land and waters of Golden Gate National Recreation Area are listed as threatened or endangered under the Endangered Species Act as amended (16 USC 1536 [a] [2] 1982). Of these, 14 are federal endangered and 14 are federal threatened. It is important to note that three separate populations of the chinook salmon species and two populations of the steelhead trout species exist in the planning area. Since the federal status of the chinook salmon varies across populations (two are threatened, one is endangered), the sum of federal endangered and federal threatened species (28) does not directly coincide with the previously-noted 37 protected species under the Endangered Species Act.

Fourteen of the wildlife species that occupy the lands and waters of the park are also listed as threatened or endangered by the California Endangered Species Act. Of these, 10 species are state endangered, and 4 are state threatened. All but three of these state-listed wildlife species are also federal listed: the exceptions being the bald eagle, bank swallow, and California black rail.

Numerous other wildlife species (birds in particular) are considered sensitive by the Audubon Society, Partners in Flight, or the California Department of Forestry, or are designated Migratory Nongame Birds of Management Concern by the U.S. Fish and Wildlife Service. Nearly all of the native birds documented in the park are protected under the Migratory Bird Treaty Act (16 USC 528-531). Thirty-eight rare or special status plant species are currently identified within the park. Of those species, 9 are federal listed endangered, 1 is federal listed threatened, and 15 are included or proposed for inclusion by the California Native Plant Society (NPS 2005a).

The U.S. Fish and Wildlife Service and the National Oceanic and Atmospheric Administration National Marine Fisheries Service provided a list of federal listed threatened and endangered species for consideration during development of the fire management plan in 2005. This list was used as the initial baseline of information for the development of this general management plan, because the planning areas for the two plans are identical (NPS 2005a). To refine and update the list of special status species in the planning area, the NPS Endangered Species Act Database, the California Department of Fish and Game's California Natural Diversity Database, and park staff data were referenced.

The table in Appendix D identifies the threatened and endangered species that could occur in the planning area. Their current federal and state status and county-specific habitat location are also identified in the table. Appendix D also identifies which of these species have been retained for further analysis of impacts (also see the summary table of impact topics at beginning of part 9 of this document, “The Affected Environment.”).

To evaluate the effects on special status species, a set of species considered likely or possible to experience impacts from GMP actions was selected for assessment based on the presence of suitable habitat within the project area and discussions with NPS biologists.

Marin County

Mission Blue Butterfly – Federal Endangered

Mission blue butterflies (*icaricia icaroides missionensis*) are closely tied to the lupine larval host plants *Lupinus albifrons*, *L. variicolor*, and *L. formoslls*, with *L. albifrons* considered to be the preferred host. These host plants tend to occur in grasslands on thin, rocky soils within broader coastal scrub habitats. Lupine are susceptible to fungal outbreaks, which have been documented to cause rapid contractions of lupine distribution at the Marin Headlands. Competition from nonnative plants, including eucalyptus, Monterey pine, grasses, and broom, also threatens lupine host plants. Lupine is a fire-adapted species, and fire may enhance suitable lupine habitat for mission blue butterflies. Adults feed on nectar from numerous plants, though they may prefer wild buckwheat (*Erigonum latifolium*), golden aster (*Chrysopsis vilosa*), blue dicks (*Brodiaea pulchella*), and Ithuriel's spear (*Brodiaea laxa*). Habitat loss is probably the primary threat to mission blue butterflies, with trampling of host and nectar plants, larvae, and pupae also of concern. Other threats to mission blue butterflies at various stages of their life cycles include parasites, predators, and desiccation and disease during diapause (NPS 2005a).

Adults have one generation per year, with a flight period from mid-March to mid-May at the Marin Headlands and late May to mid-June at San Bruno Mountain. Analyses suggest that warmer air temperatures are associated with higher numbers of adults at the seasonal peak and that rainfall is not related to the peak number of adults. Eggs are usually laid on the dorsal surface of larval host plants. Ants (*Prenolepis imparis* and *Formica lasioides*) may tend the later-instar mission blue larvae. Mission blue butterflies occur at the Marin Headlands, Tennessee Valley, Milagra Ridge, and Sweeney Ridge within the planning area (NPS 2005a).

California Red-legged Frog – Federal Threatened

The California red-legged frog (*Rana aurora draytonii*) is found primarily in wetlands and streams in coastal drainages of central California. Red-legged frogs found north of the Marin-Sonoma county border exhibit intergrade characteristics of the California red-legged frog and the northern red-legged frog. The frog requires specific aquatic and riparian features. Adults require a dense, shrubby, or emergent riparian vegetation closely associated with deep (>2.3 feet) still or slow-moving water. The highest densities of California red-legged frogs have been associated with deep-water pools with dense stands of overhanging willows and an intermixed fringe of cattails. Breeding sites are located up to 85 feet from water in dense riparian vegetation. Nonbreeding sites can be found up to 98 feet from water in adjacent dense riparian vegetation (Rathbun et al. 1993). A final rule designating critical habitat identified a small sliver near Sweeney Ridge, San Mateo (UFWS 2006). A recent court decision eliminated critical habitat within the planning area

by changing the habitat definition. Critical habitat had been defined to include essential aquatic habitat, associated uplands, and dispersal habitat connecting essential aquatic habitat (NPS 2005a).

Tidewater Goby – Federal Endangered

The tidewater goby (*Eucyclogobius newberryi*) is a small benthic fish that occurs in the upper end of California coastal lagoons in salinities less than 10 parts per thousand. While generally found in coastal embayments, gobies are also known to occur in streams. In San Antonio Creek in Santa Barbara County, the goby is known to occur up to five miles upstream of the lagoon habitat. Within the planning area, tidewater goby is known only from Rodeo Lagoon in the Marin Headlands (NPS 2005a).

Chinook Salmon – Federal Threatened and Endangered; State Threatened and Endangered

Chinook salmon (*Oncorhynchus tshawytscha*) spawning and juvenile rearing habitat occurs in the Sacramento River and its tributaries, and large streams and rivers connected to the Pacific Ocean. Chinook salmon have unique populations with distinguishable “runs” based on the timing of upstream migration and their spawning period. Winter-run chinook are listed as endangered (federal and state). Central Valley spring-run chinook are listed as threatened (federal and state). Adult and juvenile migratory corridors exist along the San Francisco Bay portion of Golden Gate National Recreation Area lands. Critical habitat for winter-run chinook includes the San Francisco Bay to the Golden Gate Bridge.

Recent data indicate that most juvenile chinook salmon are using the Central Bay as a migratory corridor with most juvenile chinook moving along the northern corridor through Raccoon Strait and around the Tiburon peninsula, by Fort Baker, and out to the Golden Gate. Based on the occurrence of juvenile chinook at the Delta pumps and a one month transit time from Chipp's Island to the Golden Gate, winter-run chinook juveniles would be present near the Fort Baker area from January through June, while spring-run chinook juveniles would be present from March through June (MacFarlane 2002).

Coho Salmon – Federal Threatened and State Endangered

Coho salmon occur in several creeks within the planning area, as well as the nearshore waters of the Pacific Ocean and estuarine sites such as Bolinas Lagoon and San Francisco Bay. Coho salmon are found in Redwood Creek in Marin County. A single cohort of coho salmon was found in Easkoot Creek (Marin County). Coho are an anadromous species. They are born and reared in freshwater streams; as juveniles, they migrate to estuaries, adjust to saltwater, and then migrate to the ocean to mature into adults. Designated critical habitat for coho in Golden Gate National Recreation Area includes accessible estuarine and stream areas in the coastal watersheds of Marin County except areas above longstanding naturally impassable barriers. Optimal habitat conditions for juvenile coho seem to be deep pools created by rootwads and boulders in heavily shaded stream sections (NPS 2005a).

Steelhead Trout – Federal Threatened

Steelhead trout occur in several creeks within the planning area. Steelhead are found in Redwood Creek in Marin County, as well as in the drainages to Bolinas Lagoon and Rodeo Lagoon. In San Mateo County, steelhead are found in West Union Creek, a tributary to San Francisquito Creek. Like coho, steelhead are an anadromous species. Adult steelhead enter Golden Gate National Recreation Area streams in the late winter

through spring to reach spawning sites, typically well-aerated areas with small- to medium-sized gravel. Habitat preferences for juvenile steelhead are deep pools created by rootwads and boulders in heavily shaded stream sections, although young-of-the-year steelhead are often forced into shallow-water habitats. The amount of time steelhead rear in freshwater and marine/estuarine habitats is variable, ranging between one to three years. For most drainages, surveys have been conducted for presence or absence of salmonids, while in watersheds supporting coho salmon, abundance data on both species are available. The variable life cycle of steelhead makes population analysis more difficult, but also makes steelhead more resilient to adverse environmental conditions. In general, if the habitat requirements for coho were met, steelhead habitat requirements would also be met (NPS 2005a).

Designated critical habitat for steelhead in Golden Gate National Recreation Area includes the width of the stream channel defined by the ordinary high water line (U.S. Department of Commerce, NOAA 2005).

Northern Spotted Owl – Federal Threatened

Lands within Marin County support a northern spotted owl population of possibly 75 pairs. This population is isolated from spotted owl populations to the north by large areas of grassland and shrubs and constitutes the southern end of the subspecies range. Genetic analysis has shown low levels of genetic diversity within and low levels of gene flow between spotted owl populations in Marin County and Mendocino National Forest. The Marin County population supports the highest known density of northern spotted owls throughout their range. Threats to spotted owls in the planning area include urbanization, intense recreational pressure, disturbance from wildlife photographers and birders, genetic isolation, West Nile virus, possible catastrophic wildfire, expansion in the range of the barred owl (*Strix varia*), and habitat changes due to Sudden Oak Death.

Spotted owls in Marin inhabit coniferous forest, including second growth and remnant stands of Douglas-fir, bishop pine (*Pinus muricata*), coast redwood (*Sequoia sempervirens*), and mixed conifer-hardwood habitats comprised of tanoak, coast live oak (*Quercus agrifolia*), and California bay (*Umbellularia californica*).

Spotted owls tend to nest in older stands of conifer and hardwood trees that create a tall overstory. Spotted owls often select larger trees with defects, such as broken tops or mistletoe (*Arceuthobium spp.*) infestations, for nesting, but also have been found nesting in young bay trees in smaller stands. Preliminary pellet analyses indicate that spotted owls forage primarily on dusky-footed woodrats (*Neotoma fuscipes*) in addition to other forest dwelling small mammals and songbirds. Within the planning area, known spotted owl locations are currently limited to Muir Woods and the Stinson Gulch area (NPS 2005a).

San Francisco County

Chinook Salmon – Federal Threatened and Endangered; State Threatened and Endangered

Chinook salmon spawning and juvenile rearing habitat occurs in the Sacramento River and tributaries, and large streams and rivers connected to the Pacific Ocean. Chinook salmon have unique populations with distinguishable “runs” based on the timing of upstream migration and spawning period. Winter-run chinook are listed as endangered.

Central Valley spring-run chinook are listed as threatened. Adult and juvenile migratory corridors exist along the San Francisco Bay portion of Golden Gate National Recreation Area lands. Critical habitat for winter-run chinook includes the San Francisco Bay to the Golden Gate Bridge. See further description under Marin County. Chinook within the vicinity of Alcatraz Island are assumed to be present as migrating juveniles and adults. Research indicates that juvenile chinook salmon are using the Central Bay as a migratory corridor. The waters around Alcatraz Island have been designated as critical habitat for Chinook salmon (NPS 2001).

Western Snowy Plover – Federal Threatened

The Pacific Coast breeding population of the western snowy plover is federal listed as threatened. On March 22, 2004, the U.S. Fish and Wildlife Service determined that substantial information existed to support the possible delisting of the species, and a status review was initiated. This population of snowy plovers occurs along coastal beaches; they nest primarily on sand spits, dune-backed beaches, beaches at creek and river mouths, and salt pans at lagoons and estuaries. Snowy plovers nest in coastal Marin County. The western snowy plover occurs within the park at Ocean Beach and Crissy Field from mid-July through early May. Snowy plovers have been observed on rare occasions and for short periods of time (over a few days) at Rodeo Beach and overwintering on Ocean Beach; they have been periodically sighted at other beaches. Snowy plovers breed primarily on coastal beaches from southern Washington to southern Baja California, Mexico (NPS 2005a).

Bank Swallow – State Threatened

Bank swallows (*Riparia riparia*) are colonial nesters, nesting primarily in riparian and other lowland habitats west of the desert. Bank swallows require vertical banks or cliffs near streams, rivers, lakes, or the ocean; they need fine textured or sandy soils in which to dig nesting holes. Erosion by water and wind is important in creating and maintaining banks and bluffs suitable for nesting. Proximity to water is important at all seasons. During migration and in winter, wetlands provide a steady source of insects and a buffer against extreme temperatures. This species nests in the Fort Funston cliffs (NPS 2005a).

San Mateo County

Mission Blue Butterfly – Federal Endangered

See prior discussion under Marin County.

San Bruno Elfin Butterfly – Federal Endangered

The larval host plant for San Bruno elfin butterflies (*Callophrys mossii bayensis*) is *Sedum spathulifolium*, a succulent that grows on rocky, north-facing slopes along the coast (Lambert 2002). Adults are thought to stay within about 330 feet of host plants. Adults have one generation per year, with flight season from late February to early April. Eggs are laid on the ventral surface of the leaves of host plants. The fourth instar larvae pupate at the base of host plants where they remain through the summer, fall, and early winter. Habitat loss and trampling of host plants, larvae, and pupae are the primary threats to these butterflies. The San Bruno elfin butterfly is known to occur only at Milagra Ridge within the planning area (NPS 2005a).

San Francisco Garter Snake – Federal Endangered; State Endangered

The San Francisco garter snake (*Thamnophis sirtalis tetrataenia*) is endemic to the San Francisco peninsula and is currently restricted to localities within San Mateo County.

This listed species is primarily threatened by the loss and alteration of suitable wetland habitat due to urban development, freeway and road construction, illegal collection, agricultural practices, and trampling. It is considered semi-aquatic and is found along the margins of ponds, lakes, streams, and estuaries (above tidal influx). It feeds on small amphibians and fish, especially the federal listed threatened California red-legged frog (*Rana aurora draytonii*). The planning area contains three sites (Sweeney Ridge, Milagra Ridge, Mori Point / Sharp Park) that appear to have suitable habitat for the San Francisco garter snake; however, no recent surveys specifically designed to locate the snake and assess habitat have been conducted. Only Mori Point / Sharp Park has had a documented occurrence of the San Francisco garter snake; however, no recent population data are available (NPS 2005a).

California Red-legged Frog – Federal Threatened

See prior discussion under Marin County.

Steelhead Trout – Federal Threatened

Adult and juvenile steelhead trout migratory corridors exist along the San Francisco Bay portion of Golden Gate National Recreation Area lands for two listed population segments (California Central Valley and California Central Coast).

Marbled Murrelet – Federal Threatened; State Endangered

The marbled murrelet (*Brachyramphus marmoratus*) nests in old-growth forests or on the ground at higher altitudes where trees cannot grow. The marbled murrelet has experienced a decline in numbers due to loss of nesting habitat. This member of the auk family feeds at sea in pelagic offshore areas and inshore in protected bays.

Special Status Plant Species

The lands and waters of the park provide natural conditions for several special status plant species (i.e., federal and state listed species, species of special concern, candidate species). Fourteen plant species that are present in Golden Gate National Recreation Area are listed as threatened or endangered under the Endangered Species Act as amended (16 USC 1536 [a] [2] 1982). Of these, twelve are federal endangered and two are federal threatened.

Eleven of the plant species that are present in the park planning area are also listed as threatened or endangered by the California Endangered Species Act. Of these species, nine are state endangered, and two are state threatened. All but one of these state listed plant species (San Francisco popcornflower) are also federal listed.

Other plant species in the park planning area are also of management concern to the park and are listed by the California Native Plant Society on List 4 – “Plants of Limited Distribution” (locally rare). Although these species are not actually listed as threatened or endangered under the federal Endangered Species Act, NPS *Management Policies 2006* states that the National Park Service will inventory, monitor, and manage state listed and locally listed species in a manner similar to its treatment of federal listed species. Management policies also state that the Park Service will inventory other species that are of special management concern to parks such as locally rare, declining, sensitive, or unique species (NPS 2005a).

San Francisco Lessingia – Federal Endangered; State Endangered

The San Francisco lessingia (*Lessingia germanorum*) is federal listed as endangered. It is found in open sandy soils and dunes in coastal scrub. San Francisco Lessingia has historically been endangered by competition with invasive nonnative vegetation and native scrub vegetation, development, sand quarrying, trampling and recreational activities, incidental use of fertilizers, and other activities (NPS 2005a).

NATURAL RESOURCES – MUIR WOODS NATIONAL MONUMENT

INTRODUCTION

Muir Woods National Monument is a part of Golden Gate International Biosphere Reserve—one of the planet’s richest and most threatened reservoirs of plant and animal life. Muir Woods National Monument occupies 558 acres of the Central California Coast Range in Marin County, California, only a few miles north of San Francisco.

Muir Woods National Monument preserves one of the last remaining ancient redwood forests on the Pacific Coast and in the world. The monument was established in 1908 to protect a unique old-growth redwood forest. Specifically, it was created in recognition of the “extraordinary scientific interest and importance because of the primeval character of the forest in which the monument is located, and the character, age, and size of the trees” (Proclamation No. 793, Jan. 9, 1908, 35 STAT. 2174). These protected redwoods are the “last contiguous stand of old-growth coastal redwood (*Sequoia sempervirens*) and Douglas-fir in Marin County.” From its inception, the monument was designed to protect the “primeval character” of the redwood forests, and today, “ecological integrity” is a major driving force (Hall 2009).

The area surrounding Muir Woods National Monument is largely protected lands, including other units of Golden Gate National Recreation Area and lands managed by the state (Mount Tamalpais State Park) and by the Marin Municipal Water District. Muir Woods National Monument is located entirely within the watershed of Redwood Creek. Originating on Mount Tamalpais (over 2,400 feet in elevation), Redwood Creek flows through the heart of Muir Woods National Monument, bisects Frank Valley, and discharges into the Pacific Ocean at Muir Beach.

In addition to preserving the California Coast Redwood, Muir Woods National Monument is home to several federal endangered and threatened species, including the northern spotted owl, coho salmon, and steelhead trout.

PHYSICAL RESOURCES

Air Quality

Muir Woods National Monument is within a Class II air quality area and is located in the San Francisco Bay Air Basin. There are no air quality monitoring stations located at or near monument. Therefore, no specific data are available. See the Golden Gate National Recreation Area section for a description of monitoring information for the general area.

Carbon Footprint

See description under Golden Gate National Recreation Area.

Soils and Geologic Resources and Processes

Muir Woods National Monument is subject to many of the same geologic processes described for Golden Gate National Recreation Area. Slopes are inherently unstable. Intense shearing associated with faulting along the plate margin has reduced the strength of the rock. Ongoing uplift of the mountains causes continued erosion as the landscape strives to become stable. Surface disturbances, such as cuts for trails and roads, vegetation clearing, and alteration of surface water drainages, can trigger or lead to slope failures (NPS 2005a).

Auwaerter and Sears (2006, p. 18–19) describe the California Coast Range as

“a narrow band of low mountains along four hundred miles of coastline on the western edge of the North American tectonic plate... characterized by bedrock formed from ancient sea floor sediments and igneous rock that was heavily folded and uplifted due to lateral slipping along the juncture of the North American and Pacific plates.”

Within Muir Woods National Monument, elevations range from 120 to 1,340 feet above sea level. Redwood Creek loses approximately 50 feet in elevation from where it enters the monument on the north to where it exits approximately 0.5 miles downstream. Redwood Creek Canyon is the major topographical feature within the monument, and its hillslopes are quite steep, often exceeding 65%. These steep slopes provide considerable shade within the canyon. The monument extends a short distance into Kent Canyon on the northwest, and the newer additions on the southeast occupy a side canyon.

Soils

Based on the lands included within the monument in 1978, six soil complexes were identified within Muir Woods National Monument, which are distinguished by their soil type and slope. Howell et al. (no date) noted that the primary types are Centissima-Barnabe (derived from chert), basalt, and Franciscan formation sandstones. The Redwood Creek canyon floor is characterized as consisting of mostly “gray-podzolic soils” with clay-silt and clay-sand (Hall 2009).

Geology

Faulting and uplift in the Coast Range have left relatively unstable slopes subject to landslides and mass wasting. Valley bottoms have deep alluvial or colluvial fills. The mainstem alluvial valley fill in lower Frank Valley (about 4 miles downstream of the monument) is at least 37 feet deep, and may be locally as deep as 90 feet. Nearly half of the Redwood Creek watershed’s hillslopes are landslide deposits. There are outcrops of rock dispersed throughout the watershed, and in the headwaters, rocks have weathered to soils that can be very thin (<1 foot), although there are reports that soils in the upper Redwood Creek watershed can be as deep as 10 feet (Hall 2009).

Water Resources and Hydrologic Processes

Surface Water

The Redwood Creek watershed extends from Mount Tamalpais to Muir Beach. Redwood Creek is the dominant hydrologic feature within the Muir Woods National Monument. The Redwood Creek watershed encompasses approximately 8.9 square miles (including

Green Gulch Creek, which flows into Big Lagoon). Above the monument, the precipitous headwater tributaries of Redwood Creek (Fern, Spike Buck, and Rattlesnake) descend the steep south slope of Mount Tamalpais with many waterfalls. These upper tributaries flow through deep, steep canyons, with step-pool channel morphology. Redwood Creek, which is formed by the confluence of Bootjack and Rattlesnake creeks, flows through the heart of the monument for approximately 0.5 mile, being fed by several intermittent streams. Fern Creek, which originates on Mount Tamalpais, flows into Redwood Creek just within the northern boundary of the monument. Once Redwood Creek enters the monument, the channel flattens considerably, to less than a 2% grade, with a bed comprised of mixed gravel and cobble. During the 1930s, Redwood Creek within the monument was lined with rock revetments, and check dams were installed to channelize the creek and protect the old growth redwoods. Since this time, the check dams have been removed and the creek is being returned to a more natural state. Consequently, the section of Redwood Creek that flows through the monument has more riffles and fewer deep water pools than would occur in a highly natural creek with a similar slope (Hall 2009).

Below the monument, Redwood Creek is joined by Kent Canyon Creek as it flows through Frank Valley and becomes a relatively broad alluvial floodplain. This stretch has experienced significant impact from agriculture and pasturing and is incised and isolated from its floodplain. Below Frank Valley, the creek enters the ocean at Muir Beach, through a 2.2-acre intermittent tidal lagoon, typically referred to as “Big Lagoon,” which is also fed by Green Gulch Creek. During winter and spring the lagoon experiences tidal influences. As streamflow declines in late spring or summer, the beach berm builds up across the mouth of the creek, blocking surface flow from Redwood Creek to the Pacific Ocean and tidal exchange between the lagoon and Pacific Ocean. Lower Redwood Creek in the Muir Beach area has been altered through water diversions, agricultural levees, the construction of an NPS parking lot, and stream bank alterations. One outcome of this cumulative change has been significant aggradation of the channel (Hall 2009).

Groundwater and Municipal Water Use

Although most of the Redwood Creek watershed is managed as state and federal park lands, it also provides water for local firefighting, residential, and agricultural uses. Marin Municipal Water District stores water from springs in the upper watershed (upstream of the monument) for firefighting. Downstream of the monument, the Muir Beach Community Services District supplies the Muir Beach Community with water from a well near the creek, and Green Gulch Farm impounds and diverts flow in the Green Gulch subwatershed. Diversions in Big Lagoon have been abandoned, though the water right remains in place (Hall 2009).

Floodplains

Within Muir Woods National Monument, 100-year floodplains are located along Redwood Creek. As a result of natural weather events and the topography and soil characteristics of the area, runoff in the Redwood Creek watershed is high in the winter, with occasional flash floods. Two-year flood magnitudes are estimated at approximately 800 cubic feet per second (cfs), while the 50-year flood magnitude estimate is just over 4,000 cfs. However, during summer, flows are much lower—often below 1 cfs at the State Route 1 bridge—and many tributary streams are intermittent (NPS 2005b).

Water Quality

Water quality monitoring has been conducted at various times and with differing intensity within Redwood Creek and its tributaries. Monitoring has mostly been conducted outside of the monument because most inputs are from agricultural uses and other sources outside the monument. In 2005, Stillwater Sciences designed a water quality monitoring protocol for the watershed that can be used to isolate general areas of contaminant sources. This protocol was implemented once in 2005 as a baseline and may be implemented in future years depending on the availability of funding. A review of a history of water quality sampling in the watershed is compiled in the Existing Conditions Report for the Big Lagoon Wetland and Creek Restoration (Philip Williams & Associates 2003). Don Weeks (2006) issued the Water Resources Foundation Report, a background document on water resources that also identifies relevant laws and policies. Lendvay and Benning (2004) collected baseline water quality data, including pH, alkalinity, metals and ions, temperature, dissolved oxygen, nutrients, and turbidity, at five locations throughout the watershed. Their extensive study compares findings to an earlier, similar study by Madej (1989). In 2008, the Regional Water Quality Control Board established monitoring sites along the length of Redwood Creek as part of their Surface Water Ambient Monitoring Program that is focusing on benthic macroinvertebrates, periphyton, nutrients, and basic water quality parameters (Hall 2009).

Field surveys and aerial photograph analysis have been conducted to identify and quantify current and potential future sediment supply from roads, trails, culvert stream crossings, and (to some extent) bank erosion in the Redwood Creek watershed. Sediment sources were assessed for 27 miles of roads and 40 miles of trails, leading to recommendations for erosion control priorities to protect fish and other aquatic species within the watershed. These results were incorporated into a more comprehensive watershed sediment budget developed for the Lower Redwood Creek Restoration Project (Hall 2009).

Madej (1989) summarized water quality monitoring that was done between 1986 and 1989 in the lower Redwood Creek watershed (below the monument). Most metals were not detected, although there was one unusually high reading for copper (80 µg/L). Later reports attribute this to pesticide use, although this appears to be speculation (NPS 1991). Park staff report that this may have been related to the use of copper hoof treatment used at the stables, a practice that has been discontinued. Levels of coliform bacteria and nitrogen were high, evidently due to horse pastures and agricultural activities at Green Gulch Farm, as well as septic leach. Phillip Williams and Associates (1995) reported the lowest levels of nutrients and bacteria in the headwaters of Redwood Creek and the highest downstream of the monument; the number of organisms per 100 ml was 50 upstream of Banducci, 300 below Banducci, and 1900 at Pacific Way. Stillwater Sciences (2005) also report that NPS testing during the 1990s at Muir Woods National Monument found fecal coliform levels within the monument to be within California state thresholds (Hall 2009).

Several studies have found that temperatures in Redwood Creek are within the tolerances of salmonids. Lendvay and Benning (2004) reported temperatures across their sample locations to range from 10.8 to 11.0°C in early March and from 14 to 16°C in late April. They concluded that temperatures during spawning season should be cool enough for coho. Their study, conducted from March through April, found dissolved oxygen levels

to be adequate for insects and salmon. However, others have found dissolved oxygen levels to be reduced in Big Lagoon in the summer, and this is considered a “key factor” limiting juvenile fish survival (Hall 2009).

Lendvay and Benning (2004) determined that most water quality parameters were within EPA standards for aquatic life. Here pH ranged from 7.3 at Muir Beach to 8.0 at Bootjack Creek. Nitrate, though variable, was far below the standard of 90.0 mg/L, suggesting little concern about eutrophication. Somewhat high ammonia readings at specific sites on specific dates might suggest some concern, but the authors said that typical levels were well below the threshold for salmonids in most parts of the watershed. Sulfate levels were extremely low. This study found low levels of copper, in contrast to the levels reported by Madej (1989). Turbidity levels were high on sampling dates following storms, but quickly fell to levels within EPA standards. The low turbidity found in the Redwood Creek watershed suggests conditions suitable for salmonids, aquatic vegetation, and benthic macroinvertebrate populations (Hall 2009).

Other parameters reported by Lendvay and Benning (2004) were out of compliance with EPA standards. Alkalinity measures exceeded the EPA minimum standard for freshwater aquatic habitat of 20.0 mg/L (even the lowest reading, 42.8 at Fern Creek, was significantly above the standard). Phosphate readings, though highly variable, exceeded the guideline of 0.1 mg/L at every site. Aluminum concentrations exceeded the recommended limit for fish at all sites on one date and at two sites on other dates, and the authors concluded that “aluminum may be a threat to aquatic species in Redwood Creek.” Similarly, zinc concentrations were frequently above the EPA limit for freshwater ecosystems, indicating possible negative effects (Hall 2009).

Overall, Lendvay and Benning (2004) conclude that the water quality of Redwood Creek is excellent. Despite the fact that some parameters were elevated, in the context of other parameters such as very healthy benthic macroinvertebrates, these do not seem to be posing significant threats (Hall 2009).

BIOLOGICAL RESOURCES

The majority of Muir Woods National Monument (approximately 80%) is occupied by old-growth coastal redwood/Douglas-fir forests in uneven aged stands (NPS 2005b). Although it is difficult to age old-growth redwoods, individual trees on alluvial flats in the monument are estimated to be as much as 1,000 years old.

Muir Woods National Monument is located within the center of the California Floristic Province, one of only five regions in the world with a Mediterranean climate. At the landscape scale, plant associations are shaped by aspect, marine influence, and elevation (NPS 2005a). Generally, within the San Francisco Area Network, the three provinces represented are the California Coastal Chaparral Forest and Shrub; the California Dry Steppe; and the California Coastal Steppe, Mixed Forest and Redwood Forest. The redwood forests of Muir Woods National Monument fall within the last of these, while around the edges of the monument are small patches of other plant communities that are much more common in parts of Mount Tamalpais and the Marin Headlands (NPS 2005a). To the southwest is coastal scrub dominated by coyote brush, grasses and forbs; and to

the northeast is a mosaic of coast live oak, California bay, and chaparral. At the south end of the monument, the Redwood Creek riparian area loses the redwoods and becomes dominated by deciduous trees like red alder and broadleaf evergreen trees such as California bay and tanoak (Hall 2009).

The monument provides important habitat for federal listed threatened or endangered species, namely northern spotted owls, coho salmon and steelhead, and several species of bats that are listed as sensitive species. All of these species breed within the monument. Redwood Creek has been identified as “a high priority restoration area for coho salmon” under the California Department of Fish and Game’s 2004 Recovery Strategy. While suitable marbled murrelet habitat has been identified in the monument, there has been no confirmation that this species uses the park for breeding (Hall 2009).

Habitat (Vegetation and Wildlife)

Plant Communities

Muir Woods National Monument is the most intact old-growth coastal redwood forest in the Bay Area. It is estimated that nearly 2 million acres of forest similar to those in Muir Woods National Monument once covered a narrow strip along the coasts of California and Oregon. Today, 97% of this area has been impaired or altered and most coastal redwoods now grow in protected second and third growth forests or managed timber plantations. Muir Woods National Monument remains as a very accessible yet prime example of an old-growth forest.

Sudden Oak Death is a common name given a pathogen (*Phytophthora ramorum*) responsible for widespread tree death throughout northern and central California. This pathogen first appeared in Muir Woods National Monument during the mid-1990s, and although many plants in the redwood forest are affected, the tanoaks have suffered the most.

“NPSpecies,” a National Park Service database, documents 263 vascular plant species present in the monument. Approximately 29 other species are probably present, but have not been verified, and 17 species are unconfirmed. Forty-four species are listed as historic, meaning they were previously present but are believed to be extirpated. The basis for this determination is staff knowledge of the site, although no field inventory of plants has yet been completed. A 1966 lichen inventory identified 7 fruticose lichens, 9 foliose lichens, and several unidentified species of crustose lichens (Hall 2009).

There do not appear to be many native plant species of concern in the monument. The 1980 general management plan (NPS 1980) identified the San Francisco wallflower (*Erysimum franciscanum* var. *franciscanum*) and Presidio clarkia (*Clarkia franciscana*) as being species of special status, but no further mention is made of these in subsequent planning documents, and they are not mentioned in current lists of species of management concern. They have never been documented within the monument and evidently their inclusion on the list and in the 1980 plan was an error. Oakland star tulip or mariposa lily (*Calochortus umbellatus*) is described in the fire management plan (NPS 2005a) as a California Native Plant Society listed species, which has been found “in the vicinity of Muir Woods” in grasslands. Additionally, the California bottle-brush grass (*Elymus californicus*) is a federal species of concern; this species prefers coniferous

forests and riparian woodlands, and has been documented in the monument (NPS 2005a). The only active management for rare plant species within the monument has been some fencing along the valley floor to protect the California bottle-brush grass, which appears to have been effective (Hall 2009).

Coast Redwood / Douglas-fir Forests

As noted earlier, most of the monument is comprised of mixed age coast redwood and Douglas-fir (NPS 2005a). In the monument, the redwood forest “extends along the canyon floor north beyond the monument, across most of the northeastern-facing canyon wall up to the Dipsea Trail, and along portions of the lower southwest-facing wall and adjoining side canyons extending to the Ocean View Trail. In these areas, the redwoods thrive in a cool microclimate with loamy soils and ample moisture from fog, rain, and groundwater” (Hall 2009).

Although this forest is largely isolated within the larger landscape, due to natural conditions such as physiography and the restricted environmental requirements of redwoods, as well as logging and conversion of lands in the surrounding area, the tracts of forest within the monument have had a serendipitous history of protection that has preserved many of the structural and functional ecological features. The monument’s redwood forests were never logged (McBride & Jacobs 1978), although logging did occur in Conlon Canyon. While it is true that substantial impacts were historically imposed by recreation and tourism (e.g., trampling, campfires, and collecting plants) and park management (e.g., stream alteration, removal of woody debris), it is possible to recover from some of these impacts within a period of years or decades. Indeed, studies have shown that areas formerly devoid of vegetation along Redwood Creek have recovered to the point that it is not possible to discern restoration plantings from natural vegetation. On the steep hillsides away from Redwood Creek, it appears that impacts to ecosystems were even more limited. Stillwater Sciences (2005) noted that “understory cover today is probably the most extensive that it has been in a century.” National Park Service staff considers the health of the redwood forest to be good. Public ownership of surrounding lands is an aspect that helps maintain certain ecosystem functions within the monument’s redwood forests.

Other Terrestrial Vegetation Types

Outside the redwood and Douglas-fir forests, there are small patches of other vegetation types in the monument that are much more extensive in other parts of the watershed outside the monument. McBride and Jacobs (1978) described five vegetation types: hardwoods, brush, grassland/brush, hardwood/brush, and grassland. These include the habitat types identified in the fire management plan (NPS 2005b) as native hardwood, coastal scrub/chaparral, grassland, nonnative evergreen, and developed. While the redwood forests are largely intact or recovering, these other habitat types have been more extensively altered (Hall 2009).

The native hardwood forest (or mixed hardwoods) covers 800 acres of the Redwood Creek watershed (Stillwater Sciences 2005), of which only 59 are within Muir Woods National Monument. These forests have not been well studied. In places like the Monte Vista tract in the Camino del Canyon and Camp Hillwood areas, where development and residential uses have occurred, the hardwood forests have been substantially reduced in extent. Presumably, under NPS management, these areas will begin to return to a more natural state, although there are concerns about invasive species such as eucalyptus,

which can dramatically alter forest structure and composition. In areas along Camino del Canyon, various landscape plants have escaped, and invasive exotics such as yellow starthistle (*Centaurea solstitialis*) and French broom (*Genista monspessulana*) are problems. Additionally, the native hardwoods are at great risk from sudden oak death (Hall 2009).

The remaining native vegetation types—coastal scrub/chaparral and grassland—have been highly altered, due to a combination of fire suppression, land use practices, and invasion by nonnative species (Stillwater Sciences 2005; NPS 2005b). The coastal scrub/chaparral occurs at upper elevations, and seems to be invading grasslands as a result of fire suppression (NPS 2005a). In turn, coniferous forests are invading the lower elevations of the scrublands. Within the Redwood Creek watershed, most native grasslands, which occupy ridge tops and slopes, have become dominated by nonnative, Mediterranean annual grasses (Stillwater Sciences 2005).

Invasive Plants

Invasive exotics are a considerable problem within all other habitat types. In fact, approximately one-third of the plants (108 species) identified within the monument are nonnatives, many of which are landscape plants found in the Monte Vista additions.

Within the redwood forests, McBride and Jacobs (1978) identified three exotic forbs, but considered them to be rare and not a threat. There are isolated patches of exotic aquatic plants, but these seem to be limited in extent and are relatively stable. Today, there are two main exotic species of concern in the riparian redwoods: the forget-me-not (*Myosotis sylvatica* and *Myosotis latifolia*) and panic veldtgrass (*Ehrharta erecta*). Originally introduced to “improve” the aesthetics of the forest, forget-me-nots quickly spread throughout the monument. Fortunately, diligent work by park staff and volunteers has kept this species in check along the canyon floor, although there is concern about the ability to eliminate it from steep, inaccessible slopes. Along Redwood Creek, removal of this species has led to an increase in native plant cover. Outside the riparian forests, the park has worked to eliminate other invasive species, including cape ivy, brooms (*Genista monspessulana*, *Cytisus scoparius*, *Spartinum junceum*), acacia (*Acacia melanoxydon*, *Acacia decurrens*), and other species (Hall 2009).

Aquatic Systems

The major ecosystem elements within the monument that have been altered include the aquatic and riparian systems. For decades, concerted efforts were made to “clean up” the Redwood Creek valley to alleviate problems with flooding and provide an aesthetically pleasing visitor experience. This amounted to removing woody debris from the forests and engineering the creek to create a more consistent gradient and protect its banks from erosion. Most of this was a result of intensive Civilian Conservation Corps (CCC) work during the 1930s, when Redwood Creek within the monument was leveled and rock revetment was installed (Auwaerter & Sears 2006; Stillwater Sciences 2005). The revetment occupies 57% of the total stream bank length (3,541 feet) within Muir Woods National Monument. As late as the early 1990s, woody material was being removed from the stream to prevent logjams that might increase flooding. Channelization has decreased flooding and, consequently, deposition. It has also drastically altered instream morphology, reducing the number and depth of pools and eliminating undercut banks (Fong 2002). Fong’s survey showed that pools occupied only 32% of that portion of Redwood Creek within the monument, with flatwater or shallow riffles being much more

extensive. In summer, some riffles become so shallow that fish are forced downstream. A survey in 2003 showed a lower biomass of salmonids was associated with the presence of riprap. The channel immediately downstream of the monument's boundary, where riprap was never installed, appears more natural than the area within the monument. However, Redwood Creek within the monument has the least amount of fine substrate and more riffles, and therefore the largest number of spawning areas (Hall 2009).

Other impacts to Redwood Creek, both upstream and downstream of Muir Woods National Monument, have impacted ecosystem functions. Sedimentation from upstream associated with roads and culverts have impacted the entire length of the creek. However, sedimentation from roads and culverts is not the major player in channel habitat downstream of the monument. The watershed sediment budget identified and quantified sediment sources to Redwood Creek for three historical periods and included future projections. In the recent past, channel incision was the largest source of sediment to the creek downstream of the monument (57% of total supply from 1921 to 1980). As channel incision slows or ceases, erosion from roads and trails is expected to contribute 23% to total sediment yield in the lower creek. In addition to roads and trails, future sediment sources include hillslope erosion (19%), tributary bank erosion (29%), and channel incision (28%). Additionally, changes at Lower Redwood Creek at Muir Beach appear to have had a significant impact on habitat characteristics necessary for salmon, steelhead, and red-legged frogs. Nevertheless, despite its degraded condition, Lower Redwood Creek appears to be a major holding area for run-back steelhead adults, and its important ecological role has led to it being a high priority for restoration (NPS 1999b; NPS and Marin County 2007; Hall 2009).

Philip Williams and Associates (1995) characterized the Redwood Creek watershed as a whole as

“unique among California coastal watersheds of its size in that it remains largely undeveloped and is protected as state and federal park lands. The creek has largely recovered from historical grazing activities in the watershed, and now supports sustainable populations of coho salmon.”

Thus, there clearly have been alterations to cover and habitat that have influenced ecological functioning. However, within the larger landscape, the Redwood Creek watershed is a primary target for restoration and maintenance of important habitats. The facts that there are no impoundments, except in the Green Gulch subwatershed (Martin 2000; Philip Williams & Associates 2003) that would severely fragment habitat, and most watershed land is in local, state, or federal government ownership, create opportune conditions for protection (Hall 2009).

Wildlife

Within the Redwood Creek watershed, riparian woodlands provide breeding habitat and forage for 85 bird species and 16 mammal species. Two mammals, the shrew-mole and the broad-footed mole, were found only in this habitat. Nineteen of the bird species and one mammal are species of management concern. Cape ivy—which is present in the Monte Vista tract but not yet in the redwoods—has had documented impacts on the diversity of bird species (Hall 2009).

Redwood / Douglas-fir forest in the Redwood Creek watershed provide habitat for 30 bird species and 20 mammals. Hall observed that “this habitat supports an average-to-

high bird diversity and low bird abundance compared to other habitat types in the watershed.” Mammals that are preferentially associated with these forests include deer mouse (*Peromyscus maniculatus*), gray fox (*Urocyon cinereoargenteus*), opossum, trowbridge shrew (*Sorex trowbridgii*), Sonoma chipmunk (*Tamias sonomae*), western gray squirrel (*Sciurus griseus*), and raccoon (*Procyon lotor*) (Howell et al. no date); 17 species of concern (4 bats and 13 birds) have been detected in this habitat type (Hall 2009).

Mammals

According to NPSpecies, 27 mammal species are confirmed present in Muir Woods National Monument, while 9 are unconfirmed. Domestic and feral cats, local dogs, and turkeys are presently considered pests. None of the mammals is considered at risk of exploitation. Howell et al. (no date), in a mammal survey, documented black-tail deer (*Odocoileus hemionus*), meadow vole (*Microtus pennsylvanicus*), and opossum, which do not appear in the NPSpecies list. Additionally they documented domestic dogs (“unconfirmed” in NPSpecies) and western spotted skunk (*Spilogale gracilis*) (“false report” in NPSpecies). NPSpecies lists no “historic” (extirpated) species, but various historic documents suggest that several large mammals, like bears, were historically present but disappeared as long ago as the late 1800s. The NPSpecies data provide no information on nativity, abundance, or residency for the mammals in the monument (Hall 2009).

Among the mammal species, bats have received significant investigation. Habitat for bats in Muir Woods National Monument is considered high-quality, and the diversity of species is notable—Heady and Frick (2004) reported 10 species foraging and/or roosting in the monument; this number represents 69% of the species that are likely to occur in the region. Redwoods are particularly good habitat because they provide hollows and crevices for roosting. The Townsend’s big-eared bat (also called the Pacific western big-eared bat) occupies humid coastal regions of California, roosting in caves, mines, buildings, and fire scars (NPS 2005a). It is very sensitive to disturbance and suffers from a lack of suitable roosting sites; because of their large cavities, large diameter redwoods offer some of the only suitable habitat. The fringed myotis occurs in a wide variety of habitats, although it prefers foothill hardwoods and hardwood-conifer forests and has been considered preferentially associated with redwood forests. The long-legged myotis is most common above 4,000 feet in elevation in primarily coniferous forest habitats. It uses trees as day roosts and creates nursery colonies in hollow trees. This has led to increased protection of fire scars. The Yuma myotis prefers open woodlands and forests, and requires still water sources that attract prey insects. It is quite tolerant of human habitation. Little is known about the western red bat (U.S. Forest Service sensitive species), although it is known to roost in cottonwoods and willows and is thought to be migratory (Hall 2009).

Birds

Over 50 species of birds have been identified in Muir Woods National Monument over a year's time. Their abundance and periods of song vary with time of day, season, and weather conditions. A deep, wooded redwood canyon is a specialized habitat. Although this old growth forest supports spotted owls and pileated woodpeckers (*Dryocopus pileatus*), the overall lack of food is the primary reason for the apparent scarcity of birds.

There are few insects in a redwood forest, as the tannin repels insects and the deep shade limits the number of flowers and fruits produced.

In addition, federal threatened northern spotted owls nest in coniferous and mixed-hardwood forests surrounding Muir Woods National Monument. The monument also contains potential marbled murrelet habitat, but no breeding murrelets have been detected in two years of surveys.

The following quotation from the superintendent's annual report for 1923 indicates little change during the past 80 years in the bird life found in Muir Woods:

"Birds, as is generally the case in a redwood forest, are conspicuous by their absence—Steller's jays being the only bird seen in any numbers."

Fifty-nine bird species are confirmed present in the monument, according to NPSpecies, although the 1999 resource management plan indicated that "at least 69 bird species occupy Muir Woods" (NPS 1999b). Seven are migratory species, and 23 are known to breed within the monument. The only federal listed threatened species is the spotted owl, which breeds in and near the monument. Although Muir Woods National Monument appears to provide habitat suitable for marbled murrelets, which nest only in redwood trees, none have been detected, despite a focused inventory. Appendix D, which provides detailed information about all special status species, lists two State Species of Concern in Muir Woods National Monument: Cooper's hawk (*Accipiter cooperi*) and sharp-shinned hawk (*A. striatus*). Inventories in 2000 did not detect either hawk species. However, Allen's hummingbird (*Selasphorus sasin*) and hermit thrush (*Catharus guttatus*)—both species of management concern—were observed, as well as the chestnut-backed chickadee (*Parus rufescens*), which is on the Audubon watch list. According to their point count data, the Pacific-slope flycatcher (*Empidonax difficilis*), a species of management concern, was the most common bird; it was observed at 93% of the census points. The other most common species were winter wrens (65%), chestnut-backed chickadees (56%), golden-crowned kinglets (54%), brown creepers (47%), and dark-eyed juncos (30%) (Hall 2009).

Amphibians and Reptiles

NPSpecies lists five amphibians as present within the monument along with two species that were documented historically, but are no longer present, the foothill yellow-legged frog and yellow-eyed ensatina (*Ensatina eschscholtzii xanthoptica*). Yellow-legged frogs were collected in 1954, but they were not found in 1993 within the monument, and Hall noted that this species is "now very rare or absent" in areas where it formerly was abundant. Very little information is available about the abundance or status of many of these amphibian species (Hall 2009).

The nonnative signal crayfish has long been established in Redwood Creek and Fern Creek. It is the only nonnative aquatic species in the monument. It is possible that this species displaced the native sooty crayfish (*Pacifastacus nigrescens*) (Hall 2009).

The California giant salamander is found from Sonoma to Santa Cruz county, particularly in humid coastal conifer forests. A recent survey found that salamander larvae were rare in the main stem of Redwood Creek, but more abundant in tributaries. Fong and Howell noted that the signal crayfish and giant salamander were rarely found together in any stream habitat type, but they were unable to determine whether the crayfish were displacing the salamanders from preferred habitats. They noted that, because crayfish

tend to favor pools, actions that might be taken to restore stream features such as pools could increase the abundance of crayfish (Hall 2009).

NPSpecies lists 12 reptile species as present within Muir Woods National Monument. The abundance, residency, and nativity of most of these species are unknown. Very little is reported about any of these species in any planning or research reports. However, the Pacific (western) pond turtle (*marmorata*, formerly *Clemmys marmorata*), a federal species of concern, is listed as present in the monument, although none of the recent aquatic habitat assessments make mention of it (Hall 2009).

Fish

An old-growth forest is very interconnected; through time, many of the plants and animals become reliant on one another. One example at Muir Woods National Monument is found in Redwood Creek. The redwoods depend on the creek for most of their water and the trees help keep the gravel in the creek clean by stabilizing the soil. The trees also help keep the temperature of the stream cool and constant. As the trees die and fall into the creek, they create pools and enrich the stream with their nutrients. Because salmon need clean gravel, constant water temperature, and pools for spawning, Redwood Creek provides good habitat for salmon. It is one of the last streams in California to have its native stock of salmon, due largely to the undisturbed forest surrounding it. Both coho salmon and steelhead trout are found in Redwood Creek.

There are four native fish species present in the monument, although additional species, including some nonnative fish, occupy lower reaches of Redwood Creek. The two most significant species—targets of extensive monitoring—are coho salmon (recently upgraded federally to endangered status) and steelhead (federal listed as threatened). Redwood Creek is critical habitat for both; Muir Woods National Monument provides good spawning habitat but, due to loss of pools and structure, juvenile rearing habitat is very limited. Both runs have been considered stable, although significantly reduced from historic times (Hall 2009).

The Redwood Creek coho are part of the Central California Evolutionarily Significant Unit (ESU), found in three watersheds in the Park Service's San Francisco Bay Area Network (NPS 1999a). However, genetic analysis shows that the coho in Redwood Creek are a genetically distinct subgroup that is not closely related to other coho in the same ESU (NPS and Marin County 2007). Spawning occurs between December and February, depending on when storm flows increase enough to permit returning adults to breach the sandbar at Big Lagoon. Emergence occurs in March and April, and the juveniles remain in fresh water for approximately 15 months, before heading to the ocean for 16 months. This cycle creates three "year-classes" of fish; for instance, the fish returning to spawn in 2007 and 2008 were from the 2004/2005 year class. Given their lifecycle, habitat requirements vary; fish need habitat for spawning, juvenile rearing and migration, growth to adulthood, and adults need migration corridors (NPS and Marin County 2007). Juvenile rearing habitat with refugia and shelter appears to be especially limiting in Redwood Creek. Big Lagoon's altered environment does not provide high-quality salmonid-rearing habitat (Hall 2009).

Nonnative Wildlife

A few nonnative mammals have been of concern to the monument. In the past, feral hogs were widespread in Golden Gate National Recreation Area (including Muir Woods National Monument), but they have been largely controlled (NPS 1999b). They can

seriously degrade habitat, disturb soils, compete for food, and transmit diseases. Feral cats and domestic dogs (unconfirmed), though not major concerns, can present problems for native wildlife (Hall 2009).

There have been anecdotal reports of chukars (*Alectoris chukar*), an exotic species, near but not yet within the monument. Also, wild turkeys are considered nonnative and increasing in and around Muir Woods National Monument. This species was introduced by California Department of Fish and Game for hunting, but Golden Gate National Recreation Area considers it invasive and uncontrolled. It competes with native species for food and has been known to harass people. National Park Service staff are contemplating small pilot removals (Hall 2009).

Special Status Species

Coho Salmon – Federal Threatened; State Endangered

Coho salmon occur in several creeks within the planning area, as well as the nearshore waters of the Pacific Ocean and estuarine sites such as Bolinas Lagoon and San Francisco Bay. Coho salmon are found in Redwood Creek in Muir Woods National Monument. A single cohort of coho salmon was found in Easkoot Creek (Marin County). Coho are an anadromous species; born and reared in freshwater streams, as juveniles they migrate to estuaries, adjust to saltwater, and then migrate to the ocean to mature into adults.

Designated critical habitat for coho in Golden Gate National Recreation Area includes accessible estuarine and stream areas in the coastal watersheds of Marin County except areas above longstanding naturally impassable barriers. Optimal habitat conditions for juvenile coho seem to be deep pools created by rootwads and boulders in heavily shaded stream sections (NPS 2005a).

See previous discussion under Golden Gate Natural Recreation Area.

Steelhead Trout – Federal Threatened

Steelhead are found in Redwood Creek which flows through Muir Woods National Monument, as well as the nearshore waters of the Pacific Ocean and estuarine sites such as Bolinas Lagoon and San Francisco Bay. Like coho, steelhead are an anadromous species. Adult steelhead enter Golden Gate National Recreation Area streams in the late winter through spring to reach spawning sites, typically well-aerated areas with small- to medium-size gravel. Habitat preferences for juvenile steelhead are deep pools created by rootwads and boulders in heavily shaded stream sections, although young-of-the-year steelhead are often forced into shallow-water habitats. The amount of time steelhead rear in freshwater and marine/estuarine habitats is variable, ranging between one and three years. For most drainages, presence/absence salmonid surveys have been conducted, while in watersheds supporting coho salmon, abundance data on both species are available. The variable life cycle of steelhead makes population analysis more difficult, but also makes steelhead more resilient to adverse environmental conditions. In general, if the habitat requirements for coho were met, steelhead habitat requirements would also be met (NPS 2005a).

In April 2002, the U.S. District Court for the District of Columbia approved a National Marine Fisheries Service consent decree withdrawing a February 2000 critical habitat designation for steelhead trout. Designated critical habitat for coho includes all accessible

estuarine and stream areas in the coastal watersheds of Marin County except areas above longstanding, naturally impassable barriers. Through this designation, NOAA-Fisheries identified ten essential features of critical habitat: substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions (NPS 2005a).

See previous discussion under Golden Gate Natural Recreation Area.

Northern Spotted Owl – Federal Threatened

Marin County supports a northern spotted owl population of possibly 75 pairs. This population is isolated from spotted owl populations to the north by large areas of grassland and shrubs and constitutes the southern end of the subspecies range. Genetic analysis has shown low levels of genetic diversity within and low levels of gene flow between spotted owl populations in Marin County and Mendocino National Forest. The Marin County population supports the highest known density of northern spotted owls throughout its range (NPS 2005a).

Spotted owls tend to nest in older stands of conifer and hardwood trees that create a tall overstory. Spotted owls often select larger trees with defects, such as broken tops or mistletoe infestations, for nesting, but also have been found nesting in young bay trees in smaller stands. Preliminary pellet analyses indicated that spotted owls forage primarily on dusky-footed woodrats (*Neotoma fuscipes*) in addition to other forest dwelling small mammals and songbirds. Within the planning area, known spotted owl locations are currently limited to Muir Woods National Monument and the Stinson Gulch area (NPS 2005a) (see discussion under Marin County).

Northern spotted owls within the monument are at the southernmost extreme of the species range, and the population in Marin County is genetically isolated, although relatively large; 161 distinct nests were documented between 1998 and 2003 (Stillwater Sciences 2005). This species was listed at the federal level as threatened in 1990. Monitoring in the county over the past several years has shown stable fecundity, with approximately 0.5 female young fledged per breeding female and nearly 90% of nests being occupied for the past several years. Old redwood forests are important nesting habitat; 43% of nests in Marin County are in redwood trees and 36% are in Douglas-fir trees. Across northern California, owls were found to select locations with large diameter conifer overstory and an understory of large hardwoods. The mean diameter of platform nest trees in Marin County is 36 inches. Two pairs have historically nested within Muir Woods National Monument or immediately adjacent to the monument (Hall 2009).

There are several threats to spotted owls in the region, although the habitat conditions within the monument itself are presently of high quality. Urban development destroys habitat, owls are especially susceptible to West Nile virus (first confirmed in Marin County in 2005), and Sudden Oak Death may affect both nesting habitat and prey species. Additionally, there are anecdotal reports of people disturbing nests and luring owls with mice. Finally, the barred owl is suspected of displacing spotted owls in Marin County. This species, once limited to the eastern United States, has been extending its range over the past century and is now found throughout the Pacific Northwest and in California. Aggressive behavior toward spotted owls has been documented in Marin County, and in 2005, a male barred owl was detected in the monument for the fourth year in a row, which coincided with the second year of spotted owl nest failure in the

monument. In 2007, the first breeding pair of barred owls was observed, and breeding was observed again in 2008 (Hall 2009).

Kelly et al. (2003) conducted extensive historical analysis of the location of spotted owl and barred owl territories at five study areas in Oregon and Washington from 1987 to 1999. The study concluded that there had been a steady increase in the number of barred owls at all long-term spotted owl monitoring sites, and that when barred owls invade, the occupancy of territories by spotted owls declines significantly. The study concludes that “land managers and regulatory agencies should regard barred owls as a threat to spotted owls.” There is some debate about whether the barred owl in Muir Woods National Monument should be considered native or not (it is listed as such in NPSpecies, but other park planning documents list it as invasive and uncontrolled). Nevertheless, barred owls have been identified as the primary threat to spotted owl recovery in the U.S. Fish and Wildlife Service’s final recovery plan. National Park Service staff consider the barred owl to be a species of concern, and feel a need to track and potentially manage the species due to its potential impact on spotted owls. It appears that the presence of the breeding barred owls in the monument has displaced the historically nesting spotted owls (Hall 2009).

Marbled Murrelet – Federal Threatened; State Endangered

See description in the discussion of habitat in San Mateo County.

CULTURAL RESOURCES – GOLDEN GATE NATIONAL RECREATION AREA

INTRODUCTION

Golden Gate National Recreation Area is home to a remarkable constellation of cultural resources, among the most diverse in the entire national park system. A cultural resource may be a tangible entity or a cultural practice. For NPS management purposes, tangible cultural resources are categorized as districts, sites, buildings, structures, and objects for the National Register of Historic Places, and as archeological resources, cultural landscapes, structures, museum objects, and ethnographic resources. The park includes more than 700 historic structures, and the park's planning area covered by this general management plan includes 5 national historic landmarks, 2 national historic landmark nominations presently in draft, 13 properties listed in the National Register of Historic Places, and 6 properties determined eligible for national register listing; most are related to military and maritime commercial themes stretching over a period of more than 200 years, with many pre-contact archeological resources associated with the Coast Miwok and Ohlone cultures extending back thousands of years. See Table 5 for a listing of these properties.

The park's nationally significant seacoast fortifications and military installations span the Spanish, Mexican, and American eras and illustrate the military architectural and engineering heritage of the United States and the broad patterns of the nation's history. Other cultural resources include an array of buildings, sites, and features that reflect the local and regional historical industrial, commercial, and recreational development of the San Francisco Bay Area, including the bay's European discovery (San Francisco Bay Discovery Site National Historical Landmark); maritime-related resources such as historic lighthouses, shipwrecks, wharves, piers, docks, and other shoreside embarkation points; and remnants of the area's historic ranching, agricultural, logging, and mining activities.

Some 370 archeological sites have been inventoried, including properties constituting the tangible connection between the Coast Miwok and Ohlone communities and park lands. Historic archeological properties constitute significant, yet incompletely documented, elements of existing national historic landmarks, national register listed properties, and cultural landscapes. Nine documented cultural landscapes in the park include rural landscapes and dairy ranches. Remnants associated with agricultural pursuits that were carried on by the same families for generations remain extant in the park, comprising a rich legacy of folkways, rural landscapes, and architecture.

Alcatraz Island, a 22.5-acre island in San Francisco Bay is best known for its reputation as the maximum security, minimum-privilege federal penitentiary that housed some of America's most notorious criminals between 1934 and 1963. However, the island also contains layers of history from its prior uses as a military fort, military prison, federal penitentiary, and as the site of the occupation by Indians of All Tribes from 1969 to 1971.

Although numerous cultural resource studies have been undertaken for Golden Gate National Recreation Area, the park's cultural resource surveys are limited for some significant resource types. Less than 10% of the park has been surveyed for archeological resources. Fifteen cultural landscapes have been identified in the park, but only nine have been inventoried or evaluated. Detailed surveys for archeological, cultural landscape, and ethnographic resources, as well as historic resource studies, national register eligibility determinations, and inventory updates for the park's List of Classified Structures (LCS), Cultural Landscape Inventory (CLI), and Archaeological Sites Management Information System (ASMIS) will provide critical information needed for park planning and historic property preservation.

Golden Gate National Recreation Area includes recently acquired lands in San Mateo County, which are the subject of a recently completed historic resource study that further identifies historic properties and themes associated with these park lands. The primarily Spanish colonial and Mexican settlement history and the agricultural, military, maritime and transportation themes of the area are not dissimilar to those of other park lands, and evidence of numerous prehistoric sites, both inside and adjacent to park lands, suggest important opportunities for joint stewardship between the park and its neighbors.

AREA OF POTENTIAL EFFECT (APE)

Section 106 of the National Historic Preservation Act requires federal agencies to take into account the effects of their undertakings on historic properties. The Advisory Council on Historic Preservation (ACHP) regulations that implement section 106 require that impacts to historic resources be identified and evaluated by determining the area of potential effects (APE) and by identifying cultural resources present in the area of potential effects that are either listed in or eligible for listing in the national register (36 CFR Part 800, "Protection of Historic Properties"). The area of potential effect is the geographic area or areas within which an undertaking may directly or indirectly cause alterations to the character or use of historic properties, and it is influenced by the scale and nature of an undertaking. The area of potential effects encompasses both those areas where proposed actions might occur that would directly impact cultural resources, as well as adjacent areas that contain resources that might be indirectly affected (see figure 6). The area of potential effects for this general management plan was discussed in a meeting between the National Park Service and the California state historic preservation office on March 16, 2010 and is generally defined as the park boundary and those properties adjacent to the park boundary where potential indirect impacts may occur. A description of the resources within the area of potential effects follows and is organized by National Register of Historic Places properties, resources that are either eligible or in need of a determination of eligibility for listing in the national register, archeological resources, and ethnographic resources. See the following table for a listing of these properties.

Table 5: Area of Potential Effect

HISTORIC PROPERTIES WITHIN THE PARK BOUNDARY (By County, Alphabetically)				
RESOURCE	COUNTY	LISTED ON NATIONAL REGISTER	NATIONAL HISTORIC LANDMARK	AREAS OF SIGNIFICANCE
Alcatraz Island	San Francisco	Yes	Yes	Social History, Engineering, Military, Commerce (District), Historic Archeology
Camera Obscura	San Francisco	Yes	No	Engineering (Structure)
Fort Mason Historic District	San Francisco	Yes	No	Architecture, Military, Transportation, Landscape Architecture (District), Historic Archeology
Fort Miley Military Reservation	San Francisco	Yes	No	Military (District)
Fort Point National Historic Site	San Francisco	Yes	Yes	Architecture, Maritime History, Military, Historic Archeology
Golden Gate Bridge	San Francisco, Marin (owned by Golden Gate Bridge District, on parkland)	Eligible	Eligible	Engineering, Transportation History
King Phillip and Reporter Shipwreck Site	San Francisco	Yes	No	(Naval) Architecture, Transportation, Commerce, Maritime History
Merrie Way Stands Site	San Francisco	Eligible	No	Recreation History, Historic Archeology
Mile Rock Tunnel	San Francisco	Eligible	No	Engineering

HISTORIC PROPERTIES WITHIN THE PARK BOUNDARY (By County, Alphabetically)				
RESOURCE	COUNTY	LISTED ON NATIONAL REGISTER	NATIONAL HISTORIC LANDMARK	AREAS OF SIGNIFICANCE
Point Lobos Archeological Site	San Francisco	Yes	No	Ohlone History, Archeology
Pumping Station #2, San Francisco Fire Department Auxiliary Water Supply System	San Francisco (owned by City of San Francisco, located on park land)	Yes	No	Community Planning And Development, Engineering (Structure)
Presidio of San Francisco	San Francisco	Yes	Yes	Hispanic, Historic - Non-Aboriginal, Military, Exploration/Settlement (District), Architecture, Landscape Architecture, Historic Archeology
San Francisco Port of Embarkation	San Francisco	Yes	Yes	Military (District), Architecture
Seacoast Fortifications of San Francisco Bay	San Francisco, Marin, San Mateo	Individual properties already listed, eligible as a district	Eligible	Military (District), Architecture, Engineering, Cultural Landscape, Historic Archeology
Six-inch Rifled Gun No. 9 (Baker Beach)	San Francisco	Yes	No	Military (Object)
Dipsea Trail	Marin (part of the trail is on parkland)	Yes	No	Entertainment/Recreation (Sports) (Structure)
Forts Baker, Barry, and	Marin	Yes	No	Military (District), Architecture, Cultural

HISTORIC PROPERTIES WITHIN THE PARK BOUNDARY (By County, Alphabetically)				
RESOURCE	COUNTY	LISTED ON NATIONAL REGISTER	NATIONAL HISTORIC LANDMARK	AREAS OF SIGNIFICANCE
Cronkhite				Landscape, Historic Archeology
Hill 640 Military Reservation	Marin	Eligible	No	Military
Hillwood Camp	Marin	Eligible	No	Social History
Muir Beach Archeological Site (CA.MRN-333)	Marin	Yes	No	Coast Miwok History And Archeology
Muir Woods National Monument	Marin	Yes	No	Conservation (District), Architecture, Landscape Architecture
Olema Valley Historic District	Marin (administered by Point Reyes National Seashore)	Eligible	No	Agriculture (Dairy Ranching), Cultural Landscape
Point Bonita Historic District	Marin	Yes	No	Architecture, Maritime History, Commerce, Transportation (District)
Ranch A/B (Miwok Stables)	Marin	Eligible	No	District, Cultural Landscape, Agriculture (Dairy Ranching)
Ranch M (Golden Gate Dairy)	Marin	Eligible	No	District, Cultural Landscape, Agriculture (Dairy Ranching), Historic Archeology
Sara Seaver Randall	Marin (administered)	Eligible	No	Agriculture (Dairy

HISTORIC PROPERTIES WITHIN THE PARK BOUNDARY (By County, Alphabetically)				
RESOURCE	COUNTY	LISTED ON NATIONAL REGISTER	NATIONAL HISTORIC LANDMARK	AREAS OF SIGNIFICANCE
House	by Point Reyes National Seashore)			Ranching), Social History
Steamship Tennessee Remains	Marin	Yes	No	Invention, Transportation, Commerce, Maritime Archeology
San Francisco Bay Discovery Site	San Mateo	Yes	Yes	Exploration/Settlement

HISTORIC PROPERTIES ADJACENT TO THE PARK BOUNDARY				
RESOURCE	COUNTY	LISTED ON NATIONAL REGISTER	NATIONAL HISTORIC LANDMARK	AREAS OF SIGNIFICANCE
Aquatic Park Historic District	San Francisco (owned and managed by San Francisco Maritime National Historical Park)	Yes	Yes	Architecture, Community Planning And Development, Art, Military (District)
Point Montara Light Station	San Mateo (owned and managed by United States Coast Guard)	Yes	No	Architecture, Maritime History, Commerce, Transportation (District)
San Francisco Veterans Affairs Medical Center	San Francisco (owned and managed by Department of Veterans' Affairs)	Yes	No	Architecture, Engineering, Health/Medical (District)

**OTHER PROPERTIES WITHIN THE PARK
POTENTIALLY ELIGIBLE FOR THE NATIONAL REGISTER OF
HISTORIC PLACES**

(In Need of Determination of Eligibility)

RESOURCE	COUNTY	AREAS OF SIGNIFICANCE	MANAGEMENT JURISDICTION
China Beach	San Francisco	Architecture, Community Planning and Development, Recreation	NPS
Cliff House	San Francisco	Architecture, Recreation	NPS
Crissy Field Ohlone District	San Francisco	Ohlone History, Archeology, And Heritage	NPS
Fort Mason Ohlone District	San Francisco	Ohlone History, Archeology, And Heritage	NPS
Marine Exchange Lookout (Octagon House)	San Francisco	Architecture, Maritime History, Commerce, Transportation	NPS
Neptune Shipwreck	San Francisco	Maritime Archeology	Multiple
O'Shaughnessy Seawall (Ocean Beach)	San Francisco	Engineering, Community Planning and Development, Recreation	NPS
Ocean Terrace Site	San Francisco	Historical Archeology	NPS
Shipwrecks of the Golden Gate	San Francisco, Marin, San Mateo	Maritime Archeology	Multiple
Sutro Baths	San Francisco	History, Engineering, Historic Archeology	NPS
Sutro Heights	San Francisco	History, Cultural Landscape, Historical Archeology	NPS
Angel Island Coast Miwok Sites	Marin	Coast Miwok History, Archeology, And Heritage	State of California
Bolinas Copper Mines	Marin	Mining And Industrial History	Point Reyes National Seashore
Bolinas Lagoon Coast Miwok Sites	Marin	Coast Miwok History, Archeology, And Heritage	Multiple
Druid Heights	Marin	Social History	NPS

OTHER PROPERTIES WITHIN THE PARK POTENTIALLY ELIGIBLE FOR THE NATIONAL REGISTER OF HISTORIC PLACES (In Need of Determination of Eligibility)			
RESOURCE	COUNTY	AREAS OF SIGNIFICANCE	MANAGEMENT JURISDICTION
District			
Elk Valley Coast Miwok Site	Marin	Coast Miwok History, Archeology, And Heritage	NPS
Marin Headlands Coast Miwok Sites	Marin	Coast Miwok History, Archeology, And Heritage	Multiple
Miwok Trail	Marin	History, Recreation	Multiple
Muir Beach Coast Miwok District	Marin	Coast Miwok History, Archeology, And Heritage	NPS
Tomaes Bay and Olema Valley Coast Miwok Sites	Marin	Coast Miwok History, Archeology, And Heritage	Point Reyes National Seashore
Francisco Guerrero Adobe Site	San Mateo	Social History, Mexican California	Multiple
Martini Creek Ohlone Sites	San Mateo	Ohlone History, Archeology, And Heritage	NPS
Phleger Estate Logging Sites	San Mateo	1850s Redwood Logging History	NPS
Rancho Corral de Tierra	San Mateo	Agriculture, Cultural Landscape	NPS
Shelldance Nursery	San Mateo	Commerce	NPS

**OTHER PROPERTIES, NOT ELIGIBLE FOR THE NATIONAL REGISTER
OF HISTORIC PLACES WITH SPECIAL MANAGEMENT**

RESOURCE	COUNTY	STATUS
Sutro Heights District	San Francisco	Determined ineligible for listing on the National Register. Park manages the district and associated features as a cultural resource.

CULTURAL RESOURCES LISTED IN OR ELIGIBLE TO BE LISTED IN THE NATIONAL REGISTER OF HISTORIC PLACES

National Historic Landmarks

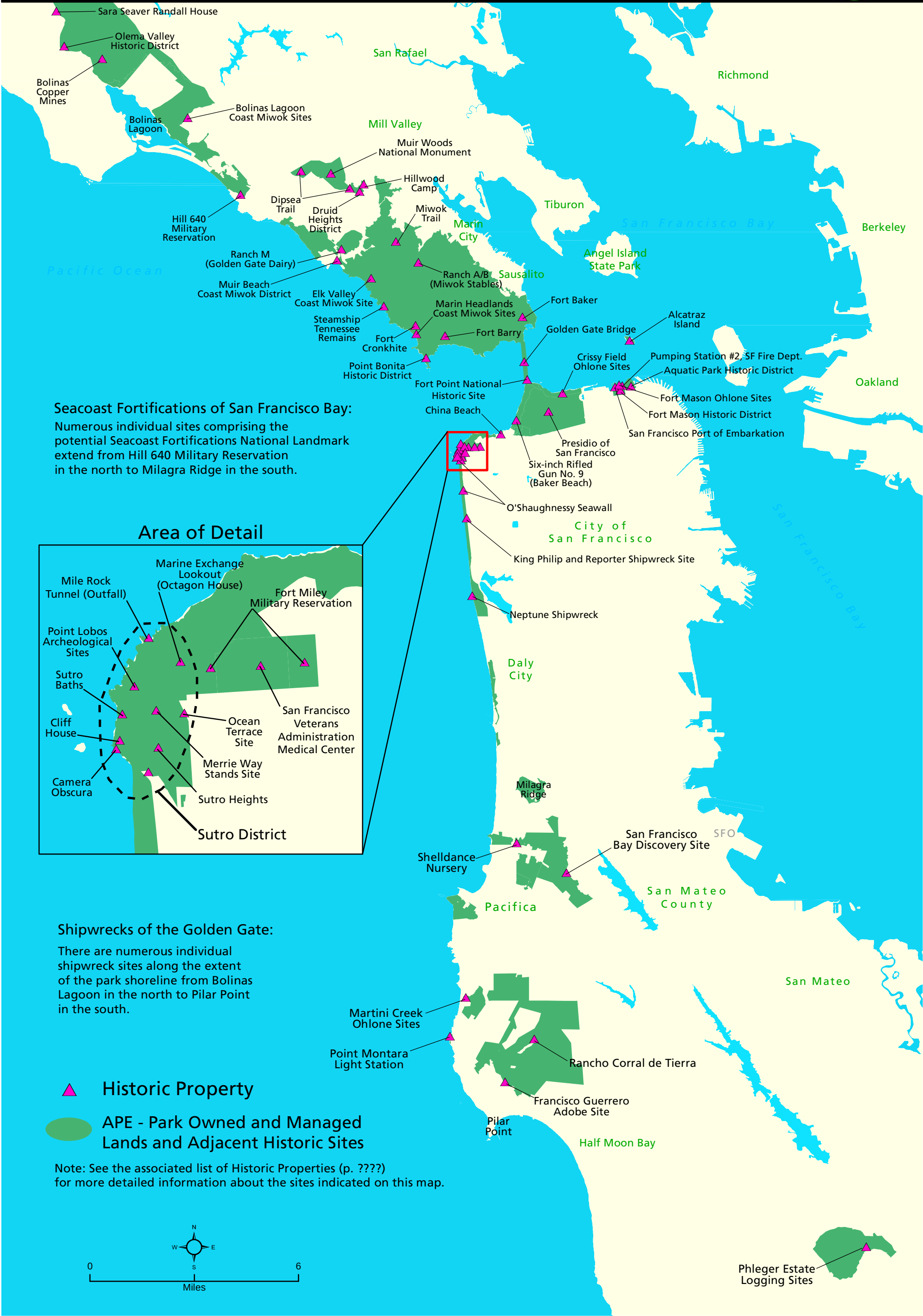
National historic landmarks are buildings, sites, districts, structures, and objects that have been determined by the Secretary of the Interior to be nationally significant in American history and culture. National historic landmarks possess exceptional value or quality in illustrating or interpreting the heritage of the United States in history, architecture, archeology, technology, and culture, and possess a high degree of integrity of location, design, setting, materials, workmanship, feeling, and association. National historic landmarks are significant because they

- are associated with events that have made a significant contribution to, and are identified with, or that outstandingly represent, the broad national patterns of United States history; or
- are associated importantly with the lives of persons nationally significant in the history of the United States; or
- represent some great idea or ideal of the American people; or
- embody the distinguishing characteristics of an architectural type specimen exceptionally valuable for the study of a period, style, or method of construction, or that represent a significant, distinctive, and exceptional entity whose components may lack individual distinction; or
- are composed of integral parts of the environment not sufficiently significant by reason of historical association or artistic merit to warrant individual recognition but collectively compose an entity of exceptional historical or artistic significance, or outstandingly commemorate or illustrate a way of life or culture; or
- have yielded or may be likely to yield information of major scientific importance by revealing new cultures, or by shedding light upon periods of occupation over large areas of the United States.

All national historic landmarks are included in the national register of Historic Places, which is the official list of the nation's historic properties worthy of preservation. National historic landmarks constitute more than 2,400 of the almost 83,000 entries in the national register; the other entries in the national register are of state and local significance. The process for listing a property in the national register is different from that for national landmark designation with different criteria and procedures. Some properties are recommended as nationally significant when they are nominated to the national register, but before they can be designated as national historic landmarks, they must be evaluated by the National Park Service's National Historic Landmark Survey, reviewed by the National Park System Advisory Board, and recommended to the Secretary of the Interior.

Area of Potential Effect Historic Properties

National Park Service
U.S. Department of the Interior
Golden Gate National Recreation Area
Muir Woods National Monument



Within the park's boundaries, the Secretary of the Interior has designated five national historic landmarks:

- Alcatraz Island
- Fort Point National Historic Site
- Presidio of San Francisco
- San Francisco Bay Discovery Site
- San Francisco Port of Embarkation

In addition, Aquatic Park Historic District, a national historic landmark managed by San Francisco Maritime National Historic Park, is adjacent to the Golden Gate National Recreation Area and could be affected by actions proposed in the general management plan. Brief descriptions of all of these properties are included here.

Alcatraz Island National Historic Landmark

Alcatraz Island includes cultural landscapes, historic structures, archeological sites, object collections, and stories associated with its use as a Civil War fort, military prison, federal penitentiary, and the site of the Indian Occupation of 1969 to 1971. Because of its strategic location in the San Francisco Bay, the island has been the site of events that have had a significant impact on the nation as a whole, from before the Civil War through the Indian Occupation. Its significance in the areas of military history, social history (penology), and maritime commerce (related to the Gold Rush and the Civil War) is enhanced by the integrity of its resources, which has resulted from the fact that access to the island has been strictly limited throughout its history.

Maritime commerce was aided by the first U.S. lighthouse on the Pacific Coast built on the island in 1854; its successor still serves. First garrisoned on December 30, 1859, the post was officially designated Alcatraz Island but was often referred to as Fort Alcatraz. By the start of the Civil War, Alcatraz was the key fort in the center of the most significant Pacific port in 19th century America. It mounted the first permanent cannon on the west coast of the United States, and featured a brick and masonry defensive barracks known as the "Citadel," which may have been unique in the annals of American military architecture. Alcatraz was designated as the official military prison for the entire Department of the Pacific on August 27, 1861, and was the first official army prison in the nation.

When Alcatraz became a civilian penitentiary in 1934, it quickly gained nationwide attention due to its association with many of the most infamous criminals of the gangster era and the bloody escape attempts made from there. It is representative of the far end of the penology spectrum, because it was a prison designed for punishment and incarceration only, not rehabilitation. It is of national importance in this regard because of its use as a repository of incorrigibles throughout the federal prison system, including Robert Stroud ("Birdman of Alcatraz"), Alphonse Capone, and George Kelly Barnes ("Machine Gun Kelly"). Alcatraz Island is certainly the best known prison in American history and arguably, along with France's "Devil's Island," is among the most infamous prisons in the world.

Alcatraz Island was occupied by "Indians of All Tribes" from November 1969 to June 1971 during an internationally publicized protest to focus attention on the plight of

American Indians and to assert the need for Indian unity and solidarity for achieving self-determination and securing political rights. Thus, the occupation increased awareness of the American Indian's political, economic, and social concerns and provided foundation for what would become a political movement—the American Indian Movement—to promote racial pride and secure and protect Indian rights. Tangible evidence of their occupancy on the island includes graffiti and physical alterations attributed to their actions.

The period of significance for Alcatraz stretches from 1847, when the island was first surveyed for military fortifications, to 1971 when the National Park Service acquired the land. This period of significance covers the military fortifications period (1847–1907), military prison period (1861–1933), federal prison period (1933–63), and American Indian occupation period (1969–71). Alcatraz Island was opened to the public as part of Golden Gate National Recreation Area in 1973, listed in the National Register of Historic Places in 1976, and designated as a National Historic Landmark in 1986.

The current landscape of Alcatraz consists of features and characteristics from each of the island's historically significant periods that are used to define cultural landscapes—buildings, structures, spatial organization, circulation, small-scale features, topography, vegetation, natural systems and features, archeological sites, and land use. It includes numerous contributing buildings and structures, and 81 areas of historic archaeological concern not yet listed in the Landmark inventory.

Fort Point National Historic Site

Fort Point National Historic Site is located within the Presidio of San Francisco, near the south anchorage of the Golden Gate Bridge. Though this landmark is within the park boundary, it is not included in the planning area. Constructed between 1853 and 1861, Fort Point is the only example of a casemated Third System fort completed on the Pacific Coast. It is also the most unaltered such fort left in the United States. Situated on the southern tip of the Golden Gate, the fort was a vital part of San Francisco's harbor defense during the Civil War, and played a role in defending the harbor entrance during World War I and World War II. Associated historic resources include Battery East, build to supplement the obsolete brick fort, the historic seawall and promenade and numerous historic landscape features and historic archeological sites.

Presidio of San Francisco National Historic Landmark

Established in 1776 by the Spanish and continued as a military post under the Mexicans and the Americans, the Presidio possesses a visual unity and a high degree of integrity that relates well to its historical importance and continuity through successive periods of development. The Presidio of San Francisco was the oldest Army installation operating in the American West and was one of the longest-garrisoned posts in the country. More than 200 years of military occupation of the Presidio have resulted in the development of a complex historic district of several overlaying historic landscapes, each composed of buildings, structures, objects, sites, and other features that represent multiple phases of development. Among the Presidio's over 450 historic buildings are examples of every major building period of U.S. military history since the 1850s. Over the years, the U.S. Army's careful site planning and extensive landscape design complemented the natural beauty of the site and made the Presidio unique among U.S. Army posts. As headquarters for the protection of the Bay and for military expeditions throughout the West, the

Presidio remained strategically the most significant military post on America's Pacific Coast during most of its extended history, until its closure in 1994. In 1994 the U.S. Army transferred the Presidio to the NPS. In 1996, the Presidio Trust Act enacted by Congress, gave jurisdiction of the inland area of the Presidio (known as Area B) to the Presidio Trust; the National Park Service continues to manage the shoreline areas, known as Area A. The Presidio is not part of the planning area covered by this general management plan.

San Francisco Bay Discovery Site National Historic Landmark

Located in the city of Pacifica, California, the site of the discovery of San Francisco Bay consists of the point at which the Portola Expedition of 1769 crossed over Sweeney Ridge and for the first time, came to view one of the world's largest sheltered anchorages. From the top of Sweeney Ridge, one can see not only inland to the Bay, but north along the ocean coast as far as Point Reyes. This landmark is on the crest of Sweeney Ridge and commemorates the place from where the main body of Spanish explorer Gaspar de Portola's expedition first sighted San Francisco Bay on November 4, 1769. The bay would become the most important harbor on the Pacific Coast of the United States and one of the great anchorages of the world. Following this discovery by the Spaniards, a presidio and two missions were established in what is now San Francisco. No structures are on the site nor are any in the immediate vicinity. It is likely that no structures ever have been there. Today, the site consists essentially of two knolls from which the member of the expedition acquired the view. The total acreage of the site is approximately 18.15. There are two commemorative monuments that celebrate the Gaspar de Portola Expedition. The view of course has changed considerably with the growth of the Bay Area, now including widespread suburban development.

San Francisco Port of Embarkation National Historic Landmark

This historic district is listed as a national historic landmark for its association with World War II in which it was defined as the principal port on the West Coast for delivering personnel, material, weapons and ammunition to the military campaigns in the Pacific Theater of War. During the months after the United States first entered World War II, the U.S. Army's San Francisco Port of Embarkation shipped more military supplies than all other military ports in the United States combined.

The statistical returns for the entire war showed that San Francisco was second only to New York in the numbers and amounts of personnel shipped to the war zones. Between December 1941 and August 1945, 1,745,000 personnel embarked at San Francisco. In addition, more than half a million veterans of the war debarked at San Francisco during the same period. An equal number came through the Golden Gate after conclusion of the hostilities. All American dead being returned to the United States from the Pacific were brought through the port. Japanese and German prisoners of war were processed through this port's facilities, as well.

During the war years, more than 25 million measurement tons of cargo were shipped through San Francisco. For various periods of time between 1941 and 1944, the ports of Los Angeles, California; Portland, Oregon; and Seattle, Washington were administered by San Francisco. In the Bay Area, Fort Mason oversaw port operations for no fewer than 13 other installations. San Francisco was the primary port for Army troops and supplies

in the central, south, and southwest Pacific areas. Moreover, the task force that drove the Japanese from Alaska's Aleutian Islands was mounted from San Francisco.

The district is significant within the area of military history for the period from 1912 to 1945. It contains 210 acres, 14 buildings, and 5 structures predominantly located at lower Fort Mason. Building 201 at upper Fort Mason, currently the park headquarters is a contributing resource to the district.

Aquatic Park Historic District National Historic Landmark

This property is outside the general management plan planning area but is adjacent to the park's Fort Mason Historic District in San Francisco. Aquatic Park Historic District is bounded by Van Ness Avenue and Hyde and Polk Streets and has an important interrelationship with Golden Gate National Recreation Area. Developed from 1936 to 1939, the park was one of California's largest Works Progress Administration projects, reflecting President Franklin D. Roosevelt's policy of providing employment to architects and artists during the Great Depression. The centerpiece of this group of "streamline moderne" structures, all employing nautical metaphors, is a multipurpose structure containing the bathhouse, concession stand, and lounge. Its rounded walls, recessed upper stories, tubular steel railings, and porthole windows were designed to create the illusion of an ocean liner. Murals and other artwork carry out the nautical theme. This main building, lifeguard stations, stadium, Sea Scout building, a seawall, and a semicircular pier form the Aquatic Park Historic District, which now is part of the San Francisco Maritime National Historical Park. The district contains ten acres of land with three buildings and five structures that are significant for the period from 1920-1945.

Potential National Historic Landmark Properties

Coastal Seacoast Fortifications of San Francisco Bay

The coastal seacoast fortifications of San Francisco Bay, which are currently being evaluated for designation as a national historic landmark, today comprise what is widely considered to be the most comprehensive collection of military architecture and coastal defense systems and the finest surviving examples of military engineering for coastal defense in the United States. The significance of the seacoast fortifications structures of the Bay Area as a group is of the highest order. These fortifications span San Mateo (Milagra Ridge, Devils Slide), San Francisco (Presidio, Fort Funston, Fort Mason, Fort Miley, Alcatraz and Fort Winfield Scott in the Presidio), and Marin (Forts Baker, Barry and Cronkhite) counties and encompass over 40 major caliber gun batteries and scores of other supporting structures. Moreover, as well-preserved examples of nearly every important development in military fortification architecture and engineering from before the Civil War to the guided missile era, they embody an extraordinary range of distinguishing characteristics of military architecture, engineering, style, and construction and outstandingly illustrate military culture and technique. They are tangible manifestations of changing periods in the nation's history and of its changing military responses, and provide associative links with people important to the history of the nation as a whole, from John C. Fremont and "Kit" Carson to Irvin McDowell and Douglas MacArthur. The military reservations that provide a relatively unchanged physical context for these fortifications also provide a spectacular scenic backdrop of largely undeveloped open space at the very edge of a great urban metropolis.

Golden Gate Bridge

The Golden Gate Bridge is on park property but is owned and managed by the Golden Gate Bridge, Highway, and Transportation District. It was determined eligible for listing on the national register in 1980 and was designated a California State Historic Landmark in 1990. The Golden Gate Bridge has not yet been listed in the national register. In 1997, the National Park Service prepared a national historic landmark nomination for the Golden Gate Bridge but it has not yet been designated as a landmark. The National Park Service was a concurring party to a Memorandum of Agreement for the Golden Gate Bridge Physical Suicide Deterrent System Project to complete and submit a landmark nomination for the Golden Gate Bridge that includes significant associated buildings, structures, roadways and pedestrian circulation features and landscaping.

Olema Valley Historic District

This rural historic landscape consists of former dairy ranches in West Marin County and, although within the authorized boundaries of Golden Gate National Recreation Area, is managed by Point Reyes National Seashore for reasons of geographic proximity.

National Register of Historic Places

The National Register of Historic Places is a list of properties (districts, sites, buildings, structures, and objects) that possess the quality of significance in American history, architecture, archeology, engineering, and culture, as well as integrity of location, design, setting, materials, workmanship, feeling, and association. Properties listed in the national register are significant because they

- are associated with events that have made a significant contribution to the broad patterns of our history; or
- are associated with the lives of persons significant in our past; or
- embody distinctive characteristics of a type, period or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction; or
- have yielded, or may be likely to yield, information important in prehistory or history.

Properties Listed in the National Register of Historic Places

Marin County

Dipsea Trail. The historic Dipsea Trail, which extends from Mill Valley to Stinson Beach, and runs through parts of Muir Woods, is one of the oldest foot races in the nation.

Forts Baker, Barry, and Cronkhite. These military fortifications and installations comprise some of the earliest coastal defense artillery batteries in Marin County and are significant landmarks for tracing the development of the American defense system. The land, on which they were constructed, strategically located at the northern point of the Golden Gate, commands the approaches to the San Francisco Bay entrance. The batteries and their ancillary structures (observation posts and cantonments) created a coordinated

system of defense at the Golden Gate from the Civil War to the Cold War. The scope of the landscape afforded by the three military fortifications includes both Native American and European-associated attributes.

In 1866, Forts Baker and Barry were acquired by purchase to be used for military defense. Fort Cronkhite was acquired in the same manner in 1914, but was considered a portion of Fort Barry until officially designated as Fort Cronkhite in 1937. The fortifications proposed for construction at the northern point of the Golden Gate were to augment those at the Presidio of San Francisco and elsewhere in San Francisco to prevent successful passage of hostile ships through the Golden Gate into the Bay. The batteries and their ancillary structures (observation posts and garrisons) created a coordinated system of defense at the Golden Gate. From the Civil War to the Cold War eras, this system of defense offered equipment ranging from smoothbore muzzle-loading cannon to rifled, breach-loading artillery, including anti-aircraft and anti-breach-landing defense from World War II and Nike anti-aircraft missiles from the Cold War. The Fort Cronkhite cantonment is not only highly representative of the once ubiquitous 700-Series World War II mobilization cantonments; it is considered the best-preserved example of its type in the nation. The district is spread over 1400 acres and over 100 historic and structures.

Muir Beach Archeological Site. This Coast Miwok archeological site dating from about AD 1300 is one of only a few such properties known in southwestern Marin County. It was recorded in 1909, and appears to be part of a series of periodic villages or encampments formed around the estuary at the mouth of Redwood Creek below present day Muir Woods between AD 1100 and as late as 1800.

Muir Woods National Monument. In 2008, Muir Woods National Monument historic district was listed on the NRHP for its significance as an early and lasting example of natural resource conservation by the federal government. In addition to the forest of giant redwood trees, the monument's collection of historic buildings, structures, and cultural landscape are representative of the National Park service's rustic design style. It is a 425-acre historic district with 5 contributing buildings, and numerous historic structures which comprise the principal elements of the cultural landscape. See the "Cultural Resources—Muir Woods National Monument" section of this document for more detailed information.

Point Bonita Historic District. The Point Bonita Historic District, located at the entrance to San Francisco Bay from the Pacific Ocean, includes both the Point Bonita Light Station and the Point Bonita Life-Saving Station and associated landscape features. Established in 1855 to mark the entrance to San Francisco Bay and to warn of local navigational hazards, the district is linked to the historic growth of commercial shipping along the West Coast and to California's critical reliance on maritime transportation and the aids that made navigation possible. The light station contains an intact lighthouse tower with an intact lens and an associated fog signal building. The tower and fog signal building, clustered together at the end of the rocky point, retain a high degree of integrity and give cohesiveness to the light station site. This is heightened by the buildings' separation from the main access path by a pedestrian suspension bridge; Point Bonita is the only lighthouse in the United States approached by a suspension bridge. The light station retains the general form of a formal late 19th – early 20th century light complex.

Steamship Tennessee Remains. The SS *Tennessee*, a side-wheel commercial passenger-cargo steamer, owned by the Pacific Mail Steamship Company and destined for Panama, crashed against the rocks in Indian (Tennessee) Cove, some three miles north of Point Bonita on March 6, 1853, amid dense fog and high surf. Today the Tennessee Valley Trail leads visitors to the cove where the ship's remains are occasionally uncovered by the restless surf.

San Francisco County

Camera Obscura. The Camera Obscura was added to the National Register of Historic Places in 2001 on the basis of the engineering significance of the camera mechanism—the largest camera obscura remaining in situ in the nation. The exterior of the building was extensively modified in 1957 to appear as a giant camera, and may be reevaluated for historical significance upon reaching fifty years of age.

Fort Mason Historic District. Beginning in 1797 and lasting through the Spanish and Mexican administrations of Alta California, Fort Mason (including Batteria San José, Punta Medanos, Battery Yerba Buena, Point San José, Black Point, and the Post of Point San José) was one of two sites in San Francisco Bay that was armed with artillery for the defense of the harbor. For over 40 years of American administration, from the Civil War to the post-Spanish American War era, Fort Mason played a role in the coastal defenses of the Bay. It also served as an important element in the first submarine mining of San Francisco Bay during the Spanish American War. From the Spanish American War to the Korean War, Fort Mason was the headquarters of the San Francisco Port of Embarkation.

Fort Mason contains a collection of military structures dating from the 1850s to the Korean Conflict that illustrates the evolution of an army post and seacoast fortifications over a period of some 100 years. The variety and contrasts among many styles of the architecture, the effect of the Army's caste system on the quarters, the charm of the earliest officers' row, the simple lines of the Endicott battery, the Works Progress Administration architecture of the Great Depression, and the Army's determination in landscaping all blend together to present a history of this place and its times. The district includes 146 historic buildings and structures spread over 68 acres of land. A wooden pier (Pier 4) and small buildings at its terminus are associated with prison operations on Alcatraz Island. The historic landscape is also a contributing feature of the district. Five archeological sites associated with Ohlone native peoples and other historic archeological sites are located at Fort Mason; however, they listed in a separately-themed historic district nomination.

Fort Miley Military Reservation. This historic district is a military landscape comprised of battery emplacements, fire control stations, and searchlight facilities that served as part of the defense system for the strategic harbor of San Francisco. These features of East and West Fort Miley were part of the defense system for the strategic harbor of San Francisco, long regarded by Army engineers and strategists as the most important harbor on the west coast of the United States. The fortification of Point Lobos in 1899 marked the final phase of the Endicott system of seacoast defense, when it was determined that the guns and mortars should be placed as far toward the sea as possible and that the inner harbor defense represented by the early Endicott-type batteries was of less importance.

The guns of Fort Miley, together with those of Fort Barry on the northern side of the Golden Gate, became San Francisco Bay's important "outer line of defense" at the turn of

the last century. The massive concrete and earth batteries, Chester and Livingston, represented the latest in design and engineering of the Endicott works as of 1900. Later installations at Fort Miley, such as a coastal searchlight powerhouse and fire control stations for other and later batteries, mark further advances in the theory, practice, and technology of seacoast defenses.

Fort Miley's continuing importance in the harbor defenses of San Francisco is illustrated by construction of a 6-inch gun battery during World War II and the subsequent arming of this battery as late as 1948—the last of the coastal guns to be mounted in the San Francisco Bay Area.

King Philip / Reporter Shipwreck Site. The *King Philip*, a three-masted wooden clipper ship named for the Indian chief who was involved in King Philip's War in 1675, crashed on Ocean Beach amid heavy surf on January 25, 1878, after leaving San Francisco without cargo. First launched in 1856, the ship went into the lumber trade working for Pope and Talbot of San Francisco after its glory days as a clipper. The location, and the remains, has also been associated with the 1876 three-masted schooner "Reporter", which wrecked in the same location March 13, 1902. The remains appear whenever storm surf scours the beach sands low enough to expose the hull.

Point Lobos Archeological Sites. The Point Lobos sites include two prehistoric Ohlone archeological sites dating from about AD 300–1100. These sites are encampments in the dunes of western San Francisco that evidence harvesting of sea mammals and shellfish from the nearby ocean shoreline. They are among a handful of prehistoric sites left in San Francisco.

Pumping Station #2, San Francisco Fire Department Auxiliary Water Supply System. Pumping Station #2 of the San Francisco Fire Department Auxiliary Water Supply System represents an example of an innovatively planned and designed "earthquake proof" fire fighting system for San Francisco. The pumping station is significant within the areas of community planning and engineering for the City of San Francisco. Its period of significance is 1912 to 1975. Although the building is sited on park land in the Fort Mason Historic District, the facility is still owned and utilized today by the City of San Francisco.

Six-inch Gun No. 9 (Baker Beach). The Six-inch Gun Number 9 and disappearing carriage were received by the National Park Service in 1977 from the Smithsonian Institution. The gun and carriage were installed at gun emplacement Number Four at Battery Chamberlin, located in the Presidio of San Francisco, and are the same type originally used there. Battery Chamberlin is an Endicott-era battery completed and armed in 1904 with four six-inch guns mounted on disappearing carriages. The battery was built to protect underwater minefields laid outside the Golden Gate during the time of war. The original guns were dismounted in 1917 for use in World War I, but the battery was modified to receive two six-inch guns on simple barbette carriages in 1920. During World War II, the Sixth Coast Artillery (Harbor Defense) Regiment, Battery "D," manned the two guns at Battery Chamberlin, which were placed under camouflage netting to hide them from potential air attack. In 1948, the Coast Artillery Corps was deactivated, the battery disarmed, and the guns scrapped. Today, an underground magazine contains photos and small exhibits on the harbor defenses of San Francisco. Operation of the gun and the magazine are open to the public periodically.

In addition to these properties which are within the park boundaries, there are two additional properties within the area of potential effects that are adjacent to the park boundary and could be affected through actions proposed in this plan. These are

Point Montara Light Station. Point Montara Light Station District covers 73 acres containing three contributing buildings and one contributing structure. The Light Station was established in 1875 as the Point Montara Fog Signal, and the house was built for the keepers. The first light was not installed until 1900, a simple lantern hung on a post. In 1912, a Fresnel lens was mounted on a skeleton tower, and in 1928, the existing cast-iron lighthouse was built to house the lens. The old-fashioned fog horn continued to be important because the fog on this part of the coast is often thick enough to restrict even the bravest beam. The property is owned and managed by the United States Coast Guard, but will likely be added to the park in the near future.

San Francisco Veterans Affairs Medical Center. This property occupies a 29-acre campus in the northwest corner of San Francisco, of which the historic district is approximately 12 acres. It is surrounded on three sides by Fort Miley. It is owned and managed by the Department of Veterans' Affairs.

Properties Determined to be Eligible for Listing in the National Register of Historic Places

Several properties within the park boundary have been identified, evaluated and assessed for their eligibility for listing on the National Register of Historic Places. The term eligible for inclusion in the national register refers to properties formally determined as such in accordance with regulations of the Secretary of the Interior and to all other properties that meet the national register criteria without a formal determination. For purposes of park management and planning, these properties are treated as contributing resources.

Marin County

Sara Seaver Randall House. Habitation of one of the earliest Anglo settlers in Marin County. The property is managed by Point Reyes National Seashore.

Hill 640 Military Reservation. This reservation, including the cultural landscape as well as the remains of its radar set and fire control stations are prime examples of the methods that evolved for the better direction of coast artillery fire against enemy vessels at sea. Overlooking the Pacific Ocean and the southern end of Stinson Beach, they are the best surviving representatives of the most northerly complexes of fire control installations for the defense of San Francisco Bay during the critical years of World War II. The radar, a surface detector set, was the first of its type assigned to the San Francisco Harbor defenses. These features are little disturbed from World War II and retain very high integrity.

Ranch M (Golden Gate Dairy). The Golden Gate Dairy at the lower end Redwood Creek is one of the last agricultural operations remaining with historic integrity intact. It was originally one of dozens of Portuguese-owned dairies in southern Marin County. The main house was built circa 1898–1900 by Azorean immigrant M. A. Mattos. The Lopez family operated a Grade A dairy here from approximately 1943 to 1962. The site contains several residences, corrals, utilitarian structures, fence lines, pastures, windbreaks, and

historic archeological deposits. The cultural landscape of the Golden Gate Dairy includes residences, corrals, utilitarian structures, fence lines, pastures, and windbreaks.

Ranch A/B (Miwok Stables). The Rapozo Ranch in the Tennessee Valley of the Marin Headlands, currently operated as the Miwok Ranch or Stables, is one of the last agricultural operations remaining with intact historic integrity. It was originally one of dozens of Portuguese-owned dairies in southern Marin County. The main house was probably built circa 1903 by Azorean immigrant M. F. DaCunha, the first single owner of the ranch. The ranch was used by the Rapozo family from 1945 to the present. The site contains a hay barn, riding barn, sanitary (dairy) barn, two residences, corrals, a eucalyptus windbreak, and other ranching features.

Hillwood Camp. The earliest surviving example in Marin County of a rural camp reflective of an effort to immerse urban-dwelling youth in a natural environment. The property includes the main lodge and associated features.

Olema Valley Historic District. Collection of properties along State Route 1, north of Bolinas representing a cultural landscape of rural farming from the late-19th and early-20th century period. The district is managed by Point Reyes National Seashore.

San Francisco County

Merrie Way Stands Site. An historic archeological site associated with an early San Francisco amusement park established by Adolph Sutro at Land's End in 1895. The pleasure ground and its concession stands lining Lobos Avenue existed until about 1920, when the last of the amusement structures were demolished.

Mile Rock Tunnel. Completed in 1915, the tunnel is an example of the reconstruction and reconfiguration of the City of San Francisco's public works system following the 1906 earthquake. Designed by M. M. O'Shaughnessy, a San Francisco City Engineer best known for his design of the Hetch Hetchy Water System, the tunnel was the first constructed in the city using a combination of open cut timber cribbing and boring through solid rock, a technological and engineering innovation for the city. It served as the storm drainage facility for the Sunset and West Mission districts and portions of the Richmond and Ingleside districts.

Properties Potentially Eligible for Listing in the National Register of Historic Places

Potentially eligible properties include those that have been identified by park staff and other cultural resource professionals as being potentially eligible for listing in the national register. These properties need to be further assessed and evaluated in order to make a determination of eligibility in the near future. A determination of eligibility would be made in advance of activity or work that could directly affect them.

Marin County

Bolinas Copper Mine. The scenic Wilkins Ranch, at the head of Bolinas Lagoon, witnessed three waves of mining fever on the upper slopes of Bolinas Ridge, beginning in the 1860s. The Chetco Mining Company, more successful than its predecessors, closed its doors in 1918; it was the last operation to work the vein. Cultural landscape features include the mine's adit and shaft, a mining road, concrete foundations and cabin site, a

rusty boiler and cable, and other large debris. The property is managed by Point Reyes National Seashore.

Bolinas Lagoon Coast Miwok Sites. A series of four pre-contact archeological sites which contain significant information on Coast Miwok history in southwestern Marin.

Druid Heights. Potentially significant as the site of a colony of artists, writers, Zen philosophers (Alan Watts) influential in the development of the counter-culture of the 1960s.

Marin Headlands Coast Miwok Sites. A series of three pre-contact archeological sites which contain significant information on Coast Miwok history near Rodeo Lagoon in Fort Barry and Fort Cronkhite.

Miwok Trail. Potentially significant as one of the earliest trails in the region.

Muir Beach Coast Miwok Sites. A district of three pre-contact archeological sites, including the National Register Muir Beach Archeological Site, which encompass the Big Lagoon area of the mouth of Redwood Creek.

San Francisco County

China Beach. Potentially significant for its architecture and design as an early post-World War II civic recreational complex.

Crissy Field Ohlone Sites. A district of two pre-contact archeological sites along Crissy Field in the Presidio of San Francisco.

Fort Mason Ohlone Sites. A district of six pre-contact archeological sites in Fort Mason, constituting the densest archeological site cluster remaining in the City of San Francisco.

Marine Exchange Lookout Station (Octagon House). Potentially significant in maritime history and commerce as well as for its rare and unusual style of architecture.

O'Shaughnessy Seawall. Potentially significant in the fields of engineering, city planning and recreation as part of the long recreational history of Ocean Beach.

Ocean Terrace Site. An historic archeological site of a commercial district associated with Adolph Sutro's Lands End properties.

Sutro Baths. Archeological remains of a major public natatorium constructed by Adolph Sutro in the 1890s and lasting until its destruction by fire in 1966. The site is a significant historic landmark in San Francisco and maintains key engineering features that facilitated its operation.

Neptune Shipwreck. Remains of the shipwreck of the 1882-constructed schooner SS Neptune, which wrecked on Ocean Beach near Fort Funston in 1900. Exposed by winter scour of beach sands in 1983.

San Mateo County

Phleger Estate. The Phleger Estate cultural landscape contains historic archeological sites relating to the area's logging history such as numerous skid roads, camps, and mill sites, as well as potential Ohlone archeological sites.

Rancho Corral de Tierra. The cultural landscape of Rancho Corral de Tierra may include structures, landscape features, and archeological sites associated with historic

ranching operations dating back as far as the Mexican rancho era. These could include the site of the historically-documented 1840s adobe residence of Francisco Guerrero y Palomares, original grantee of the northern part of Rancho Corral de Tierra; and the Martini Creek Ohlone Sites: a district of pre-contact Ohlone sites north of Montara

Shelldance Nursery. Potentially significant as representative of the cut-flower industry in west San Mateo county.

Properties Ineligible for Listing in the National Register of Historic Places with Special Management

The state historic preservation office determined the Sutro Heights District, located at Point Lobos in San Francisco, to be ineligible for listing on the NRHP in 1979 and again in 2000, although the recently restored Cliff House and the remains of the water pumping system may be reassessed for eligibility as further information is developed. The district is approximately 78 acres and includes the Cliff House, Sutro Heights, and Sutro Baths ruins. The park has chosen to manage the district and associated features, including the historic designed landscape, as a cultural resource.

ARCHEOLOGICAL RESOURCES

Definition

Archeological resources are the physical evidence of past human activity, including evidence of the effects of that activity on the environment. Information revealed through the study of archeological resources is critical to understanding and interpreting prehistory and history. Although archeological and ethnographic resources (which are covered in the following section) are considered as separate cultural resource types by the National Park Service, the two are closely interrelated.

Currently, less than 10% of Golden Gate National Recreation Area has been surveyed for pre-contact and historic archeological resources. To date, approximately 370 archeological sites have been inventoried, but the significance of those sites requires further study and evaluation. Furthermore, comprehensive consultations with Coast Miwok and Ohlone tribes and descendants regarding archeological sites with ethnographic significance in the park will continue into the future. As a result of this need for additional survey, assessment, and consultation, archeological resources in the park are subject to deterioration from natural erosion processes, inadvertent but deleterious visitor, park management, or partner activities, vandalism, and looting.

On Alcatraz Island, some 81 areas of historic archeological interest have been identified through documentary research, including substantial buried resources worthy of consideration for future incorporation into the visitor experiences on the island. There is a clear need for a comprehensive archeological survey and evaluation of the island to incorporate contributing archeological properties and issues into both the National Historic Landmark documentation and the park's future planning. Consultation with American Indian tribes regarding ethnographic significance is also needed.

Resources

Currently, there are more than 370 inventoried archeological sites in the park. Continuing research and expanding knowledge of the park's resources has resulted in a logical increase in known and expected archeological sites. Amendments to existing National Historic Landmark and National Register property documentation with this new information has lagged. Archeological sites and related historic property types in the park and monument are associated with the following themes or topics:

- Pre-contact Period (Prior to contact between indigenous and European peoples)
- Historic/Spanish, Mexican, and American Periods
- Military Reservations/Installations
- Seacoast Fortifications
- Ranching/Agriculture
- Logging
- Lighthouse/Life Saving Reservations
- Shipwrecks and Associated Remains
- Recreational Development

ETHNOGRAPHIC RESOURCES

Definitions

Ethnographic resources include sites, structures, objects, landscapes, or natural resource features assigned traditional and contemporary legendary, religious, subsistence, or other significance in the cultural system of a group associated with them.

Traditional cultural properties are ethnographic resources eligible for listing in the National Register of Historic Places. Traditional cultural properties are associated with cultural practices, beliefs, the sense of purpose, or existence of a living community that is rooted in that community's history or is important in maintaining its cultural identity and development as an ethnically distinctive people.

Currently, there are no identified ethnographic resources within the boundaries of Golden Gate National Recreation Area, although Alcatraz Island has very important ethnographic significance for American Indians, and every Coast Miwok or Ohlone pre-contact site has significant heritage values to park-affiliated native people.

History

Native Americans have called the San Francisco Bay region home for more than 10,000 years, and the park still contains archeological sites and landscapes influenced by native land management and activities. Park areas south of the Golden Gate, from the San Francisco Peninsula to the East Bay and south to Monterey, are the aboriginal lands of the Ohlones (also called Costanoans). Park lands north of the Golden Gate, primarily in Marin County and southern Sonoma County, are the aboriginal lands of the Coast Miwoks.

Both the Ohlone and Coast Miwok peoples were organized into small, politically independent societal groups or tribes; the Ohlones had about 50 tribes and the Coast Miwoks had approximately 14 tribes. Ethnohistory suggests that small villages were maintained along the marshlands. In San Francisco, villages were located in the park at present-day Fort Mason, Crissy Field, and Point Lobos. In Marin County, the Coast Miwok encampments were located in the Rodeo and Tennessee Valleys and along Redwood Creek, and at Bolinas Lagoon. Groups moved annually between temporary and permanent village sites in a seasonal round of hunting, fishing, and gathering. Periodic burning of the landscape was conducted to promote the growth of native grasses for seed gathering and to create forage for deer and elk. The worldview and spirituality of both the Ohlones and Coast Miwoks were expressed in a complex woven tapestry of stories, myth, song, dance, and ritual.

In 1776, when Spanish military and civilian settlers arrived in the San Francisco Bay area to establish military garrisons (presidios), Franciscan missions, and civilian settlements (pueblos), life abruptly and dramatically changed for the region's native peoples. With Spanish colonization came the introduction of new diseases and the establishment of mission communities meant to supplant the existing tribal organization.

Because they lived close to the Presidio's military garrison, members of the Ohlone tribes that inhabited the San Francisco Peninsula, called the Yelamu, were baptized and taken into the missions as early as the 1770s and 1780s. Because the Coast Miwok tribes lived further north, their indoctrination occurred somewhat later. In 1783, several members of the *Huimen* community, who inhabited the southernmost part of Marin County, were the first of the Coast Miwok to leave their homeland for Mission San Francisco. By 1810, introduced ideas, forced labor, and efforts to indoctrinate the indigenous peoples into an alien society and religion led to the destruction of the way of life of the Ohlones and Coast Miwoks.

Today, descendants of Ohlone and Coast Miwok peoples live throughout the San Francisco Bay area. Ohlones are organized into eight tribal bands, none of which are federally recognized, although several are seeking recognition. While participating in contemporary society, they are actively involved in the preservation and revitalization of their native culture. Restoration of native language, protection of ancestral sites, practice of traditional plant uses, story-telling, dance, song, and basket weaving are all aspects of these restoration efforts. The National Park Service works with Ohlones in stewarding the preservation and interpretation of ancestral sites and landscapes in the Presidio and throughout the park south of the Golden Gate. Additionally, the National Park Service has a government-to-government relationship with the Coast Miwoks who today form a single, federally recognized tribe, the Federated Indians of Graton Rancheria, whose recognized status was restored by congressional legislation in 2000. If and when any of the Ohlone tribes receive federal recognition, the nature of the park's relationship with these tribes will become government-to-government.

Sites

Native peoples were severed from their homelands in the park for two centuries due to European and American colonialism, irreparably rupturing their traditional connections to place; this magnifies the significance of indigenous archeological sites as focal points of native heritage today.

Archeological sites related to indigenous peoples, such as the Point Lobos Archeological Sites, the Muir Beach Archeological Site, and sites at or near Tomales Bay, Olema Valley, Bolinas Lagoon, Redwood Creek, Tennessee Valley, Rodeo Lagoon, Angel Island, Fort Mason, Land's End, Crissy Field, Mori Point, Montara, and Phleger Estate, constitute the most tangible connection between Coast Miwok and Ohlone peoples and park lands and provide a basis for understanding the history of their life ways and cultures.

Collaboration

In the late 1990s—in equal measures due to evolving NPS policy and to the rekindling of California Indian tribal life—the National Park Service made its first efforts to reach out and work with the Coast Miwok and Ohlone communities. Since the late 1990s, the National Park Service has worked on a consistent basis with the Federated Indians of Graton Rancheria (the federally recognized tribe comprised of park-associated Coast Miwoks and Southern Pomo), with the many Ohlone tribes seeking federal recognition, and with Ohlone individuals who partake in the stewardship of Ohlone heritage. Cooperative work has encompassed a broad range of park activities such as consultation on the identification, inventory, and treatment of cultural resources; collaboration on the interpretation of native history, genealogy, and culture; development of Indian-led educational programs; teacher training for Native American curricula; permanent and temporary exhibits on native history and culture; annual commemorative festivals with native components; and the permitting of religious activities on park lands and gathering of natural materials for use in traditional crafts. Recent natural resource restoration projects involving the identification and preservation of archeological sites related to indigenous peoples (i.e., the Crissy Field tidal marsh and planned Big Lagoon restoration projects) have inspired an interest in exploring the re-creation of ethnographic landscapes as a value-added component of natural resource restoration

Alcatraz Island

Although there are no identified ethnographic resources in Golden Gate National Recreation Area, Alcatraz Island has very important historical significance to American Indians. After Alcatraz became part of Golden Gate National Recreation Area, each November the International Tribal Council conducted an annual “*Unthanksgiving*” sunrise ceremony on the island. The island was occupied by “Indians of All Tribes” from November 1969 to June 1971 as an internationally publicized protest to focus attention on the plight of American Indians and to assert the need for Indian unity and solidarity for achieving self-determination and securing political rights. Thus, the occupation increased awareness of the American Indian's political, economic, and social concerns and provided foundation for what would become a political movement—the American Indian Movement—to promote cultural pride and secure and protect Indian rights. The occupation resulted in the nation's increased awareness of American Indian concerns and issues and the establishment of D-Q University at Davis, California, as well as other institutions throughout the nation. Commemorations were held on the island to remember the 20th and 30th anniversaries of the Indian Occupation. Tangible evidence of the occupation on the island includes painted political slogans and symbols on the buildings and physical alterations attributed to the Indians' activities. Since the occupation, the

island has become a symbolic focal point of American Indian pride and solidarity among relocated American Indians in the San Francisco Bay area as well as the nation at large. Thus, the National Park Service recognizes the ethnographic significance of Alcatraz Island for American Indians and the island's potential for listing in the national register as a traditional cultural property.

PARK COLLECTIONS

Definition

Park collections are prehistoric and historic objects, artifacts, works of art, archival documents, and natural history specimens valuable for the information they provide about processes, events, and interactions among people and the environment.

Resources

U.S. Military history, from 1846 to the 1990s, is one of Golden Gate National Recreation Area's major themes. Much of the park land is comprised of former military fortifications and installations. The park's collections and its cultural and natural resource holdings are inextricably bound. The two largest collection types in the park are archives and archeology. The park has a park collection of more than 4.2 million objects, including archeological and historical objects and archives, oral histories, maps, and historic documents and records, which are directly associated with the wealth of historic properties in the park. Of particular importance are the documents, maps, and engineering drawings relating to the layout, construction, development, and operation of the park's military sites and installations as well as its fortifications.

The park's collections consist of the following components:

- Archival collections (3.8 million) include subjects related to lands governed by the park covering the span of history from the mid-19th century through the present, and include all media types, such as architectural drawings, maps, photographs, documents, books, and oral history recordings. Representative topics include Alcatraz and penal history in the Bay Area; Sutro Baths, Sutro Heights and Cliff House properties and history; military fortifications from the early 19th century forward; U.S. Army infantry, cavalry and coastal artillery on the Presidio of San Francisco and at multiple other sites around the mouth of San Francisco Bay; Pacific Theatre of military operations originating in the San Francisco Bay Area; military life in the 19th and 20th centuries; historic structures and cultural landscapes; farming and ranching in the Marin Headlands; and Muir Woods and the early conservation movement. Archival collections support ongoing park management as well as diverse uses by both staff and the public.
- History collections (19,757) include such things as original FBI evidence from the 1962 Alcatraz escape, original uniforms, accoutrements, and everyday objects from the U.S. Army, swimsuits and advertising materials from Sutro Baths, architectural features from historic structures, Nike Missile Site collections, and California related materials from the former Presidio Army Museum.

- Archeological collections (378,901) include formally and informally recovered prehistoric and historic artifacts derived from park lands and from specific sites listed in the NPS Archeological Sites Management Information System. These historic properties include two National Historic Landmarks (Presidio of San Francisco and Alcatraz Island), as well as many sites listed in or eligible for listing in the National Register of Historic Places.
- The natural history collection (2,030) includes a small herbarium, insect collection, and invertebrate specimens. The park's active Inventory and Monitoring program documents significant and endangered or threatened species collected from scientific research as well as paleontological specimens. While the park only maintains a small collection, other Golden Gate National Recreation Area natural history specimens are maintained in other repositories in California and New York State. The purpose of natural history collections is to support scientific research, resource management, and education; provide baseline data of park resources; and document changes that these resources are undergoing because of internal park conditions and external effects. These collections preserve locally significant species collected in response to specific research or interpretation needs, and guarantee the protection of important specimens whose preservation cannot be assured. The natural history collection is divided into three disciplines: biology, geology, and paleontology.

Golden Gate National Recreation Area houses its park collections in 15 separate facilities throughout the park that function as visitor centers, interpretive exhibits, or dedicated storage areas. Of the four largest storage repositories, two are located in buildings owned by the Presidio Trust with no lease agreements in place. The lack of a lease places park collections in a vulnerable position due to potential eviction, and deteriorating structural conditions. There is a historic tie between the park's collection and that of San Francisco Maritime National Historical Park, which was part of the park until 1988. The themes and resources of the two parks are inextricably tied together. Under an agreement between the two parks, San Francisco Maritime National Historical Park continues to house and provide limited management of most of the non-Presidio materials in Building E of Lower Fort Mason, which is part of Golden Gate National Recreation Area.

The current conditions for park collections in the park do not meet NPS standards for the long-term preservation, protection, and use of park collections. Staffing for the park collections has never been stable, thus precluding realistic access for researchers, the general public, and park staff. Although planning has been underway for some 15 years, a suitable location for the park's park collections has yet to be finally determined.

CULTURAL RESOURCES – MUIR WOODS NATIONAL MONUMENT

INTRODUCTION

Muir Woods National Monument remains an enduring and renowned example of natural resource conservation in the United States. The redwood forest, long recognized for its significance as a natural resource, is also historically significant—along with its overlay of cultural resources—for its association with the history of the American conservation movement, early conservation efforts in the Bay Area, and the legacy of rustic design in the National Park Service.

Muir Woods National Monument is nationally significant as an early and lasting example of natural resource conservation by the federal government. The monument was designated on January 9, 1908, by President Theodore Roosevelt, who acted in large part on the advice and support of Gifford Pinchot, Chief of the United States Forest Service. The creation of Muir Woods National Monument occurred at the beginning of the federal government's proactive role in conservation and preservation of natural and historic resources. Muir Woods National Monument was the tenth monument designated under the Antiquities Act of 1906, and the first designated through donation of private land—a gift from William and Elizabeth Thatcher Kent. The proclamation of Muir Woods as a national monument helped spur conservation efforts elsewhere, notably protection of resources not under federal ownership. During the four decades following its establishment, Muir Woods National Monument—the first national monument located in close proximity to a major city—gained national and international renown as a place that expressed the ideals of American conservation. This perception culminated historically in a ceremony held on May 19, 1945, by the United Nations Conference on International Organization in memory of President Franklin D. Roosevelt. During the service in Cathedral Grove, speakers often referred to the spiritual quality of the site, thus attesting to the power of Muir Woods to function as a transcendent sacred space.

Muir Woods is also significant in the area of conservation for its association with early conservation achievements in the San Francisco Bay Area. It was the first public park established in an extensive conservation district that today extends along much of the western Marin Peninsula, directly across the Golden Gate from the City of San Francisco. This area is administered at the federal, state, and local levels by Golden Gate National Recreation Area, Mount Tamalpais State Park, Marin Municipal Water District, and Marin County Open Space District, an administrative structure that traces its origins back to the management structure William Kent established for Muir Woods and the adjoining lands under his ownership.

NATIONAL REGISTER OF HISTORIC PLACES

In 2008, a 425-acre Muir Woods National Monument Historic District was listed in the National Register of Historic Places. The historic district includes the 295 acres within the original national monument boundaries and additions of some 130 acres before 1940.

The district's historic buildings and structures were built during the first 32 years of Muir Woods National Monument's existence. In addition to the national monument's primary significance in the area of conservation, its buildings and major structures are also significant in the area of architecture. Dating from 1922 to 1940, the structures are representative examples of pre-World War II vernacular rustic architectural and engineering design in the National Park Service. The buildings were designed by well-known NPS architects and landscape architects and built in part through New Deal-era federal work-relief programs including the Civilian Conservation Corps. They reflect the systemwide effort that advocated a high degree of craftsmanship and the use of native materials to help harmonize built features with the national monument's forested natural landscape.

The most visible building, the Administration-Concession Building (1940) constructed through federal work relief programs, remains the focal point of the entry area, and retains overall massing and details that reflect the early development of the Park Service Modern style that became popular in the national park system after World War II. To the rear of the Administration-Concession Building is the Utility Area, which retains an intact collection of historic buildings, including the Superintendent's Residence (1922 with 1930s additions), Garage (1931), and Equipment Shed (1934) that reflects the NPS rustic style with exposed timber framing details that were consistently employed on all monument buildings up until the late 1930s.

Historic structures, which comprise the principal elements of the cultural landscape in the historic district, include trails, bridges, roads, erosion-control structures, walls and stairs, and monuments. The cultural landscape of Muir Woods National Monument historically illustrated characteristics of the National Park Service's rustic style through design of buildings, naturalistic design of trails and roads, use of natural stone for Redwood Creek revetments, and a pervasive log motif applied to footbridges, signs, gates, benches, and drinking fountains. Within the boundaries of the Muir Woods National Monument Historic District is the heart of the old-growth redwood forest. This area includes the Cathedral Grove and Bohemian Grove; main buildings and structures in the administrative and utility area which remain from the historic period; main trails and roads and their associated landscape structures that fan out from this headquarters to the northwest and south; and four monuments, one each to Ralph Waldo Emerson, Gifford Pinchot, Franklin D. Roosevelt, and William Kent.

The heart of the redwood forest on the canyon floor along the main trail retains much of the character it had during the latter part of the historic period. The forest retains its overall spatial organization formed by a corridor along the Redwood Creek and main trail, with secondary corridors along the side trails. Central focal points and nodal spaces within the forest remain Cathedral Grove and Bohemian Grove, with secondary nodal spaces at the entrance area/Administration-Concession Building and the utility area, all retaining much of their historic character.

The trail system is composed of the main trail (pre-1883) and its extension, Camp Alice Eastwood Trail (circa 1906); Ben Johnson Trail (circa 1904); Bohemian Grove Trail (circa 1905–07); Dipsea Trail (pre-1883); Fern Creek Trail (pre-1883); Hillside Trail (1908); and Ocean View Trail (1908). The Dipsea Trail, which extends from Mill Valley to Stinson Beach and runs through parts of Muir Woods, is the site of one of the oldest foot races in the nation. It was listed in the national register in 2010.

The main trail retains three bridges dating from the trails improvement by the Civilian Conservation Corps in 1934: most notably the Fern Creek Bridge, a stone-faced concrete-arch vehicular bridge, and two small wood stringer bridges over minor tributaries. There are also two log bridges remaining on the Ben Johnson Trail, probably built by the Civilian Conservation Corps between 1933 and 1937. With the exception of the three previously noted, most of the bridges on the canyon floor across Redwood Creek have been removed or replaced since 1947.

Roads in the historic district include a portion of the Dipsea Fire Road (Civilian Conservation Corps 1934–35) and the service drive, originally built in 1892 by the Bohemian Club as Sequoia Valley Road and realigned in circa 1906. Between 1934 and 1938, the Civilian Conservation Corps constructed an extensive system of stone revetments along Redwood Creek, portions of which have collapsed or been removed. Additionally, a log dam (1932) was constructed near the Emerson monument. Historically significant monuments to Ralph Waldo Emerson (1903), Gifford Pinchot (1910), William Kent (1929), and Franklin D. Roosevelt (1947) retain their integrity.

Legislation to acquire the Camp Monte Vista Tract south of the monument's main entrance was approved in 1972. Intended to support park operations relocated from within the redwood forest, it contains Hillwood Camp and Druid Heights. Hillwood is the earliest surviving example in Marin County of a rural camp reflective of an effort to immerse urban-dwelling youth in a natural environment. The property includes the main lodge and associated features and is eligible for listing in the national register. Druid Heights is potentially eligible for listing on the National Register as the site of a colony of artists, writers, and Zen philosophers (Alan Watts) influential in the development of the counter-culture of the 1960s.

ARCHEOLOGICAL RESOURCES

Although archeological sites were not comprehensively inventoried or evaluated as part of the study to nominate the Muir Woods National Monument Historic District to the National Register of Historic Places, eight historic archeological sites have been identified in the historic district; all are associated with vestiges of early uses of the monument. Additionally, numerous precontact artifacts have been identified in the national monument suggesting pre-monument native occupation. A comprehensive archeological survey of the national monument and adjoining related lands is warranted to determine if there are resources of both precontact and historic significance. An archeological survey could provide information on issues not presently well documented, such as the area's use by Native Americans; the exact locations of early buildings, structures, and landscape features that have been removed; the limits and use of the picnic areas; and construction and alignment of roads and trails.

ETHNOGRAPHIC RESOURCES

The National Park Service has not identified any ethnographic resources or traditional cultural properties within the national monument. However, an ethnographic survey and assessment needs to be conducted.

PARK COLLECTIONS

The park collections of Muir Woods National Monument are incorporated into the collections of Golden Gate National Recreation Area, and are discussed in that section of this document.

VISITOR USE AND EXPERIENCE—GOLDEN GATE NATIONAL RECREATION AREA

“These are the places I go when...urban life becomes too stressful. To be able to walk in these beautiful places; to watch the birds, hang gliders, surfers, children at play, and fishermen is a balm to the soul.” – Golden Gate National Recreation Area visitor during public scoping

Golden Gate National Recreation Area lands, which stand in sharp contrast to the nearby metropolitan areas, span three Bay Area counties and afford visitors outstanding recreational opportunities. Residents and visitors alike value the “wilderness next door,” an appropriate description for the park lands and waters that abut the highly developed areas of Marin, San Francisco, and San Mateo counties. Astounding scenic views, diverse recreational opportunities, and educational experiences coexist within Golden Gate National Recreation Area, making it a place for all ages.

DIVERSITY OF RECREATIONAL OPPORTUNITIES AND NATIONAL PARK EXPERIENCES

The wide-open spaces preserved here are a dramatic contrast to the surrounding city environment. Visitors to the park have expressed enjoyment in the open space and clean air; quiet and solitude; and the ability to commune with nature, slow down, and relax. Activities such as walking along a quiet beach, discovering a deserted coastal fortification, and watching a hawk soar high overhead become spiritual experiences for many. These places, where city, nature, and history are mixed together in breathtaking beauty, call deeply to the psyche of urban dwellers.

The spectacular setting of ocean, windswept coastal headlands, the bay, islands, and the iconic Golden Gate Bridge has afforded San Francisco international recognition as one of the world’s most beautiful cities. The Golden Gate National Recreation Area serves as the panoramic backdrop to the Bay Area. Some of the most scenic views in the region are of the ocean and bay from lands within the park. Views of the Golden Gate Bridge, Alcatraz Island, and the Marin Headlands from sites in San Francisco have been captured in countless photographs. The Marin Headlands offer dramatic views of the San Francisco Bay and the City of San Francisco. Another important viewshed in the park is the view of Marin County park lands in the darkness. These lands are undeveloped; from San Francisco, they appear truly dark and wild, especially in comparison to the city lights on the peninsula. During scoping for this plan, the public expressed significant appreciation for the scenic qualities of the park, and concern about the long-term protection of the park’s scenic integrity.

Viewing nature is another popular activity for visitors. Raptors can be spotted from the Marin Headlands and shorebirds can be viewed along beaches. The park has an abundance of protected land populated with 1,200 plant and animal species. The area has been designated as the Golden Gate Biosphere Reserve due to the diversity of its natural

habitat. Visitors have strongly expressed a belief that the unique fauna and flora should be protected.

Learning about the area's history is also an important part of the visitor experience at the park. Military coastal defense sites are a major reason the park is preserved today. Signs of the military history are scattered throughout the park lands. Forts Baker, Barry and Cronkhite, and the fortifications along the Presidio Bluffs, offer interpretation of the structures and strategies used to defend the Bay Area. Other interpretive exhibits and programs offered by both park staff and park partners give visitors an opportunity to learn about the diverse and extensive history of the area.

Beaches play an important role in recreational activities available to visitors in the park. Over 25% of surveyed visitors to the park lands in southern Marin County went to the beach (Godbe Research and Analysis 2002). Stinson, Rodeo, Tennessee Valley, and Muir beaches in Marin County and Ocean Beach, Fort Funston, and China Beach in the City of San Francisco provide places for visitors to walk, jog, sunbathe, swim, surf, fish, play volleyball, and picnic. Visitation to these areas is highly weather dependent; heaviest use occurs during the summer months (Godbe Research and Analysis 2002).

Trails are a significant part of the park. Trails provide access so people can connect to the area's natural and historic treasures. With 196 miles of trails that range from paved surfaces to single-track paths, much of Golden Gate National Recreation Area is a paradise for walkers and hikers. Multiuse trails also serve mountain bikers and equestrians. Scenic touring on both roads and trails, including viewing scenery from overlooks reached by foot or vehicle, is a related and important visitor opportunity.

The public has expressed their strong support for the diversity of trail opportunities provided in the park. They also have noted how much they enjoy the diversity of natural landscapes, historic sites, wildlife, and native plants that are visible along the trails. Some visitors, however, are concerned about conflicts between some trail uses, particularly safety concerns between bicyclists and equestrians. In addition, some of the public is concerned that certain trail activities, such as dog walking, horseback riding, and mountain biking, might be more restricted in the future. A desire to increase the number of trails that meet the Americans with Disabilities Act requirements was also mentioned during scoping for this plan.

Overnight lodging facilities exist within the park provided by both the National Park Service and partners, including hostels at Fort Mason, Montara Lighthouse, and the Marin Headlands, and camping areas in Marin County. Overnight accommodations allow visitors to explore a trail or area more extensively than would be possible in a day trip. Overnight areas can also serve as hubs for activities, such as at Fort Mason, where visitors can explore the park and its setting from a convenient location. Camping overnight is an important experience in itself. It is an experience most often associated with more distant national parks, but made available to local populations. It also allows for the appreciation of the night sky and natural sounds that cannot be appreciated during other times.

The park and partner programs offer many opportunities to get involved in stewardship of the park. In 2008, the National Park Service and Golden Gate National Parks Conservancy team brought thousands of volunteers to the park for activities such as trail building, habitat restoration and conservation, and organized youth programs in the park.

In 2008, community volunteerism yielded over 300,000 hours of service to the park. Stewardship activities bring in thousands of school-aged children to the park, allowing all who participate to forge a deeper connection with park lands and the resources within those lands. Environmental education programs exist through partners at several sites, including Slide Ranch and Fort Cronkite. These mutually beneficial relationships between the park, its partners, and park visitors, allow the park lands to thrive at a level much higher than could be accomplished through federal funding alone.

VISITOR OPPORTUNITIES AT ALCATRAZ ISLAND

Alcatraz Island sits in a highly visible location in the San Francisco Bay and is a major visitor attraction within Golden Gate National Recreation Area, with a significant demand for visitation. Although it has been used for a variety of purposes over the years, it is best known for its service as a federal prison from 1934 to 1963. The island was opened to the public in 1973 and has become a popular tourist destination. The National Park Service and its partners offer visitors extensive interpretation of the federal penitentiary period of the island, as well as the military prison and American Indian self-determination movement. In addition, the ferry trip over to the island and many locations on the island offer great scenic viewing of the Golden Gate Bridge, the Pacific Ocean, San Francisco Bay, the City of San Francisco, and the Marin Headlands. Further, learning about the island's role in the ecological system of the Bay, including its contribution as important bird habitat, is another highlight of a visit to the island. Alcatraz Island also offers overnight experiences a few times a year through special organized events that typically involve the use of volunteers.

VISITOR USE AND CHARACTERISTICS

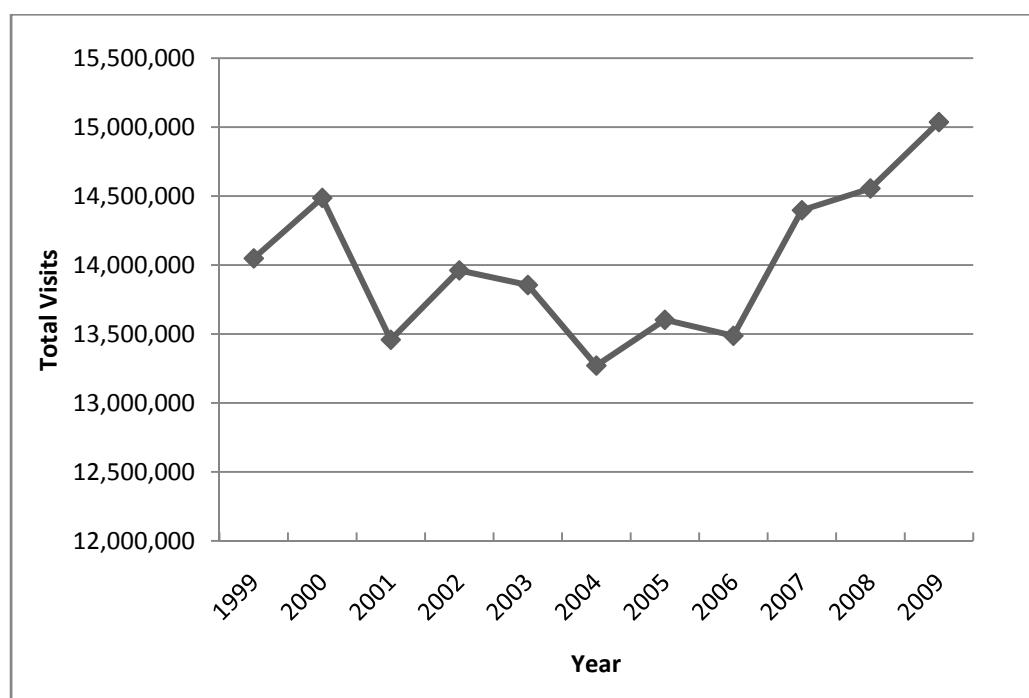
The Golden Gate National Recreation Area lands and waters serve many millions of visitors a year, making Golden Gate National Recreation Area one of the largest urban parks in the world. Extending 80 miles from north to south, the various sites of Golden Gate National Recreation Area form an expansive public green space for both the local urban population and tourists to enjoy.

In 1972, the first year that Golden Gate National Recreation Area was established, the park had over 42,000 visitors. There have been substantial increases, and a few intermittent decreases since then, but annual visitation has remained around 14 million visitors over the last 10 years (see figure 8) (NPS 2009d).

Golden Gate National Recreation Area receives about 5% of the total visitation to national parks across the nation, ranking it as the second most visited park in the park system (NPS 2009d). Many of the sites within Golden Gate National Recreation Area are located in the "backyard" of Bay Area residents who use the park lands for recreation and exercise. At many of the park sites, visitors from the local area account for the majority of visitors. Other sites, such as Alcatraz Island and the park lands of the Marin Headlands, are major tourist destinations, receiving visitors from across the nation and around the world. Visitor use levels remain relatively stable to Golden Gate National

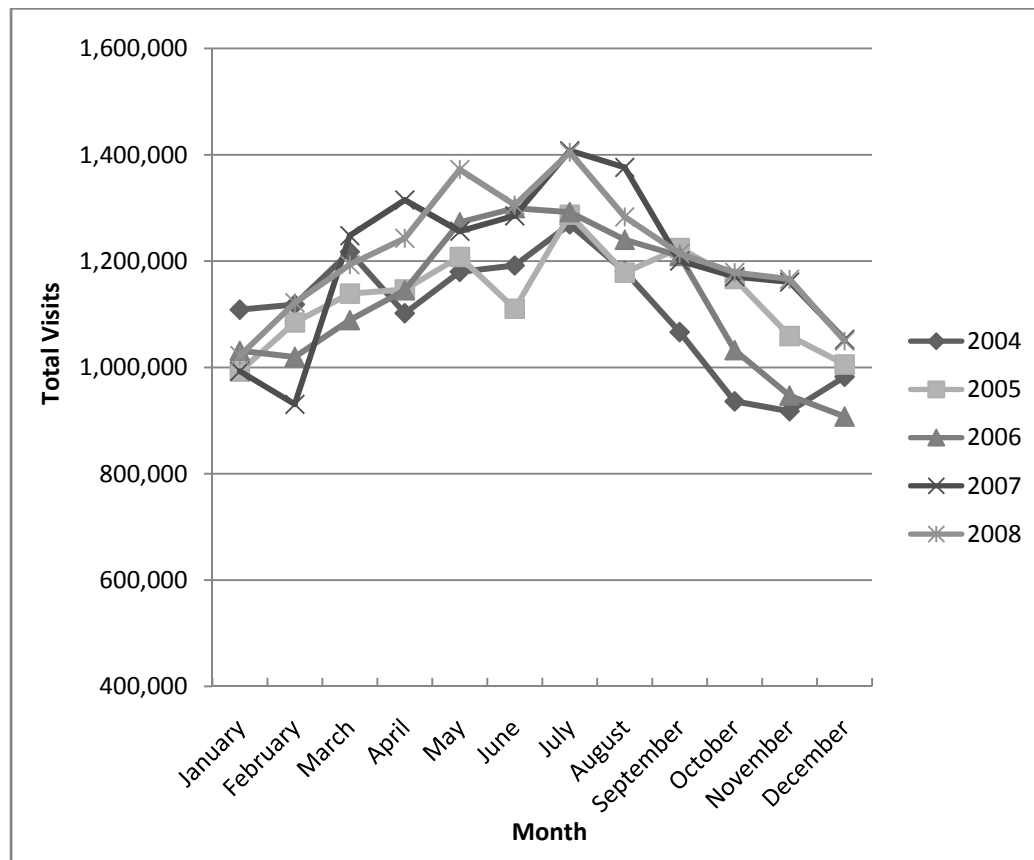
Recreation Area throughout the year, given the area's temperate climate and year-round attractions and support services. However, the park does experience higher visitation in the spring and summer, and on holidays (NPS 2009d). See the following figure.

Figure 9: Golden Gate National Recreation Area Recreational Visitors by Year 1999–2009



The National Park Service and others have conducted numerous visitor studies in Golden Gate National Recreation Area in order to provide greater insight into the current visitor profile in terms of demographics, trip characteristics, and preferences. Although the visitor populations to the various sites within the park often vary significantly, there are several specific characteristics that the majority of park visitors share.

The collection of surveys and studies of park visitors reveal that most arrive in personal vehicles (Sheffield 2008). Visitors most often come alone or in small groups of up to four people. Day users are coming to the park to sightsee, hike, walk, spend time with friends and family, escape, find respite, enjoy nature, and participate in events. A large majority of visitors come from the local area and enjoy the undeveloped open space that is nearby and easily accessible. For instance, it was found in a recent study of visitors to the park lands in San Mateo County that a majority of visitors live close to the park—some within 2 miles—and use the park on a regular basis (Manning 2007). However, at some specific sites, such as Alcatraz Island, studies indicate a much greater mix of local and out-of-town visitors (Sheffield 2008).

Figure 10: Golden Gate National Recreation Area Visitor Use by Month, 2004–2008

Several visitor surveys of trail users have been completed at Golden Gate National Recreation Area. The surveys found that trail users come primarily for exercise, rest, and relaxation, as well as to spend time with friends and family (Sheffield 2008). Some of the areas surveyed include Point Bonita and the Marin Headlands (2006), Lands End (2005 and 2007), and Mori Point and Sweeney Ridge (2004). Trails are used by both local and out-of-town visitors, although many users are frequent visitors; up to 75% to 85% are return visitors. Trail users are generally split evenly between men and women and are generally between the ages of 20 and 55, well educated, and coming to trails alone or in pairs (Sheffield 2008).

Visitors to Alcatraz Island

Over 1.4 million visitors tour Alcatraz Island each year; this has been holding fairly steady over the recent past (NPS 2009d). On peak use days, up to 4,400 visitors travel to the island, and up to 5,000 visitors travel there on days when evening programs are offered.

Several visitor studies, conducted since 1988, reveal that Alcatraz Island has a distinct visitor profile compared to the rest of Golden Gate National Recreation Area. The island gets far more first time visitors than does the rest of the park. It also gets a larger

percentage of nonlocal and international visitors. Over 70% of visitors surveyed stayed between two and three hours on the island (Manning et al. 2007).

Characteristics of Infrequent and Nonusers

Many of the diverse groups living in the San Francisco Bay Area have not traditionally been park visitors. However, some of the factors that have served to keep them from the park have recently been studied. Some of these barriers include lack of public transportation, language differences, lack of access to information, equipment costs, and lack of time. Other barriers include a minimal representation of ethnicity and race in the park staff and perceived intolerance. Lack of knowledge, experience, and awareness of where to go, what to do, and the skills needed to partake in activities were additional factors in not visiting (Roberts 2007; Winter, Jeong, and Godbey 2004).

Although some of these groups visit the park infrequently, their interests for park visits are much the same as those of more frequent visitors. In Roberts' study (2007) of ethnic minorities and visitation constraints, participants expressed a range of preferences for recreational activities (indoor and outdoor). All groups in the study expressed a clear desire to enjoy the numerous benefits associated with outdoor recreation, along with an interest in education about national parks. Cultural connections to nature and the natural environment ranged from mental and physical benefits to spiritual and religious gains in personal life. Participants identified the benefits of parks in relation to nature being healthy, with a typical emphasis on mental health (parks as reducing stress or strains of everyday life) and in reference to increasing their connection to "God or spirituality" (Roberts 2007).

VISITOR UNDERSTANDING, EDUCATION, AND INTERPRETATION

Golden Gate National Recreation Area offers unique and varied experiences to visitors through the interpretation, education, and stewardship programs offered by the park and park partners. Interpretation is delivered through a variety of media and at a variety of locations. Opportunities to learn range from self-guided to formal educational programs, and these opportunities appeal to a variety of people and learning styles.

Participation in interpretation programs helps visitors to form their own intellectual and emotional connections with the meanings and significance of the park's resources. The park interprets its resources by several methods, including visitor center exhibits, audio tours at Alcatraz Island, ranger talks, educational brochures, and interpretive signs. Visitor and park information centers are located in Fort Mason, Marin Headlands, Pacifica, and Crissy Field. According to the 2008 *Golden Gate National Recreation Area Visitor Survey Card Data Report*, the park is meeting visitor needs, and excelling in categories such as visitor centers and sightseeing facilities (NPS 2008b). It was frequently noted during this planning process that the public places a high value on the educational and stewardship programs offered at the park and would like to see those opportunities maintained and even expanded. The public expressed specific interest in having more signs, maps, and interpretive programs available. Another request was for more opportunities to learn of the American Indian stories related to the park.

Partners of Golden Gate National Recreation Area are vital to the success of the park's efforts at promoting visitor understanding, education, and interpretation. A wide range of enthusiastic and committed partners operate within the park lands, offering visitor opportunities such as environmental education, art appreciation, children's programs, equestrian programs, marine mammal conservation, agricultural education, and conservation of the parks. Partners operate park bookstores, hostels, and other facilities that offer visitor-related services on park lands, thus enhancing and deepening visitor experiences and creating a community of park stewards. Partners also fund interpretation and volunteer efforts, as well as capital construction projects such as rehabilitation of historic structures for visitor programs. Their advocacy is integral to engaging people in the parks, and facilitating visitors' understanding of park stories and resources.

SAFE AND ENJOYABLE ACCESS AND CIRCULATION TO AND WITHIN THE PARK

(See also transportation section.)

Safe and enjoyable transportation to and within the park lands is important to the visitor experience at Golden Gate National Recreation Area. The many roads, trails, and overlooks throughout the park provide scenic viewing opportunities for visitors. There are also many transportation options for connecting visitors to park sites, including auto, bicycle, and public transit.

Further, within Golden Gate National Recreation Area are miles of trails, making it possible for hikers, bikers, and equestrians to travel great distances through park lands. The Trails Forever Program was launched in 2003 to build a world-class system of trails, which has been vital to the improvement of trails within Golden Gate National Recreation Area. Public scoping comments sometimes focused on the need for trail design improvements to make the trails safer, and the need for loop trails. Trails in all areas of the park lands could be improved to connect to neighborhoods, nearby public lands, and the regional trail network.

Currently, the majority of visitors—especially those from outside of San Francisco—arrive by personal vehicle. This sometimes causes congestion problems along roadways, in parking areas, and in nearby neighborhoods. Public transportation connections to the park are limited outside of San Francisco, so the large population of regional residents without personal vehicles cannot easily travel to the park. Although there is an extensive public transportation system that serves the City of San Francisco, some connections stop short of the park, or serve the park only on weekends and holidays. Further, there are some portions of park roads that have limited options for bicycle access. The limitations with the public transit system and bicycle access are being addressed as part of a systemwide strategic planning effort.

The ferry pier to Alcatraz Island is accessible by public transportation. However, once on the island, visitors must walk up steep roads to get to the cell house and other attractions. There is a tram available for visitors who need assistance, but the road is narrow and steep, with few turn around points or pull-off areas. Although very few incidents have occurred, conflicts between visitors and vehicles are a concern to park staff.

The Transportation Section of this document goes into further detail about the intricacies of the transportation environment to and within Golden Gate National Recreation Area.

VISITOR SAFETY

Golden Gate National Recreation Area experiences safety issues similar to those found in any national park and also faces additional visitor safety challenges due to its urban location. The park staff make considerable effort to provide safety information in easily accessible locations and formats. However, there are many points of entry to the park, and visitors are sometimes unaware and unprepared for dangers.

Urban challenges include criminal activity, crowding, and congestion that affect the ability of law enforcement to respond in a timely manner. Additionally, as visitors to the park are moving from urban areas to undeveloped open space, they may fail to bring adequate food and water, become lost in unknown areas, or get into a situation too difficult for their skill or experience level. The Point Bonita and Marin Headlands visitor survey identified a lack of trail signs that makes it difficult to stay on the correct trail (Tierney 2007). At Mori Point and Sweeney Ridge, visitors identified the lack of good information about the area as a concern (Tierney 2004).

The physical features of the land and the natural habitat can also pose safety risks. The park encompasses ocean and bay waters, which have associated dangers. At ocean beaches, rip tides are common and can be dangerous for swimmers. Visitor risks are associated with steep and crumbling cliffs.

Conflicts between users can also pose safety problems, such as those between vehicles and pedestrians, or between equestrians and bicyclists. During public scoping, people expressed concern that some trails were not designed appropriately or managed to help users avoid conflicts.

Road safety is also a component of visitor safety. Access to and from State Route 1 poses a problem at several points in Golden Gate National Recreation Area, such as at Montara Lighthouse and Sheldance Nursery in San Mateo County. In some areas, closed or unmaintained facilities may pose risks to visitors who explore them and require area closures. In particular, Alcatraz Island has a number of buildings in very poor condition that can pose safety hazards to visitors.

VISITOR USE AND EXPERIENCE – MUIR WOODS NATIONAL MONUMENT

“Time stands still in Muir Woods.” – Visitor to Muir Woods

Surrounded by the tallest living tree species in the world, visitors to Muir Woods experience a majestic and awe-inspiring setting. These majestic giants, in combination with Redwood Creek, cannot help but awe visitors and take them to a more serene place and time. The monument offers a quiet sanctuary in a growing urban setting. Conservationist John Muir summed it up best when he said “this is the best tree-lovers monument that could possibly be found in all the forests of the world.”

DIVERSITY OF RECREATIONAL OPPORTUNITIES AND NATIONAL PARK EXPERIENCES

Muir Woods National Monument offers outstanding opportunities to walk and hike among the giant redwoods. There are six miles of trails within the monument, including three loop trails. One and a half miles of trail are paved surface or boardwalk, thus providing greater access to the forest for disabled visitors. Other more challenging trails extend out of the monument and connect to nearby public lands such as Mount Tamalpais State Park and Muir Beach. Opportunities for visitors include self-guided walking tours, ranger led talks and tours, volunteer activities, and educational and restoration programs.

In visitor surveys at the monument, people identified the trees, beauty, peacefulness, trails, and other aspects of the natural surrounding as the features they most enjoyed. One visitor commented on the special ability to commune with nature while at the monument. Some visitors expressed their dislike for the crowds, noise from groups, lack of parking, and closed trails. Crowding issues primarily occur at peak times in the monument, especially on weekends and holidays in the summer. While most visitors had no suggestions for improvement, some visitors mentioned that more information and interpretation, more trails, and more parking would be appreciated (Manning et al. n.d.).

The natural soundscape at Muir Woods National Monument is a highly valued part of the visitor experience. Some members of the public complained about the noise from other visitors, particularly noise from large groups. The monument has recently implemented “quiet days” and “quiet zones” to encourage visitors to voluntarily modify their behavior to enhance the contemplative feeling of the monument’s natural setting.

VISITOR USE AND CHARACTERISTICS

While annual visitation to Muir Woods National Monument peaked in the late 1990s, it has since stabilized over the last 10 years at around 750,000 (see Figure 10). Monthly visitation varies significantly, with the summer months attracting the highest number of visitors. This is likely due to the greater numbers of out-of-town visitors, who often travel

during the summer (see figure 11) (NPS 2009). Local residents may also visit Muir Woods more often in the summer when children are out of school.

Muir Woods National Monument, like Alcatraz Island, has been the focus of many visitor surveys. Studies conducted between 2003 and 2005 provide good demographic information on visitors (Manning et al. n.d.). For example, 72% of visiting groups are families with the majority of groups consisting of 2 to 4 people. Over half of the survey respondents were first-time visitors, suggesting that Muir Woods is an important urban gateway to the national park experience. Ninety-two percent of visitors were from the United States, with almost 40% of domestic visitors residing in California. The educational attainment of visitors was very high; about 80% of all visitors had a post-secondary degree. Most visitors were there for less than four hours (Manning et al. n.d.).

Figure 11: Muir Woods National Monument Recreation Visitors by Year, 1999–2009

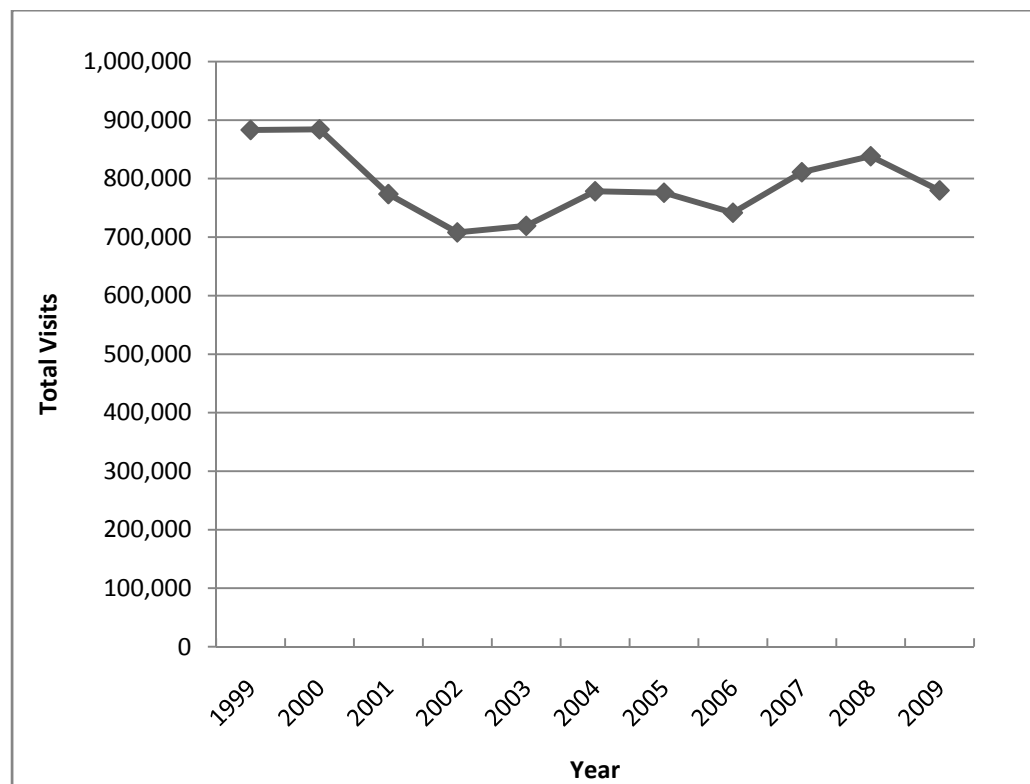
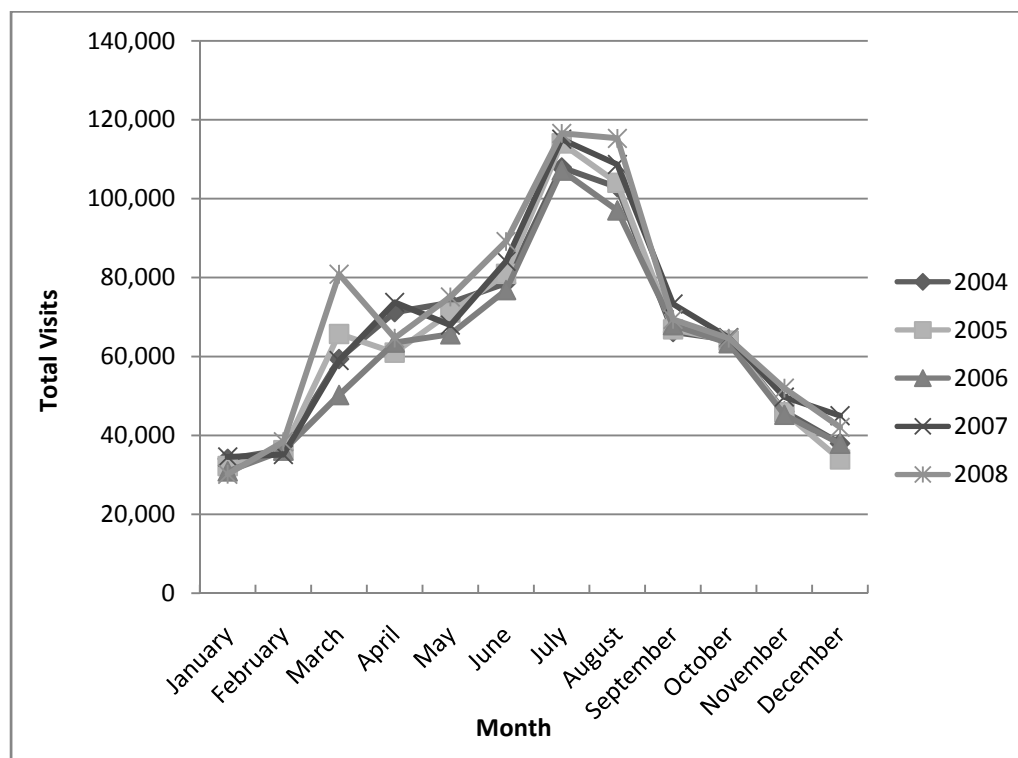


Figure 12: Muir Woods National Monument Visitor Use by Month, 2004–2008

VISITOR UNDERSTANDING, EDUCATION, AND INTERPRETATION

The stories of Muir Woods are many: the ecology of the watershed, the natural history of the redwood forest, the history of the conservation movement, and the establishment of the biosphere reserve. There are various ways in which visitors can learn these stories: at the visitor center with exhibits and information; on a self-guiding walk; by attending ranger talks, tours, or evening programs; and by attending a junior ranger program. In addition, the monument staff collaborate with many local organizations that offer learning and educational programs, thus expanding the interpretive and educational offerings available to visitors.

In public scoping for this plan, some people commented that they particularly appreciate the messages associated with the preservation values of the monument and its connection to conservation history. A few others noted that additional information and signage at Muir Woods National Monument would be desirable to enhance knowledge about the ecosystem processes.

SAFE AND ENJOYABLE ACCESS AND CIRCULATION TO AND WITHIN THE PARK (SEE ALSO TRANSPORTATION SECTION)

For many visitors, traveling to Muir Woods National Monument at peak times can be a frustrating experience. The parking lot fills up quickly, and often people resort to parking along the road. For example, during the 2003 visitor study, researchers found that 92% of visitors arrived by car, and of those, 76% were able to park in parking lots, with the remainder having to park along the road (Manning et al. n.d.).

It is likely that some visitors who drove to the monument may have left when faced with no easily accessed parking options. Public transportation via shuttle is now available on weekends and holidays in the summer, but at other times, there is no public transportation service to the monument. The shuttle system, implemented in 2004 to help ease the parking limitations at the monument, has improved access for visitors. Once within the monument, visitor access is by walking and hiking on trails. The monument has three loop trails, and 1.5 miles of accessible paved or boardwalk trail. There is also trail access from nearby public lands, including Mount Tamalpais State Park.

VISITOR SAFETY

A safety concern mentioned by members of the public relates to access to the monument. The road to Muir Woods National Monument is narrow, winding, and steep in parts. Comments indicated that larger vehicles do not always stay in their lanes on the curves, causing danger to oncoming traffic, including vehicles and bicycles. In addition, roadside parking at the monument results in real and perceived safety dangers for visitors who must traverse the road to gain access to the monument's entrance.

SOCIAL AND ECONOMIC ENVIRONMENT (INCLUDING BOTH GOLDEN GATE NATIONAL RECREATION AREA AND MUIR WOODS NATIONAL MONUMENT)

INTRODUCTION

The social and economic conditions of the Bay Area and the gateway counties of Marin, San Francisco, and San Mateo influence Golden Gate National Recreation Area and Muir Woods National Monument and how they are managed. Conversely, the park and monument directly contribute to the social and economic conditions of these three counties and the Bay Area as a whole. This section describes the existing conditions related to this relationship by highlighting the park's quality of life benefits as well as the Bay Area's demographic and economic trends.

The San Francisco Bay Area is not only one of the most diverse metropolitan areas in the United States, it also has a unique culture and community ethic that distinguishes itself from most other American urban centers. Generally speaking, the Bay Area's cultural identity exhibits an intrinsic sense of awareness, stewardship, and activism toward social and environmental issues.

This section summarizes the existing social and economic conditions in the Bay Area, as well as in the three counties most affected by Golden Gate National Recreation Area and Muir Woods National Monument (Marin, San Francisco, and San Mateo). The section also includes projections of how some of these conditions may change over the next 20 years, which is the planning horizon of the park's general management plan. To maintain consistency with regional demographic analyses, the term "Bay Area" in this section will refer to the nine-county region defined by the Association of Bay Area Governments. The nine counties of the Bay Area are Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma.

THE IMPORTANCE OF PARKS TO A COMMUNITY

Park and open space areas in and around an urban area are key contributors to the quality of life in the community. This becomes even more significant in very large metropolitan areas, where population densities and the travel distance to open, public lands are greater. The San Francisco Bay Area is the fifth largest metropolitan area in the United States. Thus, the park and monument play a vital role in sustaining and enhancing the quality of life for the residents of the Bay Area. The significance of this role becomes more evident when we consider the following four specific ways parks and open space contribute to quality of life.

“Woven into the Fabric” of the Bay Area

In a literal sense, the size, geographic orientation, and location of Golden Gate National Recreation Area within the Bay Area make the park a large physical component of this metropolitan area. The public lands of Golden Gate National Recreation Area serve as a natural and scenic backdrop to the urban landscape of the Bay Area by day and an open expanse of darkness by night. In addition, the park’s close proximity to the urban centers of the Bay Area elevates its importance. However, equally important and in a more figurative sense, Golden Gate National Recreation Area is “*woven into the fabric*” of the Bay Area community. The park is part of the community and the community’s identity. The themes and aesthetics of the various park components help feed the conservation ethic of the Bay Area community. In turn, this community ethic fuels the residents’ valuation and appreciation of the park and its intrinsic natural and cultural resources. This cyclical dynamic helps strengthen the bond between the community and the park and helps sustain a heightened quality of life for the community residents.

Community Building

On a related but distinct note, Golden Gate National Recreation Area helps instill a sense of community in the Bay Area. This community-building effect occurs on two primary levels. First, the many diverse park resources and features help provide a sense of community identity for Bay Area residents. Many of the landmarks, natural wonders, and amenities of the park are not only known on a local or state level, but also admired at a national and international level. For example, many people around the U.S. and throughout the world identify with the Bay Area by thinking of the coastal redwoods of Muir Woods National Monument, historic sites such as Alcatraz Island, or even the idyllic views of open lands and water around the San Francisco Bay. This local and global admiration contributes to a sense of identity and pride in being a resident of the Bay Area community. Just as residents may identify with the community via its cultural diversity, culinary quality, free spirit, or even 49ers or Raiders, they also find a sense of identity with the many attractions of Golden Gate National Recreation Area.

Secondly, Golden Gate National Recreation Area contributes to community building by providing numerous park sites and open lands for the diverse residents of the Bay Area to congregate and socialize. Parks are one of the most effective ways to build a sense of community and enhance quality of life by providing common places for people to interact in a shared environment (Francis 2006). Urban parks are one of the few public places where people of diverse cultures, ethnicities, ages, and lifestyles can congregate and communicate openly in a community.

Health Benefits for Bay Area Residents

In addition to community benefits, Golden Gate National Recreation Area also helps enhance the Bay Area quality of life by improving the psychological and physiological health of the Bay Area residents. A recent report by California State Parks indicates that, “Two-thirds of Californians consider outdoor recreation important to their quality of life” (California State Parks 2005).

An urban interface park such as Golden Gate National Recreation Area can help improve the community’s health by offering residents opportunities for personal fitness, active

recreation, and other physical exercise. A 2001 Center for Disease Control task force report indicated that regular physical activity correlates with a prolonged life expectancy and enhanced health, including a reduced risk for cardiovascular disease, obesity, diabetes, some cancers, and musculoskeletal conditions. The report also notes that only 25% of U.S. adults report engaging in adequate physical activity. As a result of this shortfall, the CDC task force “strongly recommended” that communities improve access to places that offer physical activity (e.g., hiking and biking trails, parks) (CDC 2001). In turn, evidence shows that when people have access to parks, they tend to exercise more. Research also indicates that contact with the natural world improves physical and psychological health (Sherer 2006). Golden Gate National Recreation Area helps satisfy these essential community needs in the Bay Area.

In terms of psychological or mental health benefits, regular physical activity can reduce the severity of many mental health disorders, alleviate depression, and decrease stress and anxiety (California State Parks 2005). Furthermore, even if a park visitor opts for a less-active, more relaxing park experience, an urban park such as Golden Gate National Recreation Area can provide an open and free feeling that helps offset the more congested feeling that can be generated by high-density urban living.

The park also contributes several other community health benefits for Bay Area residents. For example, the numerous attractions and open areas of the park offer a place for children to stay active, safe, and socially engaged. A community that offers a healthy environment for children reaps numerous social benefits in the short and long term, as the kids have ample opportunities to learn, socialize, exercise, and get “hands-on” exposure to the natural world. During the comment period for the preliminary alternatives for this plan, many children submitted letters that expressed the importance of various park features to them. Comments such as “It teaches kids how to love nature” and “kids learn and discover lots of cool stuff” were plentiful.

The Increasing Value of Golden Gate National Recreation Area

A fourth contributor to the Bay Area’s quality of life relates to how the community value of the park’s open spaces increases over time as population growth and urban sprawl continue in the region. As of 2007, the Bay Area had a population of roughly 7 million. By 2035, the Association of Bay Area Governments projects that the population of this nine-county region will grow by 2 million people (ABAG 2007). With this population growth on the horizon, housing production will need to increase as well. In recent decades, a significant amount of Bay Area housing growth has occurred along the fringes of the Bay Area to accommodate the population growth. This fringe development resulted in an expanded urban area and a decrease in open and agricultural land in the Bay Area. This trend will likely continue over the next 20 years, along with additional infill development in existing urban areas. As a result, the anticipated population and housing growth in the future will displace a significant volume of land that is currently open, undeveloped, or agricultural. Moreover, with every acre of open land that is displaced by urban development, the community value of every acre of existing park land will increase.

This “increasing park value” dynamic has other implications that need to be considered in park planning. As Golden Gate National Recreation Area lands become more and more important (and unique) as urban growth continues, pressure will likely mount to allow

more intense and nontraditional uses on these park lands. With higher population densities and less available open land in the Bay Area, both public and private interests may petition for uses such as municipal infrastructure corridors, public parking, or as places for more active and consumptive recreational uses. So, just as park lands may become more precious to the community, they also may become more at risk from demands other than the demand for preservation of open space.

POPULATION AND COMMUNITY TRENDS

The current and future management of the park and monument is directly affected by the population dynamics and composition of the communities that surround it. With the majority of visitors being Bay Area residents, the visitation and involvement from the local Bay Area communities play an integral role in sustaining the park. As the population grows, there will be an increase in visitor use and demands for the park to accommodate traditional and new outdoor recreation opportunities.

General Description of Overall Bay Area Community

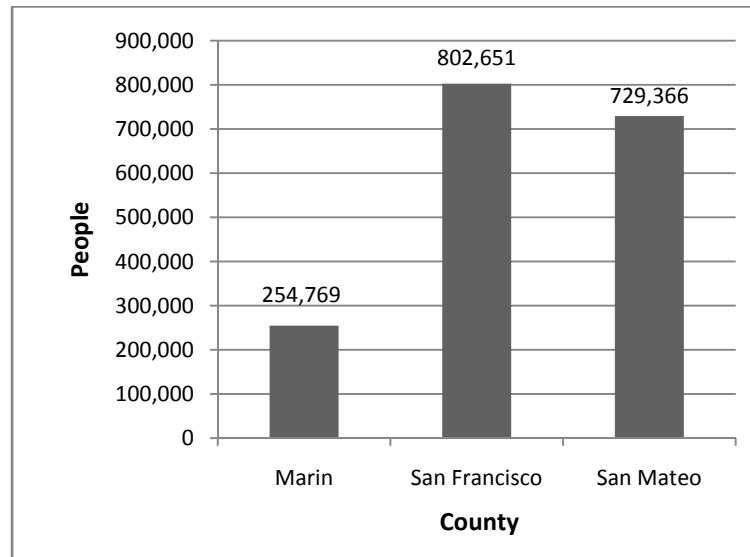
The nine-county Bay Area is generally centered on San Francisco Bay. The urban lands of the Bay Area include 101 cities, with three primary urban centers (San Francisco, Oakland, and San Jose). About half of the projected population increase in the Bay Area over this planning horizon is due to the difference between the number of births and deaths; the other half is due to expected migration into the area—as a result of abundant employment opportunities (ABAG 2008).

The Population...by the Numbers

The Bay Area population grew steadily from 2,681,332 in 1950 to 6,783,760 in 2000 (U.S. Census Bureau, 2009). As of 2006, the Bay Area population estimate was 7,167,500. Over the next 20 years, the region's population will continue to grow to a projected 8,709,000 people by 2030. Although the projected population growth is significant, the growth will not be distributed evenly throughout the Bay Area's nine counties. The vast majority of the growth (both numerically and by percentage) will be occurring in the eastern counties, such as Alameda, Contra Costa, Santa Clara, and Solano counties, where more developable land exists. This substantial population growth in the fringe areas of the Bay Area will contribute to future increases in park visitation. Also, given the longer travel distance and more limited transportation options from these eastern areas to the park, shifts may occur in visitor use patterns (e.g., duration of stay, preferred park destinations, number of vehicles in park).

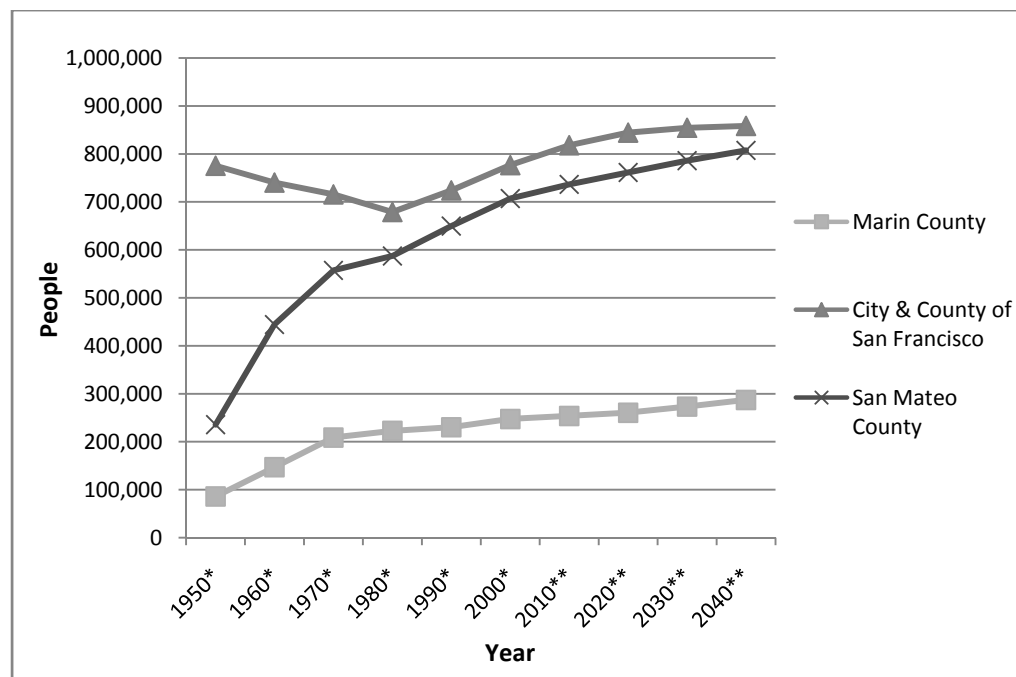
Although most population growth is forecast for these eastern fringe counties, a modest level of infill population growth is also expected in the park's gateway counties of Marin, San Francisco, and San Mateo (see following two figures). Given San Francisco's larger population on its relatively small land area of the peninsula, San Francisco's population density is over 30 times greater than the Bay Area average.

Figure 13: 2006 Estimated Populations of Gateway Counties



Source: California Department of Finance, Demographic Research Unit and Economic/Financial Research Unit, 2009. <http://www.dof.ca.gov/>

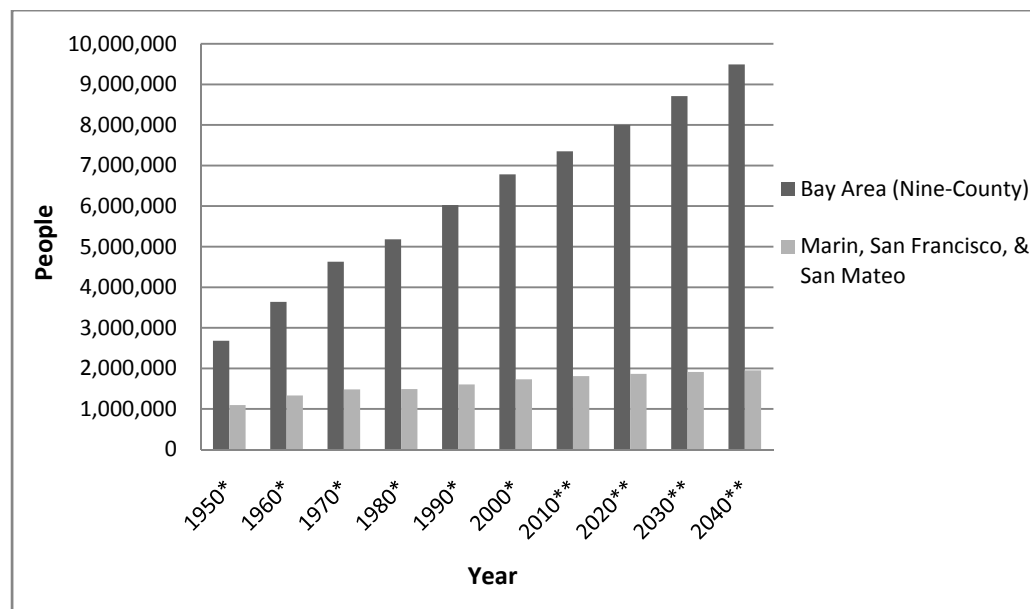
Figure 14: Past and Projected Population Growth of Golden Gate National Recreation Area Gateway Counties



Sources: * U.S. Census Bureau, 2009.; ** California Department of Finance – Demographic Research Unit, 2009.

Cumulatively, the three gateway counties will account for about 8% of the projected population growth in the overall Bay Area by 2030. As displayed in the following figure, the three counties of Marin, San Francisco, and San Mateo will become an increasingly smaller component of the overall Bay Area population, given the west-to-east shift in future population growth. In 1970, these three counties accounted for roughly one-third of the total Bay Area population. Over the next few decades, Marin, San Francisco, and San Mateo will account for only about one-fifth of the Bay Area population. Despite having access to other local and regional parks closer to home, it is likely that people in these more distant communities of the Bay Area will still seek the unique and distinct experiences provided at the park and monument.

Figure 15: Past and Projected Population Growth of Golden Gate National Recreation Area Gateway Counties Relative to Overall Bay Area



Sources: * U.S. Census Bureau, 2009.; * California Department of Finance – Demographic Research Unit, 2009.

The People and the Households

In addition to assessing the status and forecast for overall population growth in the Bay Area, it is also important to understand the changing characteristics of area residents and the composition of the community's households. This section discusses the community characteristics of median age, household size, race, income, poverty levels, and education levels.

Median Age and Household Size

As of 2007, the Bay Area had a median age of 37.7 years. Marin, San Francisco, and San Mateo counties had median ages of 43.8, 39.5, and 39.7, respectively. The average household size in the Bay Area at that same time was 2.70 people per household. Marin County and the City and County of San Francisco both had lower average household

occupancies, which were 2.35 and 2.30 people per household, respectively. San Mateo County's average household size of 2.75 people per household was slightly higher than the Bay Area average (U.S. Census Bureau 2008).

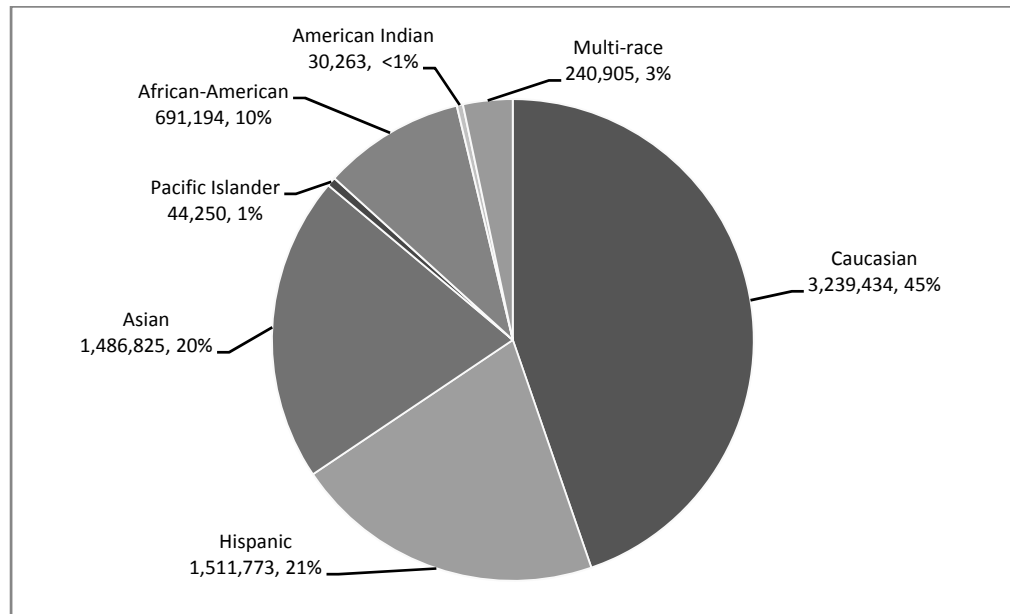
These community characteristics are expected to shift over the next 25 years due to societal changes and economic conditions. By 2035, the Association of Bay Area Governments is anticipating an increase in the Bay Area's median age to 42.5 years. The expansion of these older age groups will primarily be due to an aging population and increasing average life spans (ABAG 2007). This is consistent with other projections for the entire state of California, which indicate that the number of citizens over the age of 65 in California will double by 2020 (Roberts 2007). The Association of Bay Area Governments also anticipates that more and more people will likely be working beyond their "retirement years" over the next few decades. With a larger number of older people employed, the Association of Bay Area Governments predicts that a higher percentage of older people will be living in urban areas, which provide better public transportation opportunities and job opportunities. This trend may eventually place higher demands on public transit systems in the Bay Area, and may perhaps generate a greater need for water transport across San Francisco Bay and other bays in the region.

In addition, by 2035, the Association of Bay Area Governments anticipates that the average household size will decrease due to a percentage increase in one- and two-person households. This projection is based on the likelihood that 1) more young professionals will continue to choose not to have children or will wait longer before having them; and 2) children will be growing up and leaving the existing family households (ABAG 2007).

Race

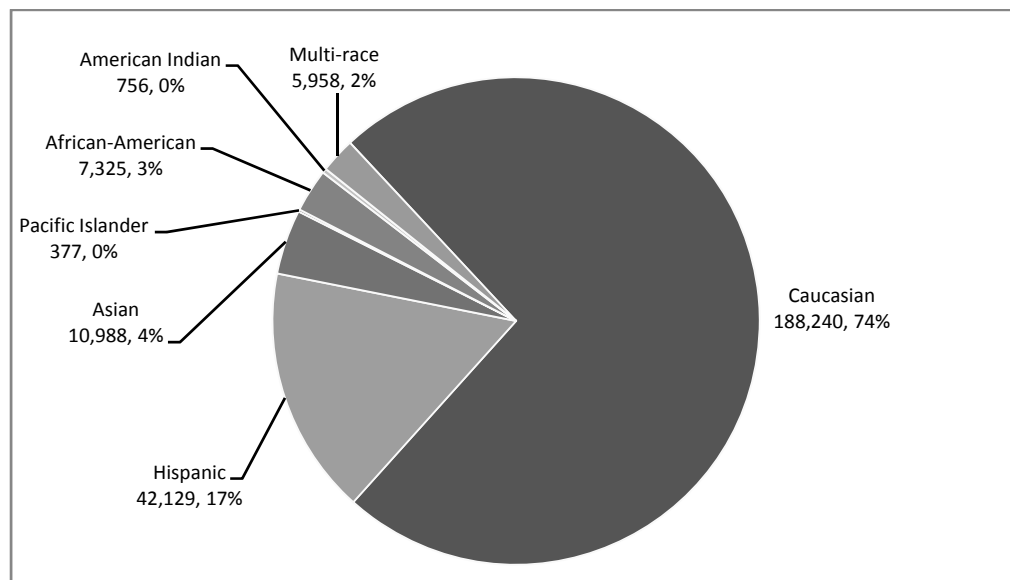
Racial diversity is one of the Bay Area's unique characteristics. The following four figures show the 2007 population estimates and percentages for each racial group in the Bay Area as a whole and in each of the three adjacent counties. From a park management standpoint, understanding the racial makeup of the community can help shed light on ways to make the park more inviting, develop better outreach with the community, and improve park program relevance. In addition, this awareness contributes to improving the quality of life in the community. As discussed in the "Visitor Use and Experience" section, many people from the Bay Area's diverse racial, ethnic, and cultural groups are not visiting Golden Gate National Recreation Area due to social "barriers" (Roberts 2007).

Figure 16: 2007 Population Estimates in Bay Area, by Race



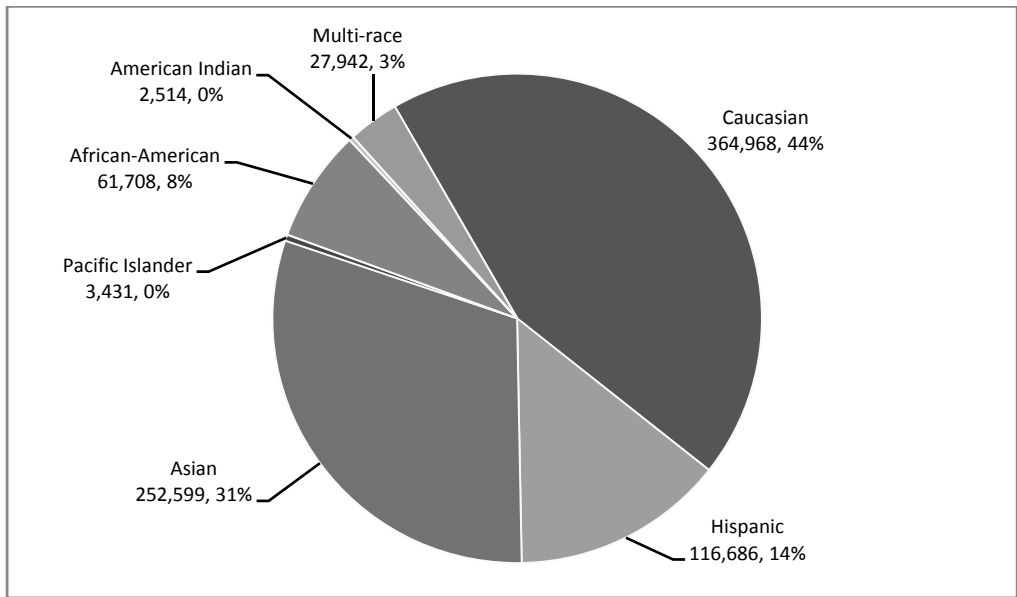
Source: California Department of Finance – Demographic Research Unit, 2009.

Figure 17: 2007 Population Estimates in Marin County, by Race



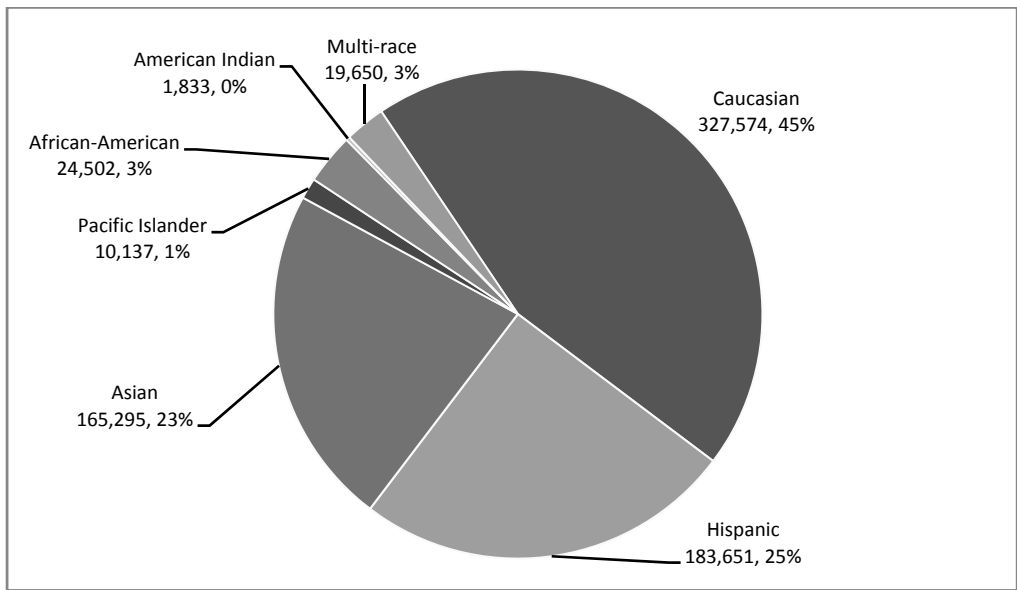
Source: California Department of Finance – Demographic Research Unit, 2009

Figure 18: 2007 Population Estimates in San Francisco, by Race



Source: California Department of Finance – Demographic Research Unit, 2009.

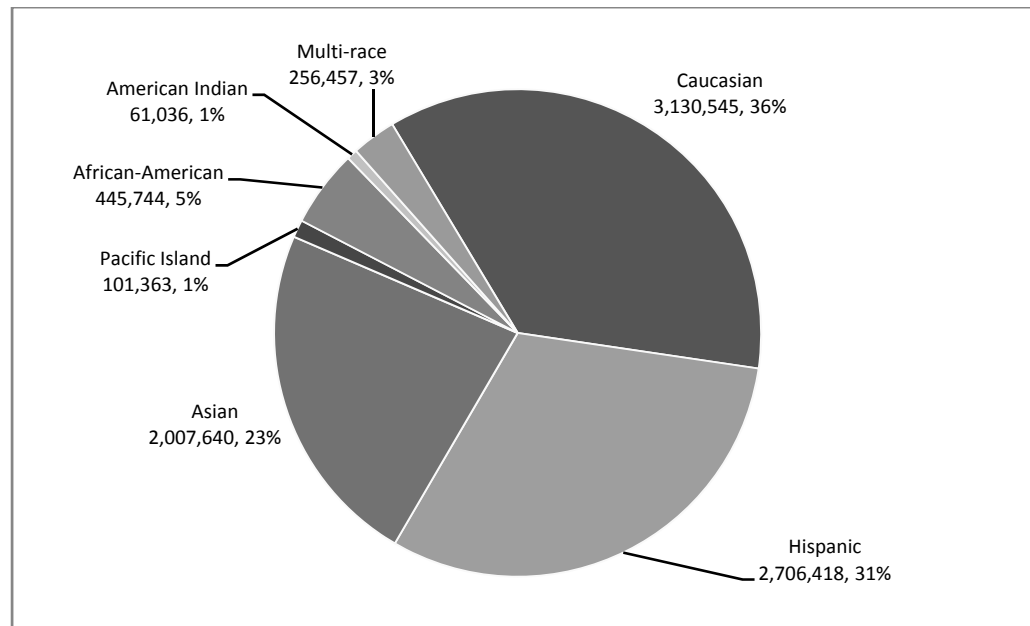
Figure 19: 2007 Population Estimates in San Mateo County, by Race



Source: California Department of Finance – Demographic Research Unit, 2009.

Just like the other community attributes, race percentages in the Bay Area will be shifting over the next few decades. By 2030, the California Department of Finance Demographic Research Unit projects that roughly 90% of the overall Bay Area population will be somewhat evenly divided among Caucasian, Hispanic, and Asian residents. This shift can be seen by comparing the following figure with figure 15 for Bay Area racial composition. This significant increase in the population of various minority racial and ethnic groups over the next 20 years further emphasizes the importance and need for the National Park Service to improve outreach and eliminate barriers that might keep people of all races and ethnic groups from experiencing the park.

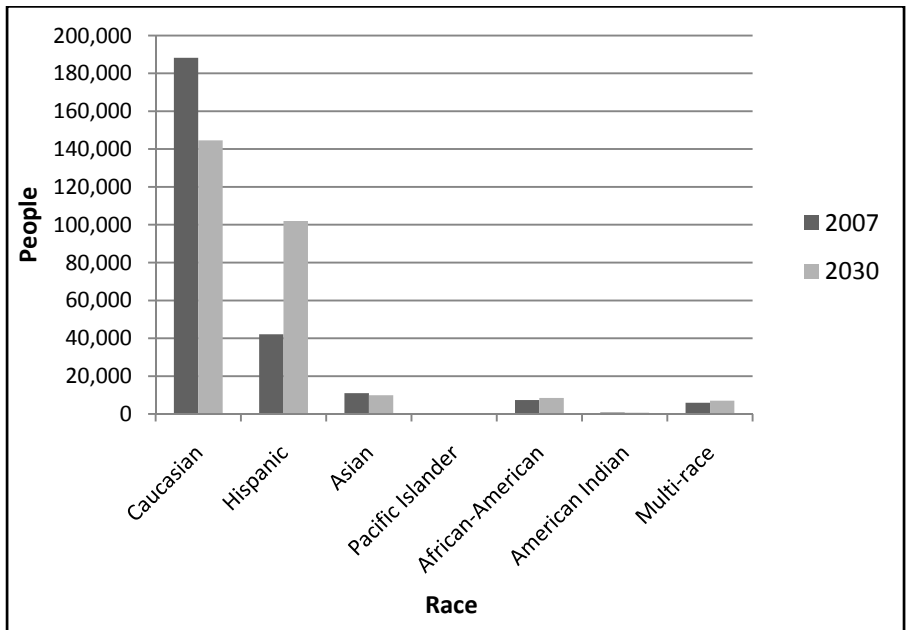
Figure 20: 2030 Population Estimate in Bay Area, by Race



Source: California Department of Finance – Demographic Research Unit, 2009.

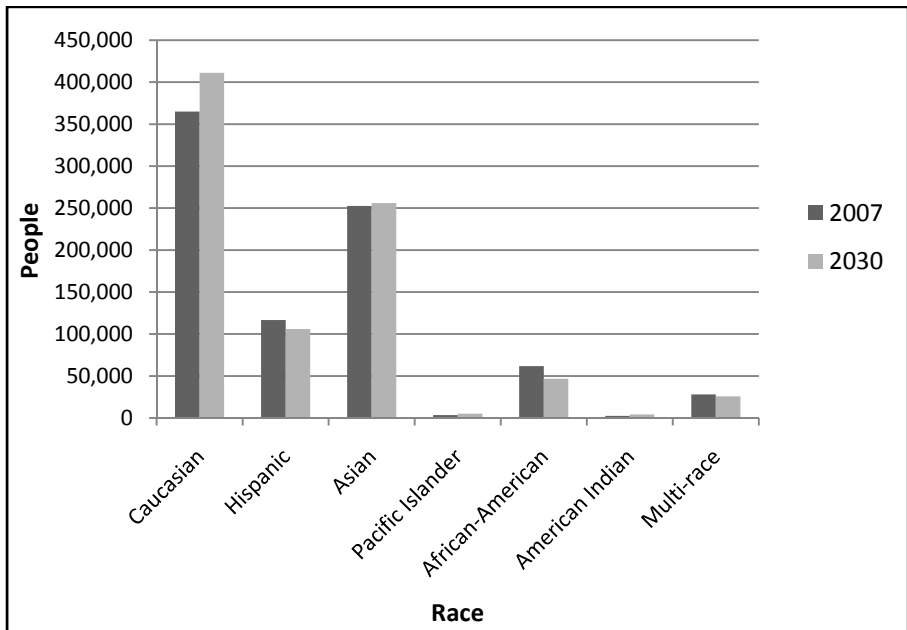
In the three gateway counties, the racial percentage shift from the present to 2030 varies considerably (see the following three figures).

Figure 21: Population Estimate by Race in Marin County in 2007 and 2030



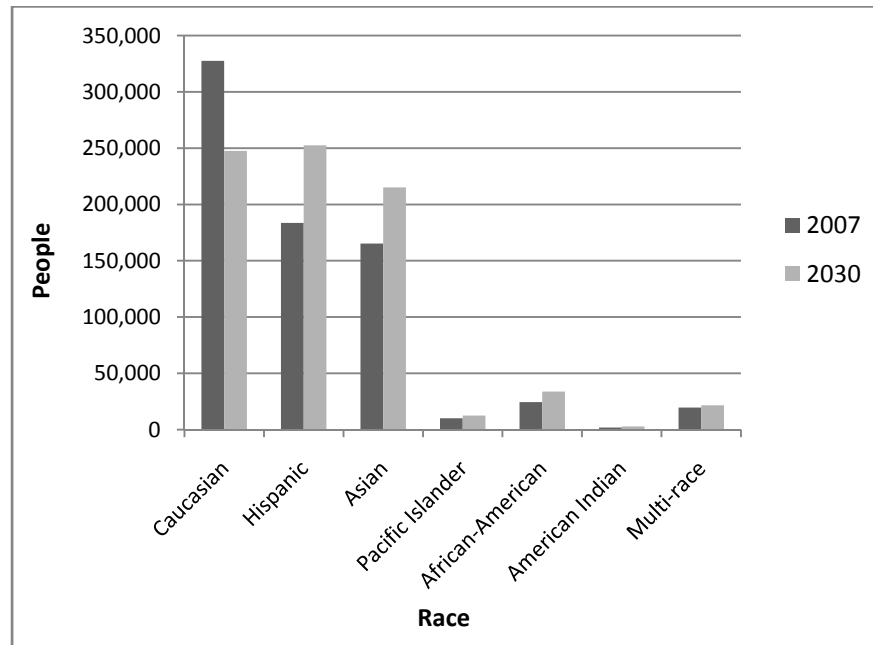
Source: California Department of Finance – Demographic Research Unit, 2009.

Figure 22: Population Estimate by Race in City & County of San Francisco in 2007 and 2030



Source: California Department of Finance – Demographic Research Unit, 2009.

Figure 23: Population Estimate by Race in San Mateo County in 2007 and 2030



Source: California Department of Finance – Demographic Research Unit, 2009.

Income, Poverty, and Education

Another factor that plays a role in park management and visitation trends is the income levels and poverty levels of residents who live in the vicinity of the park. A statistic from the California Department of Finance indicates that the three counties with the highest per capita incomes in the state as of 2005 were Marin, San Francisco, and San Mateo. In 2005, Marin County had a per capita income of \$75,844 (the highest in the state), with San Francisco at \$62,614 and San Mateo at \$59,213 (California Department of Finance 2009).

As of 2007, 9.3% of the Bay Area’s population was living below the poverty level, which was notably lower than the statewide figure of 12.7% (U.S. Census Bureau 2005–2007; American Community Survey 2008). Marin and San Mateo counties had even lower poverty rates in 2007: 7.0% and 6.7%, respectively. The City and County of San Francisco had a 2007 poverty rate of 11.7%.

The level of education attained by community residents can often correlate to the aforementioned income and poverty characteristics. The following table lists the percentage of residents in each area (25 years or older) who attained various levels of education as of 2007. Generally, the Bay Area education levels are notably higher than that of the state of California as a whole (U.S. Census Bureau 2008).

Table 6: Percentage of 2007 Population (25 or older) Reaching Various Levels of Education

	California	Bay Area	Marin	San Francisco	San Mateo
No high school diploma (or equal)	20%	14%	8%	15%	12%
High school diploma (or equal)	23%	20%	14%	15%	19%
Some college, but no degree	20%	19%	18%	14%	19%
Associates degree	8%	7%	6%	5%	7%
Bachelors degree	19%	25%	31%	31%	27%
Graduate or professional degree	10%	16%	23%	19%	16%

Source: U.S. Census Bureau, 2005–2007 American Community Survey, 2008.

Housing and Urban Growth

This section will identify current and projected trends in the housing market and highlight housing indicators such as home values, housing affordability, own/rent ratios, and single-family/multifamily dwelling ratios. One of the most notable characteristics of the Bay Area housing market is its very high home prices and values. Several variables affect home prices in this area. However, generally speaking, the Bay Area's expensive housing is a result of a high level of housing demand (due to population growth over the past several decades) coupled with a low level of housing construction (ABAG 2008). Compounding matters, high housing costs also result from an imbalance in available housing types, as primarily large, single-family housing units have been planned and built in many suburban Bay Area communities; these housing options may not meet the needs of area residents (ABAG 2007).

According to the U.S. Census Bureau's 2005–2007 American Community Survey, the 2007 median home value in the Bay Area was \$676,800. In the same year, Marin County had a median home value of \$895,100; San Francisco's median home value was \$789,400; and San Mateo County had a median home value was \$807,400. However, because the majority of San Francisco housing consists of attached, multifamily units, the price per square foot in San Francisco is likely higher than that in surrounding areas (see following table) (U.S. Census Bureau 2008).

Table 7: Percentage of 2007 Housing Stock, Detached and Attached Housing

	Bay Area	Marin	San Francisco	San Mateo
Single-family, Detached	64%	71%	34%	68%
Multifamily, Attached	34%	28%	66%	31%

Source: U.S. Census Bureau, 2005–2007 American Community Survey, 2008.

Given the high housing costs, many Bay Area residents cannot afford to own a home. In 2007, only about 15% of Bay Area households could afford a median-priced home. With the projected decrease in Bay Area household size, and the projected increase in the number of senior citizens who may be living (and possibly still working) in urban areas, demands for more compact urban housing units will likely increase. This demand may shift the housing production trends in the high demand urban areas of the Bay Area. The Association of Bay Area Government's FOCUS initiative is one multijurisdictional effort that may complement this dynamic. FOCUS is a regional planning strategy that promotes efficient and compact land development, which in turn maximizes open land conservation. The strategy also acknowledges the transportation link by encouraging the development of livable communities in areas served by public transportation.

As discussed earlier, the projected population growth in the eastern counties (Solano, Alameda, Contra Costa, and Santa Clara) will likely spur additional low-density, single-family housing development, and a subsequent reduction of open space or undeveloped lands in these areas.

Table 8: Percentage of 2007 Housing Stock, Owner-occupied and Renter-occupied Housing

	Bay Area	Marin	San Francisco	San Mateo
Owner-occupied	60%	65%	38%	63%
Renter-occupied	40%	35%	62%	37%

Source: U.S. Census Bureau, 2005–2007 American Community Survey, 2008.

ECONOMIC EFFECTS OF THE PARK ON THE COMMUNITY

Just as population growth and community demographics have effects on the management and use of Golden Gate National Recreation Area, the park has effects on the economy of the community around it. Like many other economic engines in the Bay Area (e.g., high-tech and finance industries), Golden Gate National Recreation Area and Muir Woods National Monument contribute to the local and regional economy by generating business and revenue, creating jobs, and indirectly fueling economic growth in other industries. This section identifies these economic impacts of the park and monument and provides a synopsis of the overall Bay Area economy.

The Park's Contribution to the Economic Stability of the Bay Area

The park and monument have many direct and indirect positive effects on the Bay Area's economy. This impact can be traced to several sources and attributes, such as money spent by visitors at local businesses, jobs created at these local businesses due to the visitor demands, NPS jobs created at the park and monument, NPS contracts with local businesses, and other Bay Area tourism generated by the park and monument. This section will highlight some of these factors and explain the relevance to the overall Bay Area economy.

Contributions to Local Economy from Golden Gate National Recreation Area Visitor Expenditures

Each year, millions of park and monument visitors contribute hundreds of millions of dollars to the Bay Area economy. This money directly sustains the revenue stream and jobs at hotels, restaurants, and stores that serve park visitors. Primarily, businesses in the gateway counties of Marin, San Francisco, and San Mateo are the direct beneficiaries of this economic contribution. In addition, the visitor money stream can also have other indirect, or secondary, effects. For example, this injected money that directly supports local businesses and jobs eventually recirculates further into the Bay Area economy and beyond. This recirculation happens when the gateway local businesses buy products or services from other sources (e.g., from wholesale suppliers), or when employees at the local businesses use their income earned at the local gateway business at other businesses in the area to sustain their lifestyle (e.g., grocery shopping, entertainment). This secondary effect is often referred to as an economic "multiplier," as one dollar injected into the local economy often has more than one dollar of effect in the local economy.

With funding from the NPS Social Science Research Program, researchers at Michigan State University have created the NPS "Money Generation Model 2" (MGM2) to measure these direct and indirect contributions from visitors to local economies. Dr. Daniel Stynes and Dr. Dennis Propst used the MGM2 to analyze the effect that park and monument visitors had on the local economy in 2003. The following table lists the 2003 visitation totals and the associated spending for each visitor type. "Visitor Party Days" refers to the number of days each visitor party or group spends in the Bay Area.

As noted in the table, local day trips accounted for 80% of all park and monument visitation in 2003, with each local day trip party spending an average of \$32 per day. Understandably, hotel-based visitor parties spent much more locally per day (\$229 per day). When all visitor types are included, the average park visitor party spent \$43 at local

businesses per day. When these visitor expenditures are totaled for the entire year, the MGM2 estimates that park and monument visitors directly injected \$226,810,000 into the local economy in 2003.

Table 9: 2003 Visits and Estimated Spending, by Visitation Type

	Local Day Trips	Nonlocal Day Trips	Hotel	Camp	Total
Recreation Visits	11,036,074	2,069,264	730,271	19,141	13,854,750
Percentage of Recreation Visits	80%	15%	5%	<1%	100%
Visitor Party Days	4,216,401	790,575	244,090	5,915	5,257,245
Avg. Spending Per Party Day	\$ 32	\$ 47	\$ 229	\$ 91	\$ 43
Total Spending (million's)	\$ 132.89	\$ 37.48	\$ 55.87	\$ 0.55	\$ 226.81

Source: Daniel Stynes, Ph.D. & Dennis Propst, Ph.D., Michigan State University, "Economic Impacts of Visitor Spending, by Parks" NPS Money Generation Model 2 (MGM2), 2003.

The model estimates in the following table show how this injected money circulated through the local economy. Both direct and secondary effects are included. The direct effects of these visitor expenditures include sales, income, and jobs in businesses selling goods and services directly to park visitors. Thus, the \$226.81 million in visitor spending supported an estimated 4,107 jobs, as well as \$176.96 million in sales and \$67.05 million in personal income (wages and salaries.) As for secondary, or multiplier effects, an additional \$94.13 million in sales and \$34.31 million in personal incomes were generated by park spending as the money circulated through the local economy. An additional 1,194 jobs were supported by this secondary effect. When all of these effects are totaled, the \$226.81 million in visitor spending supported a total of \$271.09 million in sales, \$101.35 million in personal income and 5,300 jobs in the community.

Table 10: 2003 Estimated Economic Contributions of Golden Gate National Recreation Area Visitor Spending, By Sector

Sectors	Sales (millions)	Personal Incomes (millions)	Jobs Supported	Value Added (millions)
Direct Effects				
Motel, Hotel, B&B and Cabins	\$ 26.39	\$ 9.34	489	\$ 14.19
Campsites	\$ 0.13	\$ 0.05	2	\$ 0.07
Restaurants & Bars	\$ 63.84	\$ 22.67	1,725	\$ 31.58
Admissions & Fees	\$ 30.03	\$ 10.61	819	\$ 17.36
Retail	\$ 35.49	\$ 18.10	870	\$ 28.28
Others	--	\$ 6.28	201	\$ 9.80
Total	\$ 176.96	\$ 67.05	4,107	\$ 101.29
Secondary Effects				
Secondary Effects	\$ 94.13	\$ 34.31	1,194	\$ 58.51
Total Effects	\$ 271.09	\$ 101.35	5,300	\$ 159.80

Source: Daniel Stynes, Ph.D. & Dennis Propst, Ph.D., Michigan State University, "Economic Impacts of Visitor Spending, by Parks"; NPS Money Generation Model 2 (MGM2), 2003.

Contributions to Local Economy from National Park Service Operations

The employment offered by the National Park Service also contributes to the local economy. The social and economic benefits of this job base are two-fold. First, the jobs made available by the park and its partners provide hundreds of Bay Area residents with a steady income that helps sustain their lives and those of their families. Secondly, similar to the economic effects of revenue generated by park and monument visitation (as previously explained), the income earned by park and partner employees also has direct and secondary effects on the local economy. These employees contribute to the local economy by spending the money they earn on goods and services in the community. This spending directly supports local businesses and their growth. The local communities also benefit directly via the sales tax generated by this spending. In addition, secondary economic benefits (i.e., the multiplier effect) are realized when this money eventually circulates further into the Bay Area economy and beyond.

Because NPS employees reside throughout the entire Bay Area, the economic effect of their earned salaries (and subsequent spending in their respective communities) extends throughout the area as well. The following table summarizes the job base provided by the National Park Service as well as the salary totals for these jobs. It also identifies where

NPS employees live, which hints at where the most direct contributions to the local economy occur.

Table 11: 2009 National Park Service Jobs and Salaries, By Location of Residence

Location of Golden Gate National Recreation Area Employee Residence	Jobs	Salary Totals
Marin County	88	\$6,354,302
San Francisco City & County	96	\$6,192,113
San Mateo County	33	\$2,031,223
Other Bay Area Counties	116	\$7,755,854
Beyond Bay Area in California	8	\$465,400
Totals	341	\$22,798,892

Source: Golden Gate National Recreation Area, National Park Service, 2009.

As highlighted in the above table, the operation of Golden Gate National Recreation Area and Muir Woods National Monument creates 341 NPS jobs. The salaries for these jobs total to \$22.8 million per year. Although each individual employee spends and saves their earned salary money according to their own personal standards, one can conclude that a large percentage of this \$22.8 million circulates back into the local economy via the purchase of goods and services. All but \$465,400 of this salary total goes to employees who reside and spend directly within the Bay Area. In addition, nearly two-thirds of the park employees reside in the three gateway counties (totaling to 217 jobs and \$14,577,638 in salary).

In addition to the employee salaries, the NPS operation also supports the local economy by contracting out services with private enterprises in the Bay Area. These government contracts help support other businesses and their employees, which also has secondary multiplier effects when this money circulates through the community. In the NPS fiscal year of 2008, the National Park Service spent \$14,807,075 on contracts with private entities.

Tourism Attraction that Complements San Francisco and Other Bay Area Sites

In addition to injecting money directly into the local economy and supporting other local institutions, Golden Gate National Recreation Area and Muir Woods National Monument also contribute to the economy by helping generate tourism to other Bay Area attractions. This economic value primarily applies to visitors who come from outside of the Bay Area. From a tourist perspective, the allure of visiting the Bay Area is notably enhanced by the many sites, amenities, and resources of the park and monument. When these

attractions are considered collectively with other Bay Area attractions, the Bay Area becomes a very appealing region to visit.

The value of this synergistic effect extends well beyond the state of California, and the nation. International tourism in the Bay Area is a strong and growing industry. In addition, Golden Gate National Recreation Area contributes to the Bay Area's international tourism draw. For example, nearly 25% of visitors to Alcatraz Island came from other countries (Manning et al. 2007). When combined with the Bay Area's other diverse attractions, the many sites and resources of Golden Gate National Recreation Area play an important role in sustaining and expanding this international tourism market.

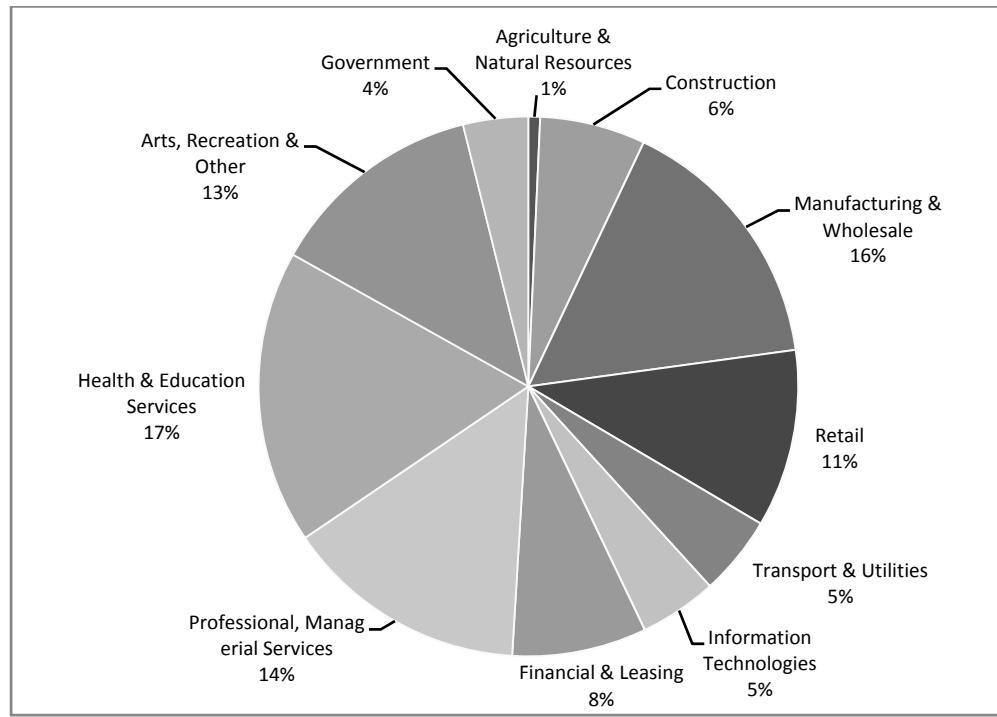
Bay Area Commerce and Industry Trends

As the Bay Area population has grown and diversified over the past 100 years, the local economy has also expanded and evolved. These changes have been brought on by local, state, national, and international attributes and events. For example, events such as World War II and the technology boom have played integral roles in the Bay Area's economic development. The Bay Area's economic history over the past 100 years can be defined by three general eras:

- **1900s to World War II** – This economic era can be described as being somewhat pastoral, with the local economy driven by industries such as seaport commerce, dairy farming, and fishing.
- **World War II era** – The Bay Area served as Central Command for the U.S. Army Pacific operations during WWII. As a result, the driving force on the local economy shifted toward military sea base and air base activities and manufacturing.
- **Post-World War II through late 20th century to present** – Over the past several decades, the Bay Area's economy has evolved, grown, and diversified considerably. The notable driving forces of the diversified economy include finance, education, local and regional tourism, health, arts, information technology, and expanding Asian markets.

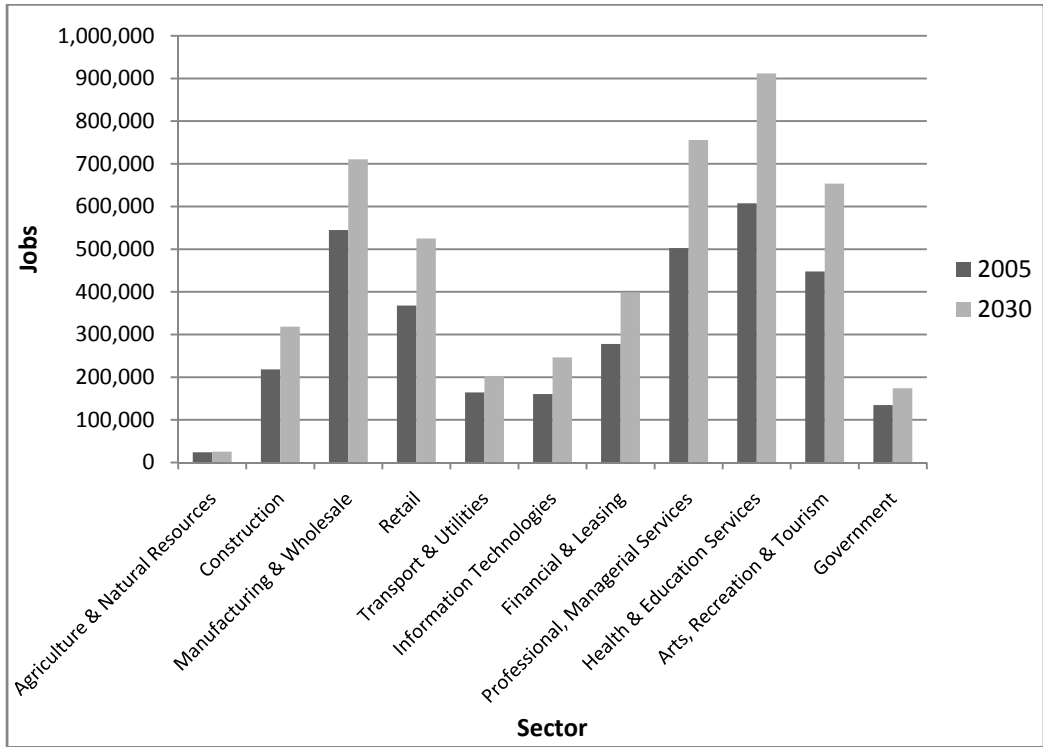
The following two graphs display the current and future projected distribution of jobs across various sectors or industries.

Figure 24: 2005 Bay Area Jobs, by Sector



Source: Association of Bay Area Governments (ABAG), "Projections 2007," 2007.

Figure 25: 2005 – 2030 Bay Area Employment Projections, by Sector



Source: Association of Bay Area Governments (ABAG), "Projections 2007," 2007

TRANSPORTATION (INCLUDING BOTH GOLDEN GATE NATIONAL RECREATION AREA AND MUIR WOODS NATIONAL MONUMENT)

This section summarizes existing transportation conditions for the planning area in Golden Gate National Recreational Area and Muir Woods National Monument. It addresses both internal circulation and access by all modes, including automobile, public transportation, bicycle, and pedestrian. Descriptions of conditions for Golden Gate National Recreation Area park sites are grouped by county (Marin, San Francisco, and San Mateo), with the exception of two park sites, Alcatraz Island and Muir Woods National Monument, which are addressed separately.

Analysis was conducted using a range of available materials, most of which are referenced directly within the text. Primary sources included the Phase 1 Transportation Analysis developed for this general management plan, for which a database incorporating information from close to 100 sources was developed by Golden Gate National Recreation Area staff. Raw data on transportation conditions collected in recent years were provided to the authors by Golden Gate National Recreation Area staff. Additional sources, such as California Department of Transportation traffic counts, were also used.

REGIONAL TRANSPORTATION CONTEXT

Existing and Projected Travel Demand

The Golden Gate National Recreation Area is located within the San Francisco Bay Area, a metropolitan region of approximately 7 million residents. In the counties surrounding the Bay Area, there are another 3.9 million residents (U.S. Census Bureau 2009). In all, close to 11 million people live within roughly a two-hour drive of Golden Gate National Recreation Area park sites.

This urban context, along with their popularity among tourists, places heavy demands on park sites. In 2007, Golden Gate National Recreation Area experienced total visitation of 20.8 million. While park sites in San Francisco are generally accessible to motorists, transit users, cyclists, and pedestrians, roads to and within many park sites in Marin and San Mateo counties are winding and narrow; both parking and public transit are limited in many places. These locations can “feel” remote during nonpeak periods despite their relative proximity to millions of residents; they are served by rural roads that were not designed to accommodate the level of traffic demand of major destinations, such as a national park. On busy summer weekends, two-lane roads leading to popular park sites can become severely congested.

Already, the Bay Area is America’s second most-congested metropolitan region, behind only Los Angeles (Schrank and Lomax 2007), with an average yearly delay per motorist caused by congestion of 60 hours. By 2030, the population of the Bay Area is expected to grow to 8.7 million, and the surrounding counties are projected to reach 5.7 million, resulting in a total population within a two-hour drive of Golden Gate National

Recreation Area park sites of approximately 14.4 million. The total number of vehicle miles traveled in the Bay Area on an average weekday is projected to increase from approximately 136 million in 2006 to as much as 179 million by 2035 (Metropolitan Transportation Commission 2008). Still, residents of the San Francisco-Oakland urbanized area take more trips, per capita, on public transportation than do residents of any other U.S. urbanized area except New York: about 130 per year, on average (American Public Transportation Association 2008).

Regional Transportation Policy

In order to accommodate population growth without compromising the regional environment or economy, Bay Area policymakers have increasingly sought to steer development and transportation trends in more sustainable directions. In its introduction to the *Transportation 2035 Plan for the San Francisco Bay Area*, the Metropolitan Transportation Commission, stated that:

“By means of its investment choices and adopted policies, the Draft Transportation 2035 Plan aims to stimulate the use of public transit, increase the safety, utility and appeal of bicycling and walking, and reduce emissions by private automobiles in the Bay Area while increasing the efficiency of the roadway systems for all users.”

While the Metropolitan Transportation Commission—through the regional transportation plan and related Transportation Improvement Program—sets funding priorities regionally, most transportation planning decisions in the Bay Area are made either at the county level by congestion management agencies or by transit agencies as part of their short range transit plans. Regional and local transit agencies are identified on the following pages. Congestion management agencies in counties with Golden Gate National Recreation Area park sites include the Transportation Authority of Marin, San Francisco County Transportation Authority, and City/County Association of Governments of San Mateo County. Marin, San Francisco, and San Mateo are all “self-help” counties under California law, meaning that voters have approved local sales taxes devoted to transportation.

Regional Transportation Network

The Bay Area is home to one of the nation’s most expansive highway systems. The regional transit network is less developed, although regional rail systems and ferry routes provide access to some Golden Gate National Recreation Area park sites via local rail and feeder bus connections.

Three major highways provide primary access to Golden Gate National Recreation Area park sites:

- *Highway 101*, which is a freeway in Marin and San Mateo counties and southern San Francisco and an arterial surface route in northern San Francisco, provides access to park sites in all three counties.
- *State Route 1*, which transitions from a two-lane highway in Marin County to an urban arterial in San Francisco and a freeway in northern San Mateo County before returning to a two-lane highway in southern San Mateo County, also provides access to park sites in all three counties.

Note: While many segments of this road have local names (e.g., Shoreline Highway, 19th Avenue, Pacific Coast Highway), throughout this document it is referred to as State Route 1.

- *Interstate 280*, a freeway, provides access to Golden Gate National Recreation Area park sites in San Francisco and in San Mateo County.

Two regional railways and several ferry routes provide transit access to Golden Gate National Recreation Area park sites:

- *Bay Area Rapid Transit*, or BART, is a metro system serving San Francisco, Alameda, and Contra Costa counties, as well as northern San Mateo County. From BART stations in San Francisco and San Mateo counties, local transit service is available to park sites in San Mateo, San Francisco, and Marin counties.
- *Caltrain* is a 77-mile-long commuter rail line operating from Santa Clara County through eastern San Mateo County to San Francisco. Local buses provide connections from Caltrain stations to park sites in San Mateo, San Francisco, and Marin counties.
- *Ferry* service is provided by the Golden Gate Bridge, Highway & Transportation District as Golden Gate Ferry, and by a private operator, Blue & Gold Fleet. At Sausalito in Marin County and in San Francisco, ferry service provides connections to transit or bike routes that can then be used to reach Golden Gate National Recreation Area park sites. Ferries also provide the only public access to Alcatraz Island. The 2007 *Golden Gate National Recreation Area Water Shuttle Access Study & Conceptual Plan* proposed additional ferry service to three Golden Gate National Recreation Area park sites: Fort Baker, Fort Mason, and the Presidio/Crissy Field in San Francisco.

“Transbay” buses operated by the East Bay’s AC Transit also connect to San Francisco Municipal Railway (MUNI) routes serving Golden Gate National Recreation Area park sites at San Francisco’s Transbay Transit Center. While most Transbay routes are commuter-oriented—offering the greatest amount of service during weekday morning and evening commuting periods—a few provide midday and weekend service.

Summary

In general, the Bay Area transportation network is oriented toward commuters; access to Golden Gate National Recreation Area park sites, which are generally relatively remote, is limited. In San Francisco, park destinations are closer to the community and well-served by transit. Even there, however, many Golden Gate National Recreation Area park sites are on the city’s west side, some distance from regional road and public transit networks. Transit access to park sites in Marin and San Mateo counties is especially limited. Demand exists for expanded transit options.

PARK TRANSPORTATION NETWORK

In this section, transportation conditions are first described for the two most-visited park sites in the planning area, Muir Woods National Monument and Alcatraz Island. Then conditions are described for park sites in each county: Marin, San Francisco, and San Mateo. Within each section, conditions are first summarized, then described by mode. Conditions are analyzed both in terms of access to park sites and internal circulation. Detailed maps of each county's transportation network can be found at the end of the transportation discussion.

Muir Woods National Monument

Muir Woods National Monument is a fee site, where an entrance fee is collected, and is a major tourist destination with an annual visitation of more than 800,000. For visitors accessing the site from Highway 101, the trip requires travel on almost 10 miles of winding two-lane county and state roads. Traffic on the two-lane roads leading to the site is often congested, especially at intersections of State Route 1 (Shoreline Highway). In addition, parking lots regularly fill by noon on busy summer weekends. Private tour buses serve Muir Woods National Monument year round. With the exception of summer and "shoulder season" weekends, there is no public transit service. Bicycle and pedestrian access to the remote canyon site is arduous. Parking at the site is especially problematic; on busy days, more cars are parked informally along roadside shoulders than in the designated lots, resulting in traffic congestion near the park entrance and conflicts between autos and pedestrians.

Traffic and Parking

Auto access to Muir Woods National Monument is along a narrow, twisting route that approaches from the east by way of a steep descent (with an average grade of more than 8%).

Traffic congestion along State Route 1 (Shoreline Highway) approaching the monument can be severe during peak periods, as noted previously. In the 2004 report from HDR, Inc. *Transportation Planning to Address Access and Congestion Issues – Muir Woods National Monument*, traffic studies indicated a peak season intersection level of service (LOS) of "F," where State Route 1 intersects with Tennessee Valley Road and Flamingo Road; and a LOS of "D" where State Route 1 intersects Muir Woods Road and Panoramic Highway. "F" is the lowest level of service, indicating average delay per vehicle of more than 50 seconds. The *Comprehensive Transportation Management Plan* also reported an accident rate along Panoramic Highway, a two-lane but relatively direct route along the spine of Dias Ridge between State Route 1 and Muir Woods Road, that was 140% higher than the statewide average for similar roads (Robert Peccia & Associates 2004).

It is estimated that even on summer weekends when Muir Woods Shuttle service is available, more than 60% of Muir Woods National Monument visitors arrive by private automobile (Nelson\Nygaard Consulting Associates 2008). Golden Gate National Recreation Area has estimated average vehicle occupancy of 2.5 persons, meaning that close to 1,200 autos might arrive at the National Monument over the course of a busy day. In 2004, as many as 2,855 cars were counted on Upper Muir Woods Road in a single

day, suggesting that the actual number of cars arriving at the National Monument on a busy day might be even higher. Also in 2004, up to 344 cars were observed arriving at the monument in a single hour (Robert Peccia & Associates 2004).

There are no current mode share data indicating how many visitors reach Muir Woods National Monument by tour bus, bicycle, or hiking.

This traffic results not only in congestion on roads approaching the national monument, but in congestion in the main and satellite parking lots, as cars circle in search of parking. It also results in congestion and auto-pedestrian conflicts along Muir Woods Road just west of the monument—where overflow parking is accommodated along the shoulder and pedestrians must at some points walk in the roadway. Officially, there are 179 parking spaces at Muir Woods National Monument in the main and satellite lots, and approximately 175 additional spaces that are considered legal along Muir Woods Road; the total then is approximately 350 parking spaces. However, up to 475 cars have been observed parked along the road near the monument at one time (Robert Peccia & Associates 2004). This is possible because motorists will park along the shoulder of Muir Woods Road up to a mile from the monument entrance, and walk along or in the road to the trail that leads to the entrance.

Transit

Muir Woods Shuttle. Established in 2005 as a pilot program, the Muir Woods Shuttle is now funded on an annual basis by Golden Gate National Recreation Area and the Marin County Transit District, or Marin Transit.

The shuttle is a seasonal service, operating on weekends during the five months from May through September. From Memorial Day weekend to Labor Day weekend, it consists of two routes:

- A Marin City to Muir Woods National Monument route operating on 20-minute headways from the Golden Gate Transit hub at Marin City (where connections can be made to buses from San Francisco) to the monument. This route also stops at satellite parking lots near the junction of Highways 101 and State Route 1 (approximately 9 miles from the monument).
- A Sausalito to Muir Woods National Monument route timed to connect with Golden Gate Ferry service from San Francisco at Sausalito (this route also serves Marin City and the Highway 101 / State Route 1 junction)

During the “shoulder season,” there is no Sausalito service, and the Marin City route operates on 30-minute headways.

Much of the shuttle’s ridership consists of motorists who, informed by changeable message signs on Highway 101 that the monument parking lots are full, follow instructions to exit at State Route 1, park, and take the shuttle instead. The service has proved to be extremely successful, currently providing 35,000 trips on weekends and holidays during the May to September season. The farebox recovery rate is 22%, comparable to many urban transit services) and ridership has grown from just a little more than 10,000 in its first year, even as the formerly free service has increased fares to \$3. Close to 10% of summer weekend visitors to the park now arrive by shuttle, and in

2008, it averaged 18.9 passengers per hour, higher than many suburban bus routes (Nelson\Nygaard Consulting Associates 2008).

The Muir Woods Shuttle has eased pressure on the overburdened parking areas at the monument and on the roads leading to the site. In addition, by connecting to regional transit services, it has greatly expanded non-automobile access for visitor to the park. Moreover, surveys of shuttle riders and other park visitors indicate that significant demand may exist for direct service between San Francisco and the monument; while relatively expensive to operate, this would serve to further reduce demand for automobile access to the monument.

Tour Bus. While no data is available on private tour bus operators serving Golden Gate National Recreation Area park sites, park staff estimate that up to 20% of visitors to the monument may arrive by tour bus. Twelve to fourteen spaces in the lower parking lot are reserved for tour buses, and multiple operators provide tours, typically departing from San Francisco and including a stop in Sausalito.

Bicycle and Pedestrian

Bicycle access to Muir Woods National Monument is poor. State Route 1 and Muir Beach Road are narrow, winding two-lane roads and lack bike lanes and shoulders for much of their length, although bicycle parking is provided. Pedestrian access is also poor, limited to trail connections that converge at the monument (including the popular Dipsea Trail, which connects the monument to the town of Mill Valley 3 miles away, and to Stinson Beach to the west).

Summary

Muir Woods National Monument is accessed primarily by automobile or tour bus, although public transit service is available on summer and “shoulder season” weekends. Cyclists and pedestrians must bike or hike long distances to reach the remote site, although trails to and within the monument are very good. Parking at the monument is limited and not well-configured—overflow parking along the shoulders of a narrow road is common—and this results both in congestion and in conflicts between traffic and pedestrians.

Alcatraz Island

With approximately 1.4 million annual visitors, Alcatraz Island is Golden Gate National Recreation Area’s most visited site. Alcatraz is an island in San Francisco Bay; while admission to the park itself is free, the only access to the island is a 15-minute trip by ferry at a cost of \$26 per person (2009). Ferries depart from a landing near Fisherman’s Wharf in San Francisco, which is relatively accessible by all modes of transportation.

Traffic and Parking

Automobile access to the Alcatraz Island ferry landing at Pier 33, just southeast of Fisherman’s Wharf, is generally good. The site is immediately adjacent to the Embarcadero, a six-lane boulevard connecting directly to the San Francisco-Oakland Bay Bridge (Interstate 80) and Interstate 280, and indirectly to Highway 101. Pier 33 is also near Bay Street, a four-lane city street connecting to Highway 101 and the Golden Gate Bridge. However, all of these routes can become congested during peak hours.

Parking near the Alcatraz Island ferry landing at Pier 33 is fee parking, and much of it consists of on-street meters with time limits of two hours or less. However, several large parking garages are located nearby.

Public Transit

Ferry service to Alcatraz Island currently departs from Pier 33. Service is provided by Alcatraz Cruises, a park concessioner, and operates as often as every 30 minutes. Other ferry operators also offer Bay tours that pass by Alcatraz Island and other Golden Gate National Recreation Area waterfront park sites. A number of public transportation options within San Francisco provide visitors with good access to Pier 33.

Bicycle and Pedestrian

Pier 33 is easily accessible by bicycle, and several bicycle rental companies are located nearby. Bicycles are not allowed aboard Alcatraz Island ferries, but limited bicycle parking is available at Pier 33 on a first-come, first-served basis.

Likewise, pedestrian access is good. From the south, a broad promenade runs alongside the Embarcadero, and San Francisco city streets to the west generally feature spacious sidewalks.

Summary

Alcatraz Island can be accessed only by ferry from San Francisco, although access to the ferry landing is good for all modes of transportation. While parking is available for a fee, there is on-street metered parking and several large garages nearby. public transit access is excellent, and bicycle and pedestrian access over San Francisco city streets is likewise very good.

Marin County Park Lands

Golden Gate National Recreation Area park sites within Marin County are generally distinct in character from those in San Francisco and San Mateo counties. As Marin County park sites are located within western Marin County, many are some distance from the county's developed eastern corridor. Due to this isolation, Golden Gate National Recreation Area park sites in Marin County are accessed primarily by automobile, although limited public transit service is available, and many recreational cyclists ride long distances to access them. In addition, there are directional and park identity signs both within the park lands and on roads leading to them that are generally clear and highly visible; there is also limited water access for private boats to Fort Baker through a marina.

The relative remoteness of Golden Gate National Recreation Area park sites within Marin County contributes to their popularity with both residents and tourists. However, it also results in severe congestion at the most accessible sites during peak periods, both on roads leading to the park sites and around parking areas. Congestion is compounded by insufficient parking and conflicts between automobile and pedestrians, who often must walk in or alongside roadways due to a lack of infrastructure—including both sidewalks and trails paralleling roadways—at popular destinations (such as Tennessee Valley).

Means of visitor access to the Marin Headlands were sampled on Fridays, Saturdays, and Sundays in the summer of 2000 and spring of 2001. The survey showed that 91% arrived

by private automobile, 4.7% by bicycle, 4% by bus (including public transit as well as private, chartered, and school buses), while just 0.2% arrived on foot (NPS 2009a).

Traffic and Parking

Many visitors to Marin County Golden Gate National Recreation Area park sites arrive in the county by driving over the Golden Gate or Richmond-San Rafael bridges, and even residents of Marin County use Highway 101 for parts of their trips. Once motorists have exited Highway 101, however, access to many Golden Gate National Recreation Area park sites requires steep, winding drives on narrow rural roads.

Average volumes of traffic on these roads do not necessarily suggest congestion, and outside of the busiest peak periods, there is little congestion on roads leading to or within Golden Gate National Recreation Area park sites in Marin County. Traffic studies conducted in October and November of 2009 show LOS A and B on State Route 1 (Shoreline Highway) between Highway 101 and Northern Avenue. However, traffic increases significantly on summer and holiday weekends. Annual average daily traffic on State Route 1 in the area of Stinson Beach, for example, is just 4,100 vehicles per day, and peak hour traffic is 420 cars per hour, or 7 vehicles per minute in both directions combined (California Department of Transportation 2009). Yet, the number of cars at the entrance to Stinson Beach reached 39,709 in July 2007, 455% higher than in January, and in 2004, counts reached 4,451 in a single summer day (Nonmotorized Transportation Pilot Program 2005). Even greater monthly traffic has been observed along Conzelman Road in the Marin Headlands, where 80,300 vehicles were recorded at a point in the Rodeo Valley in the month of September 2007. In 2000, traffic counts on roads entering and exiting the Marin Headlands near the northern end of the Golden Gate Bridge found combined traffic on summer weekends of approximately 10,200 vehicles, with about two-thirds on Conzelman Road and the remainder on Bunker Road. Summer 2000 weekend traffic on Alexander Avenue (which is just outside the Marin Headlands, and thus not maintained by the National Park Service), connecting the Golden Gate Bridge to Sausalito and providing access to the Marin Headlands and Fort Baker, was approximately 11,300 vehicles (NPS 2009a).

Roads within the park lands of Marin County managed by the National Park Service are often in a poor state of repair. A 1999 survey of pavement conditions within the Marin Headlands and Fort Baker found fully two-thirds of roads to be in poor condition (NPS 2009a). Conditions have not changed significantly since then, although all 18 miles of NPS roads in the Marin Headlands and Fort Baker are programmed for rehabilitation beginning in 2010.

The greatest traffic congestion within Golden Gate National Recreation Area park sites appears to occur immediately around parking areas at popular destinations. Whether they consist of large lots or informal, roadside parking along shoulders, cars pulling into or out of parking areas and pedestrians traveling to or from their cars can create congestion and unsafe conditions along narrow roads.

This congestion is a result of demand exceeding supply, with undesirable shoulder parking as a result. At the Tennessee Valley trailhead, where there are 86 formal parking spaces, the *Comprehensive Transportation Management Plan* reported maximum occupancy, including cars parked alongside Tennessee Valley Road, of 202 vehicles or 235% of capacity. Parking lots at Stinson Beach (124%) and Muir Beach (107%) were

also found to be filled beyond capacity (Robert Peccia & Associates 2004). The *Marin Headlands / Fort Baker Transportation Plan*, meanwhile, reported up to 35 cars parked at Battery Mendell in the Marin Headlands, in an area with a capacity of 30, and 24 cars were in 24 spaces at Battery Spencer, where, as at Muir Woods National Monument, cars, buses and pedestrians come into conflict when there is parking along a narrow road (NPS 2009a). Although all Golden Gate National Recreation Area parking within the plan area is currently free, approved plans will introduce fee parking in the Marin Headlands and at Fort Baker.

Public Transit

Public transportation access to Marin County Golden Gate National Recreation Area park sites is limited. Most destinations within the park lands are inaccessible via transit without significant hiking or biking from the closest transit stops, although a few park sites are served directly or indirectly by infrequent, weekend-only, or seasonal bus routes. Most of those routes serve a limited area, although connections can be made to regional services in eastern Marin County and San Francisco. Three public transit agencies provide some form of service to Golden Gate National Recreation Area park sites, while a seasonal shuttle service to Muir Woods National Monument is operated jointly by the National Park Service and a local transit provider. In general, transit service in Marin County is either oriented toward commuters (Golden Gate Transit) or those taking local trips (Marin Transit), or serves Golden Gate National Recreation Area park sites but only on a limited basis (West Marin Stagecoach). More information on public transit services to Marin County Golden Gate National Recreation Area park sites can be found in appendix E.

While no data is available on private tour bus operators serving Golden Gate National Recreation Area park sites, park staff believes that up to 20% of visitors to Muir Woods National Monument may arrive by tour bus. Twelve to fourteen spaces in the lower parking lot are reserved for tour buses, and multiple operators provide tours, typically departing from San Francisco and including a stop in Sausalito. Tour bus use is also common (if accounting for a relatively small mode share) in the Marin Headlands and Fort Baker.

Bicycle

Western Marin County is a popular destination for recreational cyclists. Despite blind curves and heavy traffic, road cyclists seeking a challenge are a common sight on its steep, narrow roads, while mountain biking remains popular on fire roads and trails throughout Marin County, the birthplace of the sport. Many San Francisco visitors rent bicycles and ride them over the Golden Gate Bridge making the return trip via ferry from Sausalito. Alexander Avenue between Sausalito and the Bridge, which is a regional road administered by the Golden Gate Bridge District, is a popular route for cyclists (although it lacks a complete bike lane, and is confusing and potentially unsafe for novice cyclists).

On May 11, 2008, a sunny Sunday, Golden Gate National Recreation Area counted 1,432 cyclists northbound on Alexander at Bunker Road, above Fort Baker.

Although amenities for cyclists are currently limited, there is bicycle parking at Battery Spencer. As part of the *Marin Headlands & Fort Baker Transportation Infrastructure & Management Plan* (2009), a number of improvements for bicyclists are being made. These include roadway improvements to enhance bicycle safety, a new bicycle and

pedestrian path between the Marin Headlands and Fort Baker, new trail access, and an uphill bicycle lane on Conzelman Road from Alexander Avenue to McCullough Road.

Pedestrian

The key issue for pedestrians at Marin County park sites is conflicts with automobiles near congested parking areas; this issue was described at length in the previous sections on Marin County Traffic and Parking. Remaining pedestrian issues are addressed below.

Golden Gate National Recreation Area park sites in Marin County are generally relatively remote. Muir Beach and Stinson Beach are 6 to 12 miles from the Highway 101 corridor, and are adjacent to small communities that are surrounded by park land, while the eastern edge of the park lands in the county's southwestern corner is bordered by the larger communities of Marin City, Tamalpais Junction, and Mill Valley. Despite several trails that extend into these communities, pedestrian access to park sites is fairly limited. Even in those residential areas adjacent to park lands, there are few sidewalks, and residents of southern Marin County often drive to nearby trailheads, such as Tennessee Valley. Tourists sometimes walk over the Golden Gate Bridge from San Francisco into Marin County, but are not likely to ascend into the Marin Headlands farther than Battery Spencer, which is a short distance beyond the northern end of the Bridge.

However, Golden Gate National Recreation Area park sites in Marin County feature an extensive network of fire roads and trails of all types. Trail connectivity is good, both within Golden Gate National Recreation Area park sites and to trails extending into adjacent park lands such as Mount Tamalpais State Park. Coverage is dense in the southern park lands, extending from Muir Beach into Tennessee Valley and the Marin Headlands. While many trails within Marin County park sites are multiuse, bikes, dogs, or horses are not allowed on some trails.

Summary

Marin County park sites are accessed primarily by private automobile. The most popular destinations experience considerable congestion during peak periods on winding, two-lane roads and exceed the capacity of limited parking areas. There is little public transit service to park sites within Marin County. While bicycle access can be challenging due to topography and narrow roadways, these park lands are popular destinations for recreational cyclists. There is little pedestrian access to the park sites, but hiking is a popular activity within them.

San Francisco Park Lands

Golden Gate National Recreation Area park lands in San Francisco are generally immediately adjacent to urban neighborhoods. As a result, San Francisco park sites are distinct: they are much more multimodal in terms of both access and circulation than are park sites in Marin and San Mateo counties, which are strongly oriented toward the automobile. Pedestrian, bicycle, and public transit access is generally very good. One site—Ocean Beach—is directly served by two rail transit lines. The park sites include large parking lots. Signage is good within park sites, although trails to park sites from the city are not always well marked.

Traffic and Parking

Automobile access to Golden Gate National Recreation Area park sites in San Francisco is generally good. While access to most park sites requires travel over San Francisco city streets—some of which can be quite congested during commuting hours—multiple access routes are available, and there are sizable parking lots available at almost every location. These lots often become full at peak times.

Public Transit

In general, park sites in San Francisco enjoy the sort of frequent and extensive transit service that is rare in the national park system. All Golden Gate National Recreation Area park sites in San Francisco and the Alcatraz Island ferry are served at least indirectly by MUNI light rail, historic streetcar, cable car, or bus routes operating on headways of 20 minutes or less from early morning until late in the evening.

MUNI stops near Golden Gate National Recreation Area park sites, however, generally lack many amenities (including park-related signs or other wayfinding information). MUNI vehicles are often crowded, especially at commute times, with 4.3% of morning peak period trips exceeding 125% of seating and standing capacity (San Francisco Municipal Transportation Agency 2009). Details of MUNI routes serving Golden Gate National Recreation Area park sites can be found in appendix E.

A number of changes have been planned to MUNI service that would impact access to Golden Gate National Recreation Area park sites. Some reductions in service have been implemented in response to a budget issues, but improvements in service are also planned, such as the MUNI E-line extension. Other changes are detailed in appendix E.

Transit service to selected Golden Gate National Recreation Area park sites is also provided by the PresidioGO shuttle, operated by the Presidio Trust within the Presidio, with a downtown express shuttle connecting to regional transit, and by Golden Gate Transit from Marin County.

Bicycle

Bicycle access both to and within Golden Gate National Recreation Area park sites in San Francisco is good. Unlike in Marin and San Mateo counties, where steep grades and rough trail conditions make many routes accessible to only the most expert cyclist, San Francisco's bicycle system and the park sites offer opportunities for cyclists of all skill levels.

Designated bicycle routes, including on-street bike lanes and, in Golden Gate Park, off-street paths, connect to all Golden Gate National Recreation Area park sites in San Francisco. An off-street multiuse trail runs along the northern waterfront from Aquatic Park to the Warming Hut at Crissy Field; from there it is a short distance to the Golden Gate Bridge, which features a dedicated bike path on its west side connecting cyclists to Golden Gate National Recreation Area park sites in Marin County. Additional paths and lanes can be found within the Presidio, and there are several multiuse trails at Lands End. A bike path constituting a segment of the Pacific Coast Bicycle Route runs on city land along nearly the entire 3.5 mile length of Ocean Beach, and there are numerous paved multiuse trails within Fort Funston.

Pedestrian

The uniquely urban context of park sites within San Francisco results in much greater pedestrian access than can be enjoyed at park sites in Marin and San Mateo counties. Streets leading to park sites typically include sidewalks, and the only obstacles to pedestrian access are distance, busy streets, and hills in some locations. However, all Golden Gate National Recreation Area park sites are along the city's waterfront, and thus most are at a lower elevation than the majority of pedestrian trip origins.

There are, however, some obstacles to pedestrian access. Fort Funston in the city's southwestern corner is relatively isolated, located west of Lake Merced and across the Great Highway and Skyline Boulevard from city streets. Pedestrian access to Ocean Beach requires crossing the Great Highway at signalized pedestrian crosswalks over a four-lane highway. All of the park sites in San Francisco, however, are connected to each other by the Bay Trail and Coastal Trail, including segments that meet accessibility standards for people with disabilities.

Within park sites, pedestrian routes vary from sidewalks to paved paths, boardwalks, and unpaved trails. Accessibility for people with disabilities is much higher here than at park sites in Marin and San Mateo counties, where few paved, level paths exist.

Coastal Trail and Bay Trail improvements are planned as part of the Trails Forever Program, a collaborative effort of the Golden Gate National Parks Conservancy, the Presidio of San Francisco, and the park.

Summary

San Francisco park sites, uniquely situated within an urban environment, are generally connected to their surroundings by public transit and a network of streets, bike routes, and sidewalks. Parking is generally available, and there are extensive trail networks within the larger park area.

San Mateo County Park Lands

Just as Golden Gate National Recreation Area park sites in Marin County and in San Francisco share many characteristics in common that make them distinct from the park sites in other counties, park lands in San Mateo County are notable in a number of ways. They are generally less developed in terms of amenities, less used (although some park sites are popular with local residents), less connected to one another, and different in terms of their primary means of access. As in Marin County, private automobiles are the primary mode for access to Golden Gate National Recreation Area park sites in San Mateo County.

Directional and park identification signs, as well as parking at most park sites is limited, if they exist at all. The "typical" Golden Gate National Recreation Area site in San Mateo County consists of open space with trails of various qualities that are accessible from a trailhead, which either provides limited, informal parking, or no parking at all. Some park sites are relatively remote and inaccessible to pedestrians and transit users, while others are immediately adjacent to suburban neighborhoods and feature many "social" or informal entrances. Bicycle access is generally good, although some park sites do not accommodate cyclists and safer routes are needed along much of State Route 1 south of Pacifica.

Traffic and Parking

Auto access to San Mateo park sites is generally good, although parking at trailheads can be in short supply or available only on an “informal” basis on nearby streets; also some roadways experience congestion.

Highways 1 and 280 provide primary access to most park sites, along with Highway 35, or Skyline Boulevard, which is a suburban arterial in its northern segment, near Milagra Ridge, and a two-lane rural road in the south, near Phleger Estate. Highway 92, Sharp Park Road, and other rural and suburban roadways also provide access to Golden Gate National Recreation Area park sites. State Route 1 experiences relatively high volumes of traffic (California Department of Transportation 2009).

A segment of State Route 1 between Pacifica and Montara, called Devil’s Slide, has long been prone to landslides that have closed the road for periods of several months. This segment is now being replaced by an inland bypass including twin tunnels and bridges. These are due for completion in 2011. At that time, the existing segment of roadway will be converted to a multiuse California Coastal Trail segment extending north and south to connect to Golden Gate National Recreation Area and state park sites along the coastline.

Finally, data on parking demand is not available. However, at park sites in San Mateo County, parking is generally both limited and informal; in addition to trailhead lots at Milagra Ridge, Sheldance Nursery, and Sneath Lane, parking is found along roadsides, in neighborhoods, and in business parking lots.

At San Francisco Public Utility Commission (SFPUC) watershed trailheads, parking is likewise along roadsides. However, there are more than 40 spaces at the southern end of the popular Sawyer Camp Trail. At Rancho Corral de Tierra, parking is associated with the equestrian facilities.

There are several parking areas that serve to access the park at adjacent college or state park parking lots.

Access to Phleger Estate is generally through Huddart County Park, which provides adequate parking on most days.

Public Transit

The San Mateo County Transit District, or SamTrans, provides bus service throughout the county. As San Mateo is a relatively low-density, suburban county, much of this service is relatively infrequent, operating on headways of 30 minutes to as much as 180 minutes, and some routes do not operate on weekends or mid-days, outside of normal commuting hours. Stops generally lack amenities, and pedestrian routes from stops to Golden Gate National Recreation Area park sites often lack sidewalks and directional signs. However, as many park sites in San Mateo County are immediately adjacent to neighborhoods, a few stops are located within walking distance of Golden Gate National Recreation Area park sites. In general, SamTrans provides a fair level of service to Pacifica and Montara, including relatively frequent service to Mori Point and Milagra Ridge. Service to these two areas also connects to BART and operates seven days a week. Service to the Sawyer Camp and San Andreas trails, however, is limited to weekdays, and Phleger Estate is currently not served by transit. More information on SamTrans service can be found in appendix E.

Bicycle

Bicycle access to Golden Gate National Recreation Area park sites in San Mateo County is mixed; however, bicycle amenities within the park are generally good, as cyclists are allowed on most trails.

While most bicycle access is over roadways without separate bicycle facilities, a grade-separated, off-road bike path parallels State Route 1 along the Pacifica shoreline, connecting Pacifica State Beach just north of Pedro Point to Rockaway State Beach and Mori Point. Another unpaved path runs north from Mori Point to Sharp Park Beach, and there are bike lanes along Sharp Park Road connecting to Milagra Ridge. Cañada Road, running south from the SFPUC watershed, is closed to motor vehicles for several hours on county-sponsored “Bicycle Sundays.”

Milagra Ridge, meanwhile, features a paved loop within the site. The popular Sneath Lane Trail at Sweeney Ridge is paved, and the popular Sawyer Camp and San Andreas trails in the SFPUC watershed are primarily high capacity, paved, multiuse trails with median striping and mile markers. Bicycles are prohibited on trails within the Phleger Estate.

The *San Mateo County Bicycle Plan* proposes improvements to routes popular with cyclists, including Cañada Road, and while improvements are not planned, a route allowing bike access from the San Mateo County suburbs east of Interstate 280 to the road and mountain bike trails west of Skyline Boulevard has been identified as a priority for cyclists. This could require bicycle access in the vicinity of Phleger Estate.

At Rancho Corral de Tierra, several miles of existing trails are primarily multiuse, though mostly steep and unpaved. The northern area of Rancho Corral de Tierra is connected to McNee Ranch State Park, by Old Pedro Mountain Road, a multiuse county trail that continues north to Pacifica.

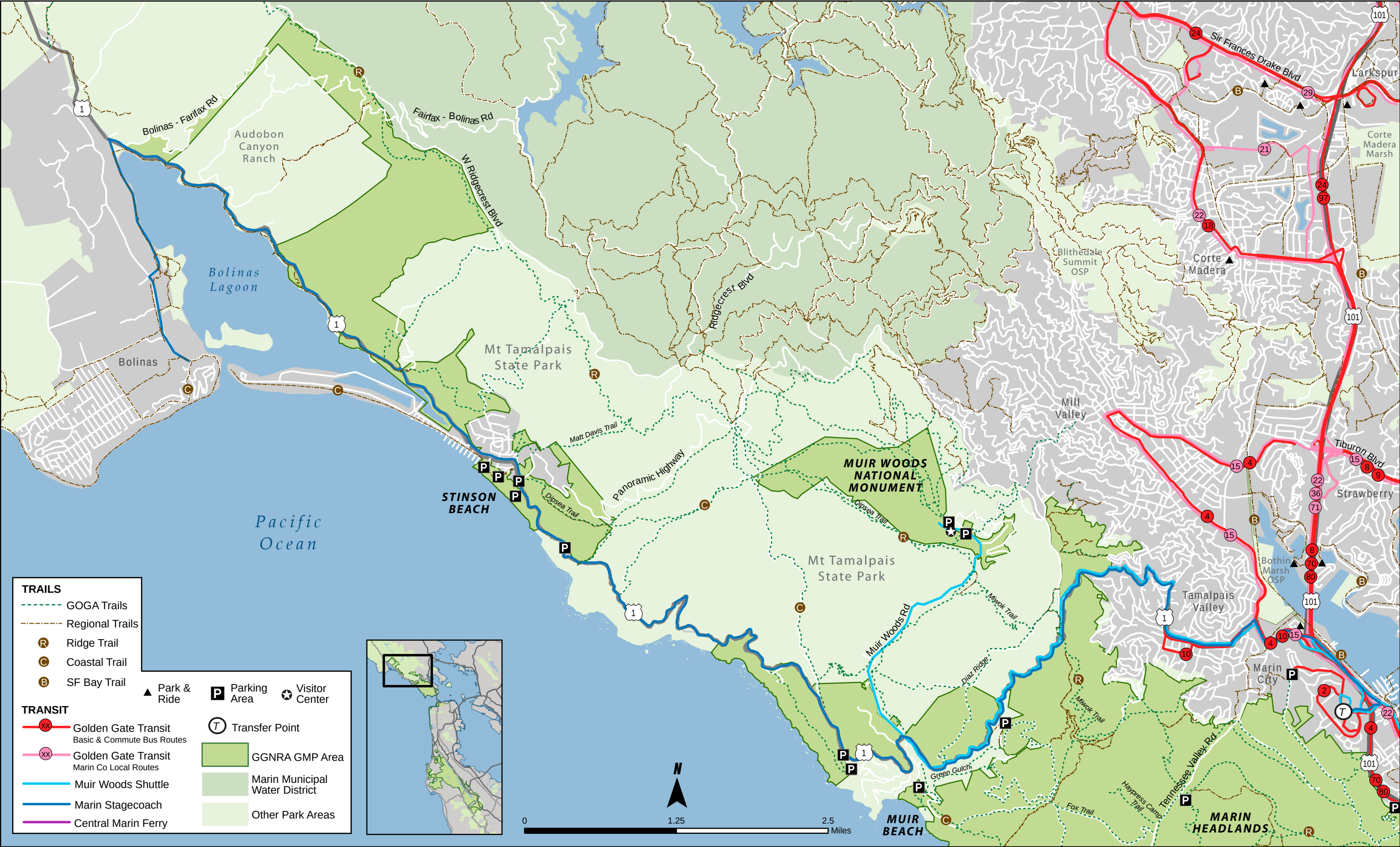
Pedestrian

Pedestrian access to Golden Gate National Recreation Area park sites in San Mateo County is limited. Trailheads at a few park sites, such as Milagra Ridge, Sweeney Ridge, Mori Point, Pedro Point, and Rancho Corral de Tierra, are adjacent to suburban neighborhoods and thus are relatively accessible to pedestrians (although sidewalks leading to the park sites are sometimes lacking). However, pedestrian circulation within San Mateo County park sites is in many cases very good, as most San Mateo County park sites are essentially open space preserves with trail networks. Also, two park sites, Rancho Corral de Tierra and Phleger Estate, offer extensive equestrian access. Trails within San Mateo County Golden Gate National Recreation Area park sites are detailed in appendix F.

Summary

San Mateo County park sites are generally adjacent to suburban developments and are easily accessible by automobile. However, they are not well served by public transit, which is oriented toward commuters. Bicycle access is generally good, and hiking is popular within the parks. While more discontinuous than park sites in Marin County or San Francisco, San Mateo County park sites are connected in part by both the California Coastal Trail and the Bay Area Ridge Trail. San Mateo park sites are also popular with equestrians, and there are many multiuse trails, with little conflict among users.

Marin County Transportation Network: Muir Woods, Stinson Beach



Marin County Transportation Network: Marin Headlands



San Francisco Transportation Network: Fort Mason, Alcatraz

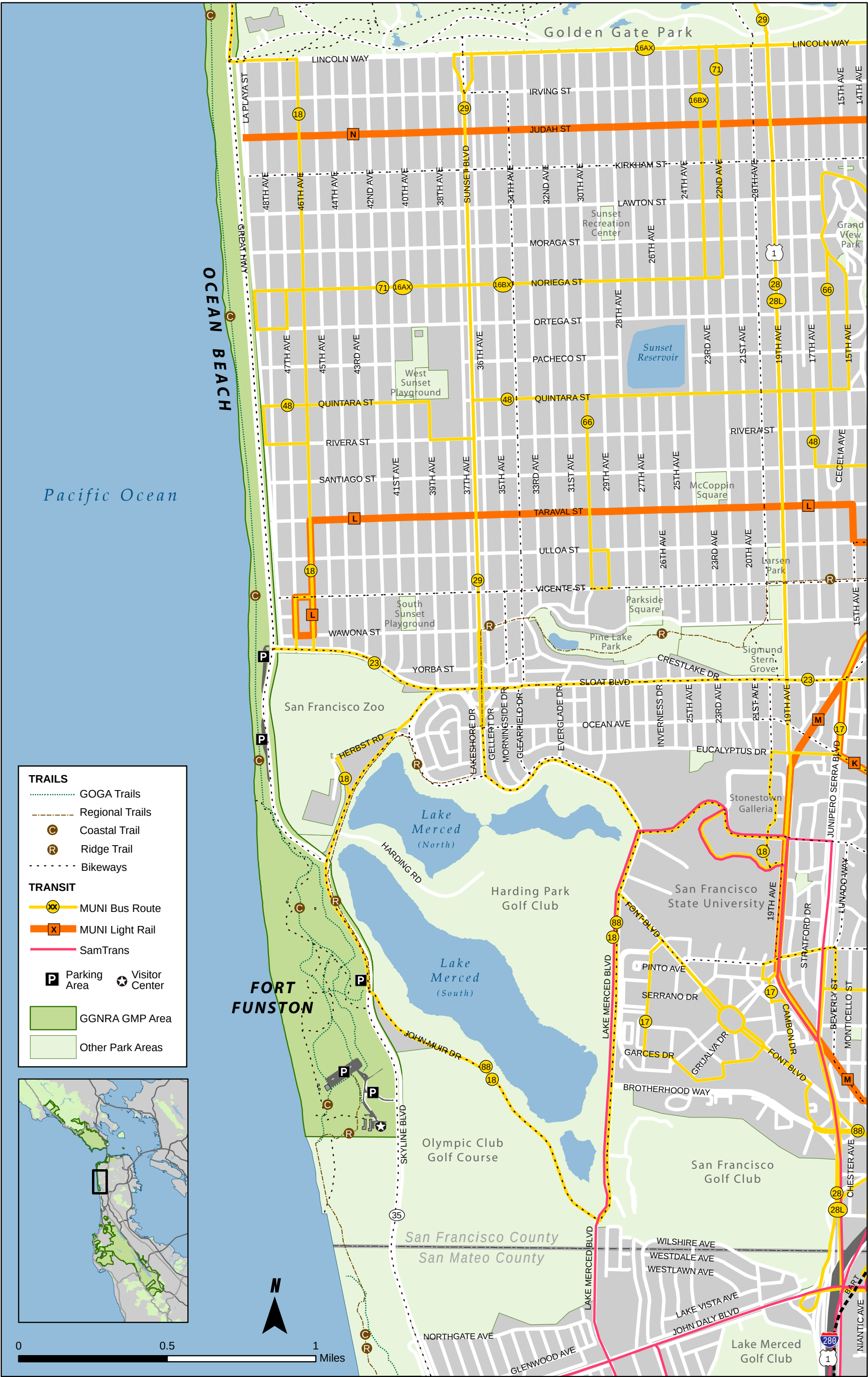


San Francisco Transportation Network: Baker Beach, Presidio, Crissy Field

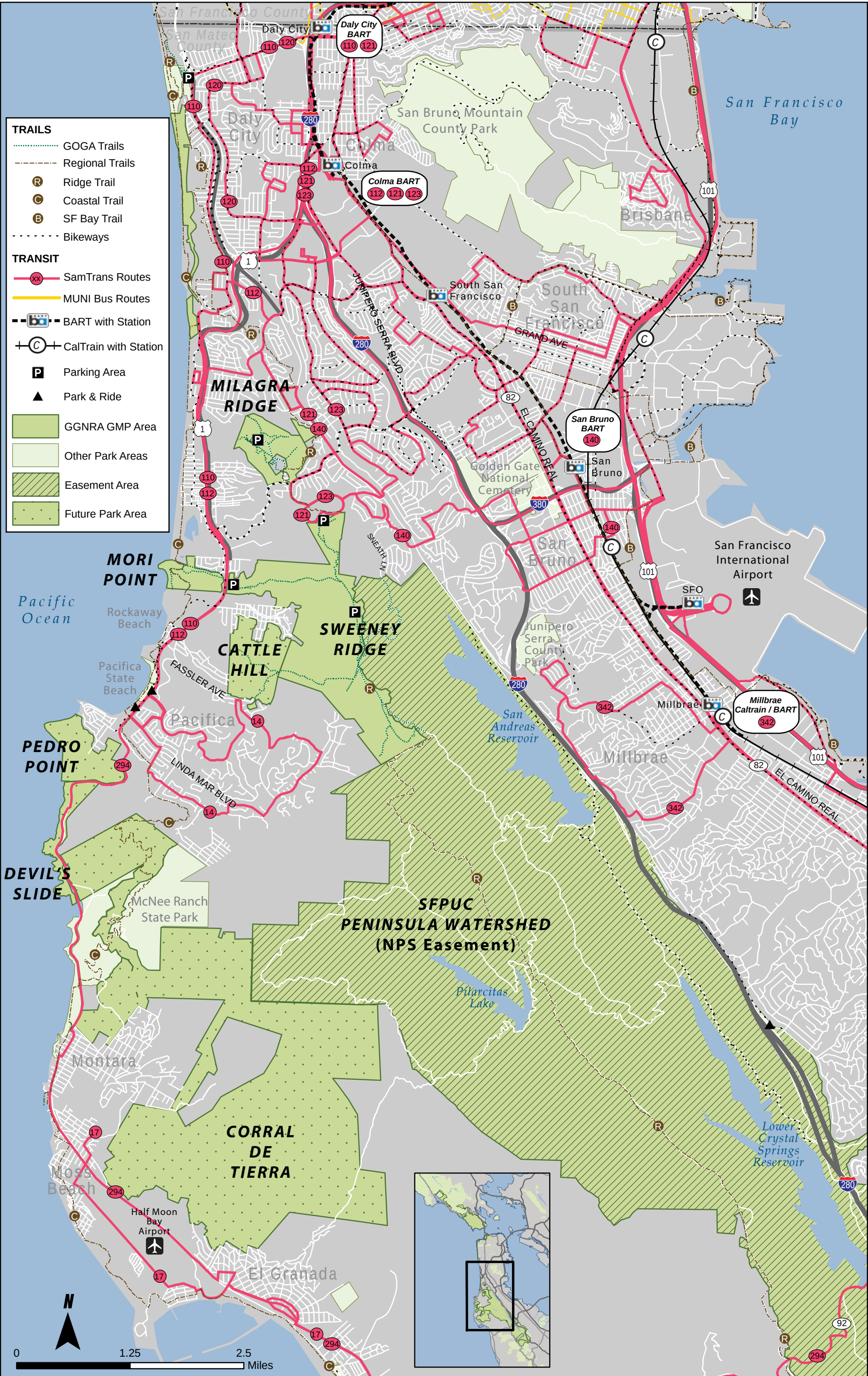


[illegible]

San Francisco Transportation Network: Ocean Beach, Fort Funston



San Mateo County Transportation Network: Northern San Mateo County



San Mateo County Transportation Network: Phleger Estate, SFPUC Watershed

PARK MANAGEMENT, OPERATIONS, AND FACILITIES (INCLUDING BOTH GOLDEN GATE NATIONAL RECREATION AREA AND MUIR WOODS NATIONAL MONUMENT)

STAFFING

The park management team and staff are responsible for both Golden Gate National Recreation Area and Muir Woods National Monument. In 2009, the park was staffed by 335 full-time-equivalent employees (FTEs), which includes full-time, part-time, term, temporary, and student employment. The NPS staff is supplemented by the staff of the Golden Gate National Parks Conservancy, numerous park partners, and a large number of volunteers who fulfill critical roles within the operations and programming of the park and monument.

Office of the Superintendent

The Office of the Superintendent includes managerial activities of the Superintendent, Deputy Superintendent, Public Affairs, and Strategic Planning and Initiatives, as well as administrative staffs. The Deputy Superintendent's Office is responsible for a considerable portion of the park management including staff in the areas of administration, business management, cultural resources and museum management, interpretation and education, environmental and safety, maintenance, natural resources management and science, planning and compliance, visitor resources and protection and administration.

Planning, Projects and Compliance

The Division of Planning is an assemblage of planning, environmental review, transportation, and design professionals who provide park management with the technical expertise and policy guidance needed to plan for preservation and protection of the park's natural and cultural resources, provide for appropriate public use, and manage public involvement in the planning and decision-making process. Planning staff work as a team with other park divisions, park partners, other agencies, and consultants to make this mission a reality.

Given the complexity of managing a large park unit adjacent to a high density, urban population, the project workload into the future is substantial. Adequate planning staff is critical for achieving the park's vision; maintaining positive relationships with the public; and meeting the high expectations set internally by the National Park Service and externally by the community. The park's ability to benefit from the philanthropic capacity of the Bay Area will continue to depend heavily on the park's ability to plan for and manage projects and programs funded by outside sources. Current funding provides about two-thirds of the needs for management and administration with the balance derived from external sources.

Cultural Resources and Museum Management Division

This division oversees management of more than 365 inventoried archeological sites, some of which predate European contact and constitute the most tangible connection between the Coast Miwok and Ohlone communities and park lands, and more than 700 historic structures, most of which related to military and maritime commercial themes stretching over a period of more than 200 years. The park includes 5 national historic landmarks, 12 properties listed in the National Register of Historic Places, and 7 properties determined eligible for national register listing; 9 documented cultural landscapes, including rural landscapes and dairy ranches; and 4.2 million items in museum collections. The staff for this division includes authorization for 16 FTEs, however, 4 key positions (3 Historical and Landscape Architects and 1 Compliance Assistant) are term appointments and dependent on funding levels. The division is working toward documenting baseline conditions of all park resources in an effort to guide future operations and programs. Volunteers are necessary to support the park staff, given the large number, diversity, and significance of the park's cultural resources.

Environmental and Safety Division

This group is responsible for environmental protection and occupational health and safety; the staff consists of 1% of the total park workforce. The division manages the park's sustainability programs and is central to addressing climate change. Minimizing the park's environmental impact and movement towards being climate neutral are core responsibilities of the division. The group also manages comprehensive water and energy conservation programs, reduced fossil fuel consumption, sustainable waste management, hazardous and universal waste management, air permits, hazardous materials, and hazardous waste remediation projects.

Facility Operations and Maintenance Division

The Operations and Maintenance Division is responsible for ensuring the physical integrity of park assets and infrastructure. Facility management includes responsibility for buildings, utilities, roads, trails, grounds, housing, and project management. The park staff maintains over \$150 billion worth of structures and infrastructure. One-third of park staff work in the division. This workforce includes electricians, gardeners, engineering equipment operators, and other specialists that work to ensure the parks are safe and prepared for visitors.

Responsibilities are divided geographically, as well as by asset type: trails, roads, housing, buildings, and utilities. Project management and special fund source projects also have separate groups. Nearly half of the park building square footage is occupied by park partners in exchange for assuming building maintenance and other responsibilities. Further, in 2009, park volunteers provided 24,500 hours of support toward maintenance projects, mostly trail projects. Despite creative approaches in supplementing the work of park staff, the workload needed to maintain and support the park assets exceeds the available staff resources, resulting in a significant maintenance backlog. The maintenance of aging infrastructure within the park requires increasing resources and results in increased operational and environmental risks. A majority of the maintenance needs

annually go unmet due to insufficient funding, which results in an increasing backlog of deferred maintenance.

Visitor and Resource Protection Division

This group includes responsibilities for law enforcement, structural fire suppression, and wildland fire control. Safety services are particularly unique within the park due to its urban location, its large area, and the variety of water and land-based recreation that occurs within the park. The staff in this division make up 30% of the total staff for the park. Law enforcement and the U.S. Park Police are responsible for enforcing law and protecting the public's safety. Law enforcement staff is organized into several geographic areas north and south of the Golden Gate Bridge. Patrol operations are conducted in marked and unmarked police cruisers, motorcycles, bicycles, on foot, horseback, and with all-terrain vehicles, although a lack of sufficient patrolling units has resulted in adverse impacts to the park's resources.

Safety services include search and rescue, emergency medical services, and structural and wildland firefighting. The structural fire department also includes paramedic support and lifeguards. Wildland fires are managed by a staff of nine. The Office of Fire Management monitors and responds to all wildland fires within the park and maintains an appropriate preparedness level in accordance with the park's 2006 fire management plan. Structural fires within the park and in the Presidio are handled by the Presidio Fire Department. The Golden Gate National Recreation Area's Fire Management Program is part of the San Francisco Bay Area Network. Fire staff based at Golden Gate National Recreation Area also serve Point Reyes National Seashore, John Muir National Historic Site, Eugene O'Neil National Historic Site, and Pinnacles National Monument. Professional lifeguards are located at Stinson Beach and patrol units cover the 6-mile stretch of Ocean Beach. A small park horse patrol, using 3 or 4 NPS horses, is managed by division staff, with over 7,200 volunteer hours provided in 2009.

Interpretation and Education Division

The Interpretation and Education Division aims to connect people to their parks. The division includes Community Outreach, Education Programs, and the Volunteers-In-Parks Program, and provides staff for specific interpretation services throughout Golden Gate National Recreation Area, Fort Point National Historic Site, and Muir Woods National Monument. Staff in this division make up 10% of the park's workforce, which includes permanent and term staff as well as students. The interpretation and education division has the responsibility of communicating the value and significance of the park and monument's resources to the public through signs, exhibits, brochures, ranger-led programs, and audio tours. Interpretation programs are offered at Alcatraz Island, Muir Woods National Monument, Fort Point National Historic Site, the Presidio, Fort Funston, the Sutro District, Marin Headlands, San Mateo County, the Crissy Field Center, and other locations throughout the park. Community Outreach staff are responsible for managing communications and outreach to the local community.

Education Programs staff deliver formal curriculum-based educational programs to approximately 20,000 Bay Area children annually on topics including habitat restoration, invasive species, marine biology, plate tectonics, geology formations, and day-to-day life

at Fort Point National Historic Site. The Volunteers-In-Parks program manages thousands of volunteers who contribute over 300,000 hours annually to park programs.

The demand for education and interpretive programs far exceeds what the park is currently able to deliver. Many valuable resources within the park and monument are not interpreted due to limited staff and funding for program development. Park partners such as the Bay Area Discovery Museum, Headlands Institute, Marine Mammal Center, Point Bonita YMCA, and Slide Ranch assist in meeting the public's demand for educational and interpretive programs; however, a significant gap remains between park offerings and the public demand.

Natural Resources Management and Sciences Division

The Natural Resources Division includes responsibility for protection of a diverse array of aquatic, vegetation, wildlife, and physical resources. The park's 80,500 acres of land and water extend from Tomales Bay in Marin County south into San Mateo County. Division staff manages the park's ecosystems and numerous plant and animal species, including many sensitive, rare, threatened, or endangered species. With only 4% of the park's total staff working in the division, including base-funded and project-funded staff, the division's work is further supported by specialists from the Golden Gate National Parks Conservancy and by Volunteers-In-Parks natural resource stewards. Current staffing levels prevent the park from completing the baseline studies and monitoring necessary to guide the park's natural resources preservation efforts in the future.

Management, Administration, and Business Services

This division makes up 15% of the park's staff and is responsible for integrating operations and organizational support across the park. The staff consists of personnel in Administration, Budget and Finance, Contracting and Procurement, Fee Collection, Human Resources, Information Technology, Public Affairs and Special Events, the Superintendent's Office, and the Office of Strategic Planning. The Business Management office oversees complex contracts and partnership agreements that provide key services within the park. The division also manages leases, concessions, and the legal aspects of park and partner projects, including property easements, encroachments, and acquisition of new lands.

PARTNERS AND OTHER ENTITIES

The Volunteer-In-Parks program is critical to the ongoing operation of Golden Gate National Recreation Area and Muir Woods National Monument. Volunteers provide between 300,000 and 400,000 volunteer hours to various programs and efforts within the park in a typical year. However, due to staff limitations to manage volunteer efforts, the volunteer program does not have the capacity to grow and provide additional benefit to the parks.

As a park partner for more than 24 years, the nonprofit Golden Gate National Parks Conservancy has provided more than \$80 million in assistance to the park and monument. This organization provides support with education and interpretation

programs and with the protection of natural and cultural resources; the Golden Gate National Parks Conservancy also collaborates with the National Park Service with visitor program partnerships, including the Crissy Field Center and the Institute of the Golden Gate. The organization has been instrumental in facilitating visitor enhancements throughout the park, including the spectacular transformation of Crissy Field, improvements to Alcatraz Island, and the successful Trails Forever program.

In addition to programs offered by the National Park Service, park visitors can enjoy programs provided by a number of nonprofit organizations in facilities owned by the National Park Service. There are many other excellent park partners who provide conservation restoration and protection, environmental education, outreach programs, and recreational opportunities that support the goals of the park while achieving their own organization's missions.

Many of the parks' better known partners are located in the Marin Headlands, just north of the Golden Gate Bridge. These include the Marine Mammal Center, Headlands Institute (a part of NatureBridge), Bay Area Discovery Museum, Headlands Center for the Arts, Point Bonita YMCA, and Hostelling International. The Fort Mason Center houses 23 nonprofit organizations and provides meeting, exhibit, recreation, and performance space in 11 historic landmark buildings. Alcatraz Cruises LLC (a part of Hornblower Cruises and Events) brings visitors to and from the island. The park staff continues to explore new partnerships and to improve ways to nurture and sustain them to extend ongoing collaborations.

PARK FACILITIES

The large size of Golden Gate National Recreation Area and Muir Woods National Monument, in combination with the diversity of natural and cultural resources and the history of land use, makes for numerous facilities to be maintained and managed. The park lands contain approximately 1,150 total facilities that include buildings, trails, roads, and other structures and landscapes.

The park has been at the forefront of asset management planning, and has creatively found ways to adaptively reuse historic buildings, to lease space to park partners, and to prioritize funding towards most needed maintenance and deferred maintenance. Sustainability goals are being incorporated into facility and systems construction. The park has also proactively worked with partners to obtain outside funding for projects.

Table 12: The Golden Gate National Recreation Area Portfolio Summarized by Record Count for Various Asset Types

Asset Type	NPS	Partner	Total
Historic Buildings	142	88	230
Nonhistoric Buildings	105	117	222
Maintained Landscapes	35	1	36
Trails	146	1	147
Paved and Unpaved Roads	215	1	216
Parking Lots	113	0	113
Water Systems	16	2	18
Wastewater Systems	13	2	15
Other Assets	187	4	191

Note: Many of the park's historic assets such as archeological sites and cultural landscapes are described in the Cultural Resources section.

Historic and Nonhistoric Buildings

Nearly half of the buildings within park lands are historic, carrying special consideration for maintenance. A significant number of buildings are managed and maintained by the partner organizations occupying them.

Maintained Landscapes

The park maintains landscapes for public use, such as the grounds surrounding buildings. The Upper Fort Mason grounds and the Alcatraz Island gardens are examples.

Trails, Roads, and Parking

The staff maintains paved and unpaved roads throughout the park. Roads need continual maintenance in which lack of funding reduces the ability to maintain them at an optimum level.

The park maintains extensive trail networks. Additional trails will be coming into park management with the acquisition of new areas in San Mateo County. The park has an extensive trails network, which is heavily used due to the urban park setting. This

requires diligent maintenance; it is a challenge to find funding sources to support the necessary work. Park partners assist in this area through donations.

The park maintains 113 parking lots, which range in size, and serve many of the major sites.

Utilities

Water and wastewater capacity are critical to all sites within the park lands. System needs vary over time and can be stressed by increases in use as well as the age and level of maintenance. Planning for utilities is critical in order to ensure excellence in operational effectiveness, sustainability, and conservation. Current water and wastewater system constraints occur at Alcatraz Island and Stinson Beach. Several systems are antiquated and many are failing and require constant maintenance. Replacement of these systems is a high priority.

Park Operations, Maintenance, and Public Safety Facilities

Park operations, maintenance, and public safety functions are presently scattered throughout the park at sites and facilities that were not intended for these uses. Staff carrying out these functions have been forced to adapt to conditions that do not adequately meet their space, size, function, mobility, and security requirements. Maintenance and public safety operations have moved numerous times over a short period, requiring staff to reprogram their operations; this has resulted in operational inefficiencies. Ideally, park maintenance and public safety staff would have adequate space for both personnel and facilities located with appropriate access to various park units. Additionally, sheltered space for a variety of equipment is needed for equipment protection and efficient operations.

Park Maintenance Facilities

For efficient operations, park maintenance staff require secured vehicle parking, ability to receive cell and radio transmissions, access to arterial roads and highways for moving equipment, and ideally access to transit for ease of access for staff. Many of these criteria are not currently met by the existing facilities. Given the coastal climate, with its salt air and blowing sand, equipment life is significantly shortened by storage outdoors or in unenclosed shelters. Currently, there is inadequate enclosed storage for maintenance equipment within the park.

Table 13: Maintenance Facilities

Location	Description
Muir Woods National Monument	
	Park maintenance is supported by a small office in the Administration-Concession Building, maintenance operations in the Old Inn, and facilities at Lower Conlon Avenue. These spaces support trail maintenance, building maintenance, and office space. A maintenance yard is located adjacent to Muir Woods Road near Conlon Avenue.
Marin County	
Stinson Beach	4 modular buildings for offices, a workshop, and storage
Tennessee Valley	Barn used for the storage of trail maintenance supplies and shared with the park horse patrol
Nike Missile Site	Maintenance yard, road maintenance operations, and for storage of fill materials
Fort Baker	Buildings and utilities shop and parking for vehicles and equipment (the building is temporary and scheduled for demolition to provide space for visitor parking)
Fort Cronkhite	Grounds maintenance operations, a sign shop, offices, and storage
San Francisco County	
Alcatraz Island	Park operations and maintenance facilities within former prison buildings
Upper Fort Mason	Grounds maintenance operations and administrative offices
East Fort Miley	A small onsite maintenance facility, heavy vehicle repairs, office space and shops on the east side in a warehouse and battery
Fort Funston	Park maintenance support located in former military structures
The Presidio	Additional maintenance functions and storage

Location	Description
San Mateo County	
Shelldance Nursery	Vehicle storage
Native Plant Nurseries	Small native plant nurseries are located at Tennessee Valley, Marin Headlands, and adjacent to Muir Woods Road in Marin County and at Fort Funston in San Francisco County. Another native plant nursery is located in the Presidio. The National Park Service, Presidio Trust, and the Golden Gate National Parks Conservancy cooperate in its use and management. All nurseries serve as volunteer stewardship centers and facilitate significant volunteer contributions to the parks natural resource and restoration programs.

Public Safety Facilities

Currently public safety staff shares space with other divisions throughout the park. This is less than ideal because there are certain public safety functions that need to be exclusive and secured. Further, efficient operation requires adequate space for training and meetings, visibility to the public for reporting incidents, adequate cell and radio coverage, and access to public transportation for staff. Current public safety facilities do not meet these requirements in each location, and reassignment of space for public safety is desirable.

Within Marin County, the park's public safety program has an office at Stinson Beach that provides space for law enforcement, water safety, and seasonal Emergency Medical Services staff, along with storage. Fort Cronkhite Building 1056 is the main, parkwide law enforcement office. The small park horse patrol is located at lower Tennessee Valley.

The park's public safety office in San Francisco County includes Presidio Building 223, Fort Miley and Upper Fort Mason, Fort Funston, and lifeguard operations at China Beach. The Alcatraz Island public safety office is housed in Building 64, the historic barracks on the north end of the island.

The public safety staff at Muir Woods National Monument is located in the Administration-Concession Building.

Residential Facilities

The park continues to provide some limited housing for employees. The park staff manages park housing units located in the Marin Headlands. Housing in the San Francisco Bay Area is among the most expensive in the United States. Recruitment and retention of employees for both the park and park partners are hindered by the expense of housing in the area and low number of available park housing units.

ASSET MANAGEMENT

With a large number of facilities and constrained funding, the park staff strives to address the challenge of maintaining assets in acceptable condition and sustaining them over time. Park staff is responsible for maintaining nearly 1,150 assets; base funding of \$5.3 million covers only a portion of the annual operations and maintenance requirements of \$24.6 million.

For the same NPS-occupied and NPS-maintained assets, annual special project funding of approximately \$6.0 million covers only a small portion of its \$148.8 million in deferred maintenance backlog. Including the park assets managed by park partners, total documented park deferred maintenance exceeds \$198.1 million.

In 2006, the park staff developed one of the first park asset management plans to describe its asset inventory, summarize its current budget, communicate funding requirements, and provide strategies to better manage assets that are essential to park operations and to high-quality visitor experiences. This document was updated in 2009.

Operations and Maintenance Funding Priorities

Assets maintained and managed by the park's Maintenance Division (e.g., nonpartner assets) were categorized into priority levels based on a variety of factors. Those factors include the importance of the assets to the mission of the park and the recognized level of maintenance needed to keep the assets operational to suit their intended functions. Funding is then directed towards the highest priority assets, while lower priority assets will be maintained to the best level that limited available funding allows. However, even with prioritization, there remains \$2.9 million in priority band 1 and 2 assets that would remain unfunded and therefore represent the most pressing unfunded needs for operations and maintenance. See table 14.

Partner Assets

Roughly one-half of all park buildings are affiliated with partners or concessioners. While the park shares maintenance responsibility for many of these assets, most of the concession and partner facilities are under contractual arrangements. The park asset management plan has identified some specific funding needs and issues for key park partners; with new draft maintenance plans in place, park management can now follow-up with partners to clearly communicate recommendations for best addressing needed maintenance. The goal is for the park staff to help its partners identify and address maintenance needs in a way that sustains the overall asset portfolio in support of the park mission.

Table 14: Golden Gate National Recreation Areas Operation and Maintenance Planned Funding Summary

O&M* Optimizer Priority Band	Asset Count	Base O&M Allocations	O&M Benchmarks	Percent Coverage	O&M Funding Gap
• Highest Priority	81	\$3,561,497	\$5,148,089	69%	\$1,586,592**
• High Priority	133	\$1,012,566	\$2,405,661	42%	\$1,393,095**
• Medium Priority	132	\$545,513	\$2,298,316	24%	\$1,752,803
• Lower Priority	290	\$200,043	\$7,987,277	3%	\$7,787,234
• Lowest Priority	276	\$718	\$6,781,986	0%	\$6,781,268
Totals	912	\$5,320,337	\$24,621,329	22%	\$19,300,992

*Operation and Maintenance

**Gap for bands 1–2: \$2,979,687

Removal of Assets

Removing unneeded assets that are not mission related is essential to keeping the portfolio a manageable size and allowing available funding to be spent on a smaller pool of higher priority assets. In developing the GMP alternatives, the park staff identified potential assets that could be disposed of over the life of the plan. The facilities identified through this process generally consist of nonhistoric structures in poor condition with no mission related use existing or planned.

Addressing Deferred Maintenance

Recognizing that the park cannot reasonably address all of its deferred maintenance in the short run, the park has a schedule of facility projects that extends out 10 years; this plan addresses the highest priority assets and most critical equipment needs. The condition of these more important assets will show the most rapid improvement, measured by the facility condition index. If 100% of project funding were applied to critical needs and projected component renewal, the park would stabilize the condition of the critical components of its portfolio.

The GMP process has also identified deferred maintenance savings that would be achieved by taking the actions proposed in the alternatives. Deferred maintenance issues can be addressed through several actions recommended in the general management plan, including removal, stabilization, restoration, renovation, and preservation of facilities. The park is pursuing a reduction in deferred maintenance through other funding methods

as well, such as the use of historic leasing as a source of funds to reinvest in historic structures, pursuing Federal Land and Highway Program (FLHP) funds, pursuing annual 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 will also continue to look for opportunities to work with partners in addressing deferred maintenance when updating or issuing new partner agreements.

Table 15: Project Funding and Deferred Maintenance

Type of Funding	Amount
Estimated Annual Special Project Funding	\$6.0 million
NPS Deferred Maintenance	\$148.8 million
Combined NPS and Partner Deferred Maintenance	\$198.1 million

Sustainability

In a ‘funding-constrained’ world, it is also extremely helpful for the park to identify more efficient ways of operating and managing its assets. The park staff has identified goals for achieving a higher level of sustainability, including managing and tracking energy performance, using renewable fuels, conserving water at high use areas, and continuing to enact best practices in waste management. The park managers also recognize the need to broadly communicate sustainability goals with park staff and to collaborate with park partners. These measures are opportunities for the park to find cost savings and become more fiscally responsible.

Coordination between the General Management Plan and the Park Asset Management Plan

Asset data from the park asset management plan helped to inform the development of the GMP alternatives. The updates of the park asset management plan, in light of the planning process for the general management plan, provide an extraordinary opportunity for park managers to promote sound asset management principles, incorporate the value and objectives of partnership relationships, and advance sustainability goals in a coordinated manner.



INTRODUCTION

The National Environmental Policy Act requires that environmental documents discuss the environmental impacts of a proposed federal action, feasible alternatives to that action, and any adverse environmental effects that cannot be avoided. In this case, the proposed federal action would be the adoption of a general management plan for Golden Gate National Recreation Area and Muir Woods National Monument. This part analyzes the potential environmental impacts on natural resources, cultural resources, visitor use and experience, the social and economic environment, transportation, and NPS operations and management that could result from implementing the four alternatives.

Because of the general, conceptual nature of the actions described in the alternatives, the impacts of these actions are analyzed in general, qualitative terms. Thus, this environmental impact statement should be considered a programmatic analysis. For the purposes of analysis, it is assumed that all of the specific actions proposed in the alternatives would occur during the life of the plan.

This environmental impact statement generally analyzes several actions, such as the development of recreational facilities (including trails and trailheads), the construction of facilities for visitor orientation and NPS operations, and the maintenance or restoration of natural and cultural resources. If and when proposed site-specific developments or other actions are ready for implementation following the approval of the general management plan, appropriate detailed environmental and cultural compliance documentation would be prepared. This compliance would be in accordance with the National Environmental Policy Act of 1969 and the National Historic Preservation Act of 1966, both as amended, and would meet requirements to identify and analyze each possible impact for the resources affected.

This part begins with a description of the methods and assumptions used for each impact topic. Impact analyses are organized by impact topic and then by alternative. The existing conditions for all of the impact topics that are analyzed were identified in Part 8 of this document. All of the impact topics retained for detailed analysis are assessed for each alternative.

The analysis of the no-action alternative (continue current management) identifies the future conditions at Golden Gate National Recreation Area and Muir Woods National Monument if there are no major changes to facilities or NPS management direction other than those included in existing approved plans; the no-action alternative assumes implementation of existing approved plans. The three action alternatives are then compared to the no-action alternative to identify the incremental changes that would occur as a result of changes in park facilities, uses, and management. Impacts of recent decisions and approved plans, such as those identified in Part 1 of this document, are not evaluated as part of this environmental analysis, except as part of cumulative impact analysis when appropriate. Although these actions would occur during the life of the general management plan, they have been (or would be) evaluated in other environmental documents.

The key impacts of each alternative are briefly summarized in volume 1 of this document. When this project is considered in conjunction with other projects and actions occurring in the region, impacts can become cumulative. The discussion of cumulative

PART 8: POTENTIAL ENVIRONMENTAL CONSEQUENCES

impacts is presented separately in “Part 11: Other Analyses and Statutory Considerations.”

METHODS AND ASSUMPTIONS FOR ANALYZING POTENTIAL IMPACTS

The planning team based the impact analysis and the conclusions in this part mostly on the review of existing literature and studies, other environmental documentation completed for the park, information provided by experts in the National Park Service and in other agencies, and staff insights and professional judgment. The team's method of analyzing impacts is further explained below. It is important to remember that all the impacts have been assessed assuming that mitigative measures will be implemented to minimize or avoid impacts (see volume I, part 7 for mitigative measures). If mitigative measures were not applied, the potential for resource impacts and the magnitude of those impacts would increase.

The environmental consequences for each impact topic were identified and characterized based on impact type (adverse or beneficial), intensity, context, and duration. Cumulative effects are discussed in Part 10.

Impact intensity refers to the degree or magnitude to which a resource would be beneficially or adversely affected. Each impact was identified as negligible, minor, moderate, or major, in conformance with the definitions for these classifications provided for each impact topic. Because this is a programmatic document, the intensities were expressed qualitatively.

Context refers to the setting within which an impact may occur, such as the affected region or locality. In this document most impacts are either localized (site-specific) or parkwide.

Impact duration refers to how long an impact would last. The planning horizon for this plan is approximately 20 years. Unless otherwise specified, in this document the following terms are used to describe the duration of the impacts:

Short-term: The impact would be temporary in nature, lasting one to three years or less, such as the impacts associated with construction and/or disruption of visitor use to an area of the park.

Long-term: The impact would last more than three years and could be permanent in nature, such as the loss of soil due to the construction of a new facility. Although an impact may only occur for a short duration at one time, if it occurs regularly over a longer period of time the impact may be considered to be a long-term impact. For example, the noise from a vehicle driving on a road would be heard for a short time and intermittently, but because vehicles would be driving the same road throughout the 20-year life of the plan, the impact on the natural soundscape would be considered to be long term.

Effects also can be direct or indirect. Direct effects are caused by an action and occur at the same time and place as the action. Indirect effects are caused by the action and occur later or farther away, but are still reasonably foreseeable. This document discloses and analyzes both direct and indirect effects, but does not differentiate between them in the discussions.

Discussion of the impacts of the action alternatives describe the difference between implementing the no-action alternative and implementing the action alternatives. To

understand a complete “picture” of the impacts of implementing any of the action alternatives, the reader must also take into consideration the impacts that would occur in the no-action alternative.

NATURAL RESOURCES

The analysis of natural resources was based on research, knowledge of the area’s resources, and the best professional judgment of planners and resource specialists, who have experience with similar types of projects. The definitions for impact intensity of all impact topics are included in this section under the impact topics; additional considerations used in characterizing the severity or intensity, as well as the duration, of certain impact topics are also discussed.

Impacts are determined by comparing projected changes resulting from the action alternatives (alternatives 1, 2, and 3) to the no-action alternative (continue current management). For all impact topics the analysis and conclusion sections are conducted at the parkwide level supported by discussion specific to the counties or to individual planning areas/sites where the impacts differ from those identified at the parkwide level. For example, for vegetation and wildlife, a parkwide analysis of the impacts of the alternatives would appear first, followed by specific discussions for Marin County and at two sites, Stinson Beach and Rodeo Valley, where impacts to vegetation and wildlife differ from those described at the parkwide level. A description of the impacts at the county level or at individual planning areas or sites would occur only when they differ from the parkwide analysis and conclusions.

Carbon Footprint and Air Quality

The park’s contribution to global climate change is evaluated by assessing the relative production of greenhouse gases (CO₂) for each of the alternatives. Certain actions included in the alternatives of the plan would have an effect on the parks’ total greenhouse gas emissions, known as the carbon footprint. Because some of the actions, such as the construction of new facilities could increase CO₂ emissions, and other actions, such as providing alternative transportation and reducing visitors’ dependency on personal automobiles, could reduce CO₂ emissions, it is important to evaluate the impact that these actions could have on global warming. Although the National Park Service would pursue sustainable practices whenever possible in all decisions regarding operations, facilities management, and development in the parks, and the parks’ focus on using renewable energy is a continuation of current management trends, the changes in energy consumption, energy availability, or costs compared to current conditions is of interest to NPS managers and the public.

The analysis of the effects of the actions contained in this plan on the parks’ carbon footprint is based on a comparison with existing conditions. The baseline that is used for comparison is the carbon footprint of the no-action alternative, which is included in the “Natural Resources – Golden Gate National Recreation Area” section of Part 8. The park staff inventoried its emissions in 2006 as part of their *Climate Change Action Plan* using the NPS and EPA CLIP tool. The CLIP tool converts emissions of various greenhouse gases into a common “metric tons of carbon equivalent” unit, which provides a basis for

comparison among gases and simplifies reduction tracking. The conversion of a greenhouse gas to metric tons of carbon equivalent is based upon how strongly that particular gas contributes to the greenhouse effect, and how many tons of carbon emission would have the same effect.

The carbon footprint of each action alternative was calculated using the CLIP tool. National Park Service staff input energy consumption information (gallons of diesel fuel used, kilowatt hours per year, miles driven) into the CLIP tool based on assumptions made for facility use (square footage of building space), NPS operations, and recreational demand. Actions that had attributing emissions were assessed in comparison to existing conditions. The CLIP tool produces quantitative measures of gross emissions, measured as MTCE. This data provides a measurement of the carbon footprint. While the gross emissions of the alternatives are expressed numerically, the impact analysis (especially for effects on park resources) is general and qualitative. Overall, the goal of the analysis was to assist park managers with evaluating carbon footprint as part of their decision-making process.

The thresholds to determine the impact intensity for carbon footprint are defined as follows:

Negligible: The action would result in a change in total greenhouse gas emissions, but the change would be at the lowest level of detection, or not measurable. Impacts would not result in a change to local air quality.

Minor: The action would result in a slight, but detectable, change in total greenhouse gas emissions. Impacts could result in a change to local air quality, but the change would be so slight that it would not be of any measurable or perceptible consequence.

Moderate: The action would result in a modest change in total greenhouse gas emissions, which could result in a change to local air quality.

Major: The action would result in a substantial change in total greenhouse gas emissions, which could result in a change to local air quality.

Soils and Geologic Resources and Processes

The effects of the alternatives on soils and geologic resources (including shoreline and coastal processes) are analyzed based on the possibility of impacts resulting primarily from facility development and visitor use.

The thresholds to determine the impact intensity for these resources are defined as follows:

Negligible: The impact is barely detectable and/or would result in no measurable or perceptible changes to soils and geologic resources or processes. The effects on soil character and stability, and natural shoreline or coastal processes would be slight. Disruptions to geologic processes would not be perceptible.

Minor: The impact is slight but detectable, and/or would result in small but measurable changes to soils and geologic resources; the effect would be localized. There could be changes in soil character and stability in a relatively small area, but the change would not noticeably increase the potential for erosion. Disruptions to natural shoreline or coastal processes would be within the natural range of variability.

Moderate: The impact is readily apparent and/or would result in easily detectable changes to soils or geologic resources; the effects would be localized. The effect on soil productivity and natural shoreline or coastal processes would be apparent. The potential for erosion to remove small quantities of additional soil would noticeably increase or decrease. Disruptions to geologic processes are expected to be within the natural range of variability, but could be perceptible in the short term.

Major: The impact is severely adverse or exceptionally beneficial and/or would result in appreciable changes to soils or geologic resources; the effect would be regional in scale. There would be a strong likelihood that erosion would remove large quantities of additional soil or erosion would be substantially reduced. Disruptions to natural shoreline or coastal processes are expected to be outside the natural range of variability and may be permanent.

Water Resources and Hydrologic Processes

Terrestrial and freshwater resources (including stream character, water quantity and quality, watershed processes, wetlands, and floodplains) are analyzed together in this section because of the similarities of these resources, their interrelationship with each other, and their collective effect on the overall integrity of hydrologic systems. For example, terrestrial sediment inputs shape the character of streams: sediment-starved streams incise, while sediment-rich streams often result in aggradation and widening. Healthy riparian vegetation can also filter pollutants before reaching a creek; this in turn affects water quality. In addition, many riparian areas are often classified as wetlands, depending in part on their duration of saturation each year. Together, all of these elements affect hydrologic processes that can influence the condition of a watershed. Marine and estuarine resources/systems are discussed with a focus on water quality and ocean stewardship. Although impacts to terrestrial/freshwater and marine/estuarine resources and systems are discussed and analyzed separately, one conclusion is presented for water resources as a whole.

The following impact thresholds have been developed for analyzing water resources:

Negligible: Stream character, water quality, watershed processes, wetlands, and floodplains would not be impacted, or the impacts would be undetectable, or if detectable, the effects would be considered slight, localized, and short term. Any measureable changes would be within the natural range of variability.

Any impacts to marine/estuarine water quality and ocean resources would be slight, localized, and mostly inconsequential.

Minor: Impacts (chemical, physical, or biological) to stream character, water quality, watershed processes, wetlands, and floodplains would be small, short term, and localized. Natural processes, functions, and integrity would be temporarily affected, but would be within the natural range of variability. The impacts would only affect a few individuals of plant or wildlife species dependent on one or more of these water-related resources. Any changes would require considerable scientific effort to measure and have barely perceptible consequences.

Any impacts to marine/estuarine water quality and ocean resources would be noticeable and would be short term, requiring considerable scientific effort to measure and having barely perceptible consequences.

Moderate: Impacts (chemical, physical, or biological) to stream character, water quality, watershed processes, wetlands, and floodplains would be readily apparent, long term, and localized. Natural processes, functions, and integrity would be affected, but would be only temporarily outside the natural range of variability. The impacts would have a measurable effect on plant or wildlife species dependent on one or more of these water-related resources, but all species would remain indefinitely viable within the park and monument.

Any impacts to marine/estuarine water quality ocean resources would be noticeable and might be long term.

Major: Impacts (chemical, physical, or biological) would have drastic and permanent consequences for stream character, water quality, watershed processes, wetlands, and floodplains that could not be mitigated. Species dependent on one or more of these water-related resources would be at risk of extirpation from the park. Changes would be readily measurable, would be outside the natural range of variability, would have substantial consequences, and would be noticeable on a regional scale.

Any impacts to marine/estuarine water quality and ocean resources would be readily noticeable and long term, and would cause permanent damage or benefit.

Habitat (Vegetation and Wildlife)

Vegetation and wildlife are addressed together in this section, because an analysis of potential impacts to wildlife typically involves a discussion of wildlife habitat, which consists of various vegetation and aquatic communities found within the park and monument. Soils and substrates, topography, microclimates, and landscape configuration also affect habitats, but these elements are addressed in separate sections within the natural resources section of the environmental consequences part. Threatened and endangered species associated with these resources are discussed under a separate impact topic as well. The effects of the alternatives on marine resources and habitat are analyzed based on the possibility of impacts resulting primarily from facility development and visitor use.

The thresholds to determine impact intensity for these resources are defined as follows:

Negligible: There would be no observable or measurable impacts to the spatial extent of native species or their habitats, or the natural processes sustaining them. There would be no discernable change in native habitat integrity. Native and nonnative species richness and abundance would remain the same. Impacts would be of short duration and well within natural fluctuations.

Minor: Impacts would be detectable, but they would not be expected to be outside the natural range of variability and would not be expected to have any long-term effects on native species, their habitats, or the natural processes sustaining them. Any changes in native habitat integrity and native and nonnative species richness and abundance would be minimal.

Population numbers, population structure, genetic variability, and other demographic factors for species might have small, short-term changes, but long-term characteristics would remain stable and viable. Disturbance of some individuals could be expected, but without interference to reproduction or other factors affecting population levels.

Key ecosystem processes might have short-term disruptions that would be within natural variation. Habitat integrity would be maintained to support species' needs. Impacts would be outside critical reproduction periods for sensitive native species. Improvements to habitat quality may be detectable, but would not result in measurable improvements in ecosystem resiliency.

Alcatraz waterbirds would be affected by localized disturbance and/or unnaturally elevated predation levels. Few species would be affected, with potential for localized reduction in reproductive success and/or localized decline in size of subcolonies.

Moderate: Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and they could be outside the natural range of variability for short periods of time. Population numbers, population structure, genetic variability, and other demographic factors might experience short-term changes, but would be expected to rebound to pre-impact numbers and to remain stable and viable in the long term. Frequent responses to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, or other factors affecting short-term population levels.

Breeding animals of concern are present; animals are present during particularly vulnerable life-stages, such as migration or juvenile stages; mortality or interference with activities necessary for survival can be expected on an occasional basis, but is not expected to threaten the continued existence of the species in the park and monument.

Key ecosystem processes might have short-term disruptions that would be outside natural variation (but would soon return to natural conditions). Habitat integrity would be maintained to support species' needs. Some impacts might occur during critical periods of reproduction or in key habitat for sensitive native species. Improvements to habitat quality would be detectable and could result in measurable improvements in ecosystem resiliency.

Alcatraz waterbirds would be affected by disturbance and/or unnaturally elevated predation levels over a broader area of the island. More species would be potentially affected, there would be potential for long-term abandonment of subcolonies, with moderate reduction in population size (less than 50%).

Major: Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and they would be expected to be outside the natural range of variability for long periods of time or be permanent. Population numbers, population structure, genetic variability, and other demographic factors might have large, short-term declines, with long-term population numbers significantly depressed. Frequent responses to disturbance by some individuals would be expected, with negative impacts to feeding, reproduction, or other factors resulting in a long-term decrease in population levels.

The impact is severely adverse or exceptionally beneficial or would result in appreciable changes to wildlife resources and habitat; the effect would be regional in scale. Impacts would result in a reduction in species numbers, alteration in behavior, reproduction,

migration, or survival. Severe adverse impacts would alter or destroy habitat in a way that would prevent biological communities that inhabited the area prior to the action from re-establishing themselves. These impacts are expected to be outside the natural range of variability and may be permanent.

Key ecosystem processes might be disrupted in the long term or permanently. Loss of habitat integrity might affect the viability of at least some native species. Improvements to habitat quality would be detectable and permanent and would result in substantial improvements in ecosystem resiliency.

Many Alcatraz waterbird species would be affected by continuous, prolonged disturbance and/or unnaturally elevated predation levels. There would be potential for long-term subcolony or Island abandonment with significant reduction in Island population size (greater than 50%).

Special Status Species

Federal and state listed threatened and endangered species are addressed together in this section, because many of these species 1) have dual federal and state special status, 2) occur together in the same habitats, or 3) would be impacted similarly under each alternative. The environmental consequences for federal threatened and endangered species are described in such a way that meets the requirements of the National Environmental Policy Act and the Endangered Species Act. Definitions for impact conclusions required for Section 7 Endangered Species Act consultation are presented below:

No effect: When a proposed action would not affect a federal listed species, candidate species, or designated critical habitat.

May affect, not likely to adversely affect: Effects on federal listed or candidate species are discountable (i.e., extremely unlikely to occur and not able to be meaningfully measured, detected, or evaluated) or are completely beneficial.

May affect, likely to adversely affect: Adverse effects to a federal listed or candidate species may occur as a direct or indirect result of proposed actions and the effects are either not discountable or completely beneficial.

Likely to jeopardize proposed species or adversely modify proposed critical habitat (impairment): The appropriate conclusion when the National Park Service or the U.S. Fish and Wildlife Service identifies situations in which the proposal could jeopardize the continued existence of a federal listed or candidate species or adversely modify critical habitat to a species within or outside park boundaries.

The following impact threshold definitions are used to describe the severity and magnitude of changes to federal and state listed species under each of the alternatives. Each threshold definition references the Endangered Species Act determinations previously described.

Negligible: Impacts would be imperceptible or not measurable (undetectable). For federal listed species, this impact intensity would equate to a determination of “no effect.”

Minor: Impacts would be slightly perceptible and localized in extent; without further actions, adverse impacts would reverse and the resource would recover. Adverse impacts may include disturbance to individuals or avoidance of certain areas. Beneficial impacts would include slight increases to viability of the species in the park as species-limiting factors (e.g., habitat loss, competition, and mortality) are kept in check. For federal listed species, this impact intensity would equate to a determination of “may affect, not likely to adversely affect.”

Moderate: Impacts would be readily measurable (apparent) and extend farther geographically than a minor impact; localized in extent; adverse impacts would eventually reverse and the resource would recover. Adverse impacts may include disturbance, injury, or mortality of individuals, but the long-term viability of the population would be maintained. For federal listed species, this impact intensity would equate to a determination of “may affect, likely to adversely affect.” Beneficial impacts would include increases to viability of the species in the park as species-limiting factors (e.g., habitat loss, competition, and mortality) are kept in check. For federal listed species, this impact intensity would equate to a determination of “may affect, not likely to adversely affect.”

Major: Impacts would be substantial, highly noticeable, and affecting a large geographic area; changes would be irreversible with or without active management. Adverse impacts may include disturbance, injury, or mortality of individuals to the point that the long-term viability of the population would be compromised. In extreme adverse cases, effects would be irreversible and populations may be extirpated from the park. For federal listed species, this impact intensity would equate to a determination of “may affect, likely to adversely affect.” Beneficial impacts would include increases to viability of the species in the park as species-limiting factors (e.g., habitat loss, competition, and mortality) are substantially reduced and species resilience is enhanced by greatly improving habitat integrity. For federal listed species, this impact intensity would equate to a determination of “may affect, not likely to adversely affect.”

CULTURAL RESOURCES

Methodology

In this assessment, environmental impacts to cultural resources are described in terms of type (adverse or beneficial), context, duration (short-term, long-term, or permanent), and intensity (negligible, minor, moderate, major), which is consistent with the regulations of the Council on Environmental Quality that implement the National Environmental Policy Act. These impact analyses are intended, however, to comply with the requirements of both the National Environmental Policy Act and Section 106 of the National Historic Preservation Act. In addition to including Section 106 findings in this document, the National Park Service intends to submit an independent Finding of Effect to the California state historic preservation office on the final preferred alternative (which will constitute the “undertaking” for Section 106 purposes). See “Part 12: Consultation, Coordination, and Preparation” for more information on the Section 106 consultation with the state historic preservation office. In accordance with the Advisory Council on Historic Preservation’s regulations implementing Section 106 of the National Historic

Preservation Act (36 CFR Part 800, *Protection of Historic Properties*), impacts to cultural resources were also identified and evaluated by 1) determining the area of potential effects; 2) identifying cultural resources present in the area of potential effects that are either listed in or eligible to be listed in the National Register of Historic Places; 3) applying the criteria of adverse effect to affected, national register-listed or national register-eligible cultural resources; and 4) considering ways to avoid, minimize, or mitigate adverse effects. Cultural resources that could be affected under this project were identified by consulting with park cultural resources staff, reviewing previous studies and reports, reviewing site inventories and maps, conducting field visits to sites where actions may occur, and overlaying proposed actions on top of maps of known resources to identify potential direct and indirect impacts.

In accordance with 36 CFR 800, for historic properties in the area of potential effects that are listed in or eligible for listing in the National Register of Historic Places, the results are either *no historic properties affected* (either there are no historic properties present or there are historic properties present but the undertaking will have no effect upon them), or *historic properties affected* (there are historic properties that may be affected by the proposed action.) In addition, a determination of either *adverse effect* or *no adverse effect* must be made for affected national register-listed or national register-eligible cultural resources. A determination of *no adverse effect* means there is an effect, but the effect would not diminish the characteristics of the cultural resource that qualify it for inclusion in the national register. The ACHP regulations (36 CFR 800.5) define an adverse impact to a historic property as one that may

alter, directly or indirectly, any of the characteristic of a historic property that qualify it for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the national register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance, or be cumulative (36 CFR 800.5, Assessment of Adverse Effects).

Council on Environmental Quality regulations and the National Park Service's *Conservation Planning, Environmental Impact Analysis and Decision Making* (Director's Order #12) also call for a discussion of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact, e.g., reducing the intensity of an impact from major to moderate or minor. Any resultant reduction in intensity of impact due to mitigation, however, is an estimate of the effectiveness of mitigation under the National Environmental Policy Act only. It does not suggest that the level of effect as defined by Section 106 is similarly reduced. Cultural resources are nonrenewable resources and adverse effects generally consume, diminish, or destroy the original historic materials or form, resulting in a loss in the integrity of the resource that can never be recovered. Therefore, although actions determined to have an adverse effect under Section 106 may be mitigated, the effect remains adverse.

In addition, special consideration must be given to national historic landmarks during the planning process. Section 110(f) of the NHPA requires that a federal agency, to the maximum extent possible, minimize harm to a national historic landmark that may be

directly and adversely affected by an undertaking. When there is an adverse effect on a national historic landmark, the agency shall request the ACHP to participate in any consultation to resolve adverse effects. The agency shall also notify the Secretary of the Interior of any consultation and invite the Secretary to participate in the consultation where there may be an adverse effect. When this happens, the ACHP shall report the outcome of the Section 106 process to the President, the Congress, the Secretary of the Interior and the head of the lead federal agency, and provide written comments or any memoranda of agreement to which it is a signatory as a result of this consultation.

A Section 106 summary is included in the conclusion for each alternative's impact analysis sections. The Section 106 summary is an assessment of the effect of the undertaking (implementation of the alternative), based upon the criteria of effect and criteria of adverse effect found in the Advisory Council's regulations.

Historic Structures, Districts, and Cultural Landscapes

The following impact thresholds have been developed for analyzing impacts to historic structures and districts and cultural landscapes:

Negligible: Impacts would be at the lowest levels of detection, barely measurable with neither adverse nor beneficial consequences. Historic structures, districts, and cultural landscapes would incur no change or barely perceptible changes to the defining features that contribute to the resource's national Register eligibility. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Minor: Adverse Impact: Impacts would not affect the character-defining features of a historic structure, district, or cultural landscape listed or eligible for the National Register. Impacts would be measurable or detectable but would be slight and would not diminish the overall integrity of the resource. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Beneficial Impact: Historic features of the structure, district, or landscape would be stabilized and preserved in accordance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*, thus maintaining the integrity of the resource. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Moderate: Adverse Impact: Impacts would alter a character-defining feature(s) of a significant historic structure, district, or cultural landscape and would result in measurable and perceptible effects. These changes to one or more of the characteristics that qualify the resource for inclusion in the National Register could diminish the overall integrity of the resource but would not jeopardize its national register eligibility. For purposes of Section 106, the determination of effect would be *adverse effect*.

Beneficial Impact: Preservation and rehabilitation of the historic structure, district, or cultural landscape and its contributing features would be in accordance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Major: Adverse Impact: Impacts would result from substantial and highly noticeable changes that would alter the character-defining features of a historic structure, district, or cultural landscape. These impacts would be substantial, noticeable, and permanent. The action would severely change one or more characteristics that qualify the resource for the

National Register of Historic Places, and would diminish the overall integrity of the resource to the extent that it would no longer be eligible to be listed in the national register. For purposes of Section 106, the determination of effect would be *adverse effect*.

Beneficial Impact: The character-defining features of a historic structure, district, or landscape would be maintained and restored in accordance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Archeological Resources

The following impact thresholds have been developed for analyzing impacts to archeological resources:

Negligible: Impact is at the lowest level of detection. Impacts would be measurable but with no perceptible consequences. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Minor: Disturbance of a site results in little loss of integrity. The determination of effect for Section 106 would be *no adverse effect*.

Moderate: A site is disturbed but not obliterated. The determination of effect for Section 106 would be *adverse effect*.

Major: A site is obliterated. The determination of effect for Section 106 would be *adverse effect*.

Ethnographic Resources

The following impact thresholds have been developed for analyzing impacts to ethnographic resources:

Negligible: Impacts would be at the lowest levels of detection and barely perceptible. Impacts would neither alter resource conditions, such as traditional access or site preservation, nor alter the relationship between the resource and the affiliated group's body of practices and beliefs. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Minor: Impacts would be slight but noticeable and would neither appreciably alter resource conditions, such as traditional access or site preservation, nor alter the relationship between the resource and the group's body of beliefs and practices. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Moderate: Impacts would be apparent and would alter resource conditions or interfere with traditional access, site preservation, or the relationship between the resource and the affiliated group's beliefs and practices, even though the group's practices and beliefs would survive. For purposes of Section 106, the determination of effect would be *adverse effect*.

Major: Impacts would alter resource conditions. Proposed actions would block or greatly affect traditional access, site preservation, or the relationship between the resource and the group's body of beliefs and practices to the extent that the survival of a group's

beliefs and/or practices would be jeopardized. For purposes of Section 106, the determination of effect would be *adverse effect*.

Park Collections

Park collections (prehistoric and historic objects, artifacts, works of art, archival documents, and natural history specimens) are generally ineligible for listing in the National Register of Historic Places. As such, Section 106 determinations of effect are not provided. The following impact thresholds have been developed for analyzing park collections:

Negligible: Impact(s) would be at the lowest levels of detection – barely measurable with no perceptible consequences, either adverse or beneficial, to park collections.

Minor: Impact(s) would affect the integrity of a few items in the park collection but would not degrade the usefulness of the collection for future research and interpretation.

Moderate: Impact(s) would affect the integrity of many items in the park collection and diminish the usefulness of the collection for future research and interpretation.

Major: Impact(s) would affect the integrity of most items in the park collection and destroy the usefulness of the collection for future research and interpretation.

VISITOR USE AND EXPERIENCE

This impact analysis considers various aspects of visitor use and experience at Golden Gate National Recreation Area and Muir Woods National Monument, including the effects on diversity of recreation opportunities and national park experiences; visitor understanding, education, and interpretation; safe and enjoyable access and circulation to and within the park; and visitor safety.

The analysis is primarily qualitative rather than quantitative due to the conceptual nature of the alternatives. Impacts on visitor use and experience were determined considering the best available information. Information on visitor use and opinions were taken from the public scoping information for this plan and surveys of visitors and nonvisitors conducted by various researchers. Other information that was considered in the analysis includes the parks' annual reporting of visitor use levels, including overnight stays, to the National Park Service's Public Use Statistics Office, and local and regional travel and tourism data.

Primarily, visitors expressed interest in preserving and educating visitors about the unique natural and cultural resources of the park and monument, continuing to provide high-quality trail opportunities, exploring improved transportation and access to the park lands and better preserving the scenic beauty of the park's setting.

Impacts on visitor use and experience are described in terms of the effect on the following components:

- Diversity of recreation opportunities and national park experiences
- Visitor understanding, education, and interpretation

- Safe and enjoyable access and circulation to and within the park (see also transportation section)
- Visitor safety

The duration of a short-term impact would be less than one year. A long-term impact would last more than one year and would be more permanent in nature.

Adverse impacts are those that most visitors would perceive as undesirable. Beneficial impacts are those that most visitors would perceive as desirable.

The thresholds to determine impact intensity are defined as follows:

Negligible: Most visitors would likely be unaware of any effects associated with implementation of the alternative.

Minor: Changes in visitor opportunities and/or setting conditions would be slight but detectable, would affect few visitors, and would not appreciably limit or enhance experiences identified as fundamental to the park's purpose and significance.

Moderate: Changes in visitor opportunities and/or setting conditions would be noticeable, would affect many visitors, and would result in some changes to experiences identified as fundamental to the park's purpose and significance.

Major: Changes in visitor opportunities and/or setting conditions would be highly apparent, would affect most visitors, and would result in several changes to experiences identified as fundamental to park purpose and significance.

SOCIAL AND ECONOMIC ENVIRONMENT

When assessing the potential impacts to the social and economic environment, several impact parameters must be analyzed for each action alternative. First, the *type* of impact must be determined (i.e., whether the impact is beneficial or adverse). The beneficial and adverse impacts to the social and economic environment are determined by comparing the anticipated changes resulting from implementing any of the action alternatives to the results of continuing current management (i.e., the no-action alternative). Once it is determined if an impact is beneficial or adverse, the other impact attributes can be assessed, such as *context*, *duration*, and *intensity*.

Context: The context refers to the setting or geographic scope of the impact to the social and economic conditions. In this analysis, impacts will be measured relative to the following three context levels (when applicable):

- Local gateway communities (immediate proximity to park sites)
- Three adjacent counties (Marin, San Francisco, and San Mateo)
- Bay Area (nine-county region)

Intensity: The intensity refers to the significance or degree of the impact to the social and economic conditions. The thresholds are defined as follows:

- **Negligible:** No effects occur or the effects on social and economic conditions would be unnoticeable. The action would not yield any noticeable or measureable changes to quality of life, the population demographic, and local economy.
- **Minor:** The effects on social and economic conditions would be detectable, but only slight and limited to a small portion of the surrounding community and local economy. The action would minimally influence the quality of life, the population demographic, and/or local economy.
- **Moderate:** The effects on social and economic conditions would be readily apparent and would influence multiple segments of the community or local economy. The action would yield changes that are noteworthy or modest to the quality of life, the population demographic, and/or local economy.
- **Major:** The effects on social and economic conditions would be very apparent, significant, and/or widespread throughout the community and local economy. The action would yield considerable changes to the quality of life, the population demographic, and/or local economy.

In the discussion of impacts to the social and economic environment, an analysis section and conclusion section are included for each alternative for Golden Gate National Recreation Area including Alcatraz Island and Muir Woods National Monument, including the no-action alternative. Also, the analysis begins with a section that addresses the impacts from actions that are common to all action alternatives for both Golden Gate National Recreation Area and Muir Woods National Monument.

TRANSPORTATION

Planning alternatives for Golden Gate National Recreation Area and Muir Woods National Monument were developed for park lands in San Mateo, Marin, and San Francisco counties. For each of the three counties, as well as for Muir Woods National Monument, the proposed alternatives are discussed with respect to their qualitative effect on visitor access and circulation related to roadways, parking, bicycle access, pedestrian access, transit service, and access to transit. Muir Woods National Monument has been the subject of more detailed transportation analysis in recent years, enabling this section to include more quantitative analysis than the other areas.

Transportation impacts for the no-action alternative and the three action alternatives are discussed for park lands for each county and separately for Muir Woods National Monument.

- Marin County – southeast coastal area, southwest coastal area, Marin Headlands, and the Stinson Beach area
- San Francisco – Upper Fort Mason, China Beach, Lands End, East and West Fort Miley, Ocean Beach, and Fort Funston
- San Mateo County – multiple sites
- Muir Woods National Monument

Other than continuing and expanding shuttle service to Muir Woods National Monument, changes in transit service that would be provided by agencies other than the National Park Service, are not modeled.

Impacts on visitor access and on the transportation system are described in terms of their effect in the following areas, as applicable:

Multimodal Visitor Connections to Park Sites and Communities

- Access by land, including roads, public transit, tour buses, trails, and bicycles
- Access by water, including ferries, water taxis, or other water transit

Functionality of the Transportation System

- Land transportation, including traffic flow, congestion, and circulation; parking availability; transit service availability; transit facility capacity; amenities and condition; and public safety
- Water transportation, including facility capacity and condition, multimodal access, and public health and safety
- Connectivity, including number and capacity of connections, and availability of modes of travel
- Directional and park site identification signs and wayfinding information

For this analysis, equestrian activity is considered recreational and is not included as part of the transportation system.

Definitions

Type: The impact is determined to be either beneficial or adverse. The beneficial and adverse impacts to the transportation system are determined by comparing the anticipated changes resulting from implementing any of the action alternatives to the results of continuing current management (i.e., the no-action alternative).

Intensity: The intensity refers to the significance or degree of the impact to the transportation system. The thresholds are defined as follows:

Negligible: Most visitors would likely be unaware of any effects associated with implementation of the alternative.

Minor: Changes in visitor access/circulation would be slight but detectable, would affect few visitors, and would not appreciably limit or enhance visitors' ability to visit park sites or move within park sites.

Moderate: Changes in visitor access/circulation would be noticeable, would affect many visitors, and would result in some changes to visitors' ability to visit park sites or move within park sites.

Major: Changes in visitor access/circulation would be highly apparent, would affect most visitors, and would result in many changes to visitors' ability to visit park sites or move within park sites.

In addition to the aforementioned terms, four terms are used to describe the seasonality of transportation impacts:

Peak season: The impact would occur primarily from Memorial Day through Labor Day.

Shoulder season: The impact would affect transportation in April and May in the spring, and in September in the fall.

Low visitation or offseason: The impact would occur primarily from October 1 through April 30.

Year-round: The impact would affect visitor experiences for much of the year, especially if adverse effects during peak months had the effect of spreading visitation more evenly throughout the year.

PARK MANAGEMENT, OPERATIONS, AND FACILITIES

The impact analysis evaluated the effects of the alternatives on Golden Gate National Recreation Area and Muir Woods National Monument operations, including staffing, infrastructure, maintenance, visitor facilities, and services.

The analysis focused on how operations and facilities might vary with the different management alternatives. The analysis is qualitative rather than quantitative because of the conceptual nature of the alternatives. Consequently, professional judgment was used to reach reasonable conclusions as to the intensity, duration, and type of potential impact.

The following impact thresholds have been developed for analyzing park management, operations, and facilities:

Negligible: The effect would be at or below the lower levels of detection, and would not have an appreciable effect on park operations and management

Minor: The effects would be detectable, but would be of a magnitude that would not have an appreciable effect on park operations and management.

Moderate: The effects would be readily apparent and would result in a change in park operations and management in a manner noticeable to staff and the public.

Major: The effects would be readily apparent and would result in a substantial change in park operations and management in a manner noticeable to staff and the public. The change would produce conditions that would be markedly different from existing operations.

IMPAIRMENT OF PARK RESOURCES

In addition to determining the environmental consequences of implementing the alternatives, *NPS Management Policies 2006* (section 1.4) requires analysis of potential effects to determine whether alternatives would impair the park's resources and values.

The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve resources and values. National Park Service managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on resources and values. Although Congress has given the National Park Service the management discretion to allow certain impacts within a unit, that discretion is limited by the statutory requirement that the National Park Service must leave resources and values unimpaired unless a particular law directly and specifically provides otherwise.

The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of resources and values, including the opportunities that otherwise would be present for the enjoyment of those resources or values (*NPS Management Policies 2006* section 1.4.5). An impact would be more likely to constitute impairment if it 1) results in a moderate or major adverse affect on a resource or value whose conservation is necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the area; 2) is key to the natural or cultural integrity of the area or to opportunities for enjoyment of the area; or 3) is identified as a goal in the area's general management plan or other relevant NPS planning documents.

A determination on impairment is made in the "Conclusion" section for each required impact topic related to the park's resources and values. An evaluation of impairment is not required for topics related to visitor use and experience (unless the impact is resource based), the social and economic environment, or NPS operations. When it is determined that an action or actions would have a moderate to major adverse effect, an explanation is presented of why this would not constitute impairment. Impacts of negligible or minor intensity would not, by definition, result in impairment. The impairment analysis for each of the impact topics, found later in this part, has determined that none of the alternatives presented in this plan would result in impairment of park resources.

COMMON TO ALL ALTERNATIVES AT GOLDEN GATE NATIONAL RECREATION AREA AND MUIR WOODS NATIONAL MONUMENT

NATURAL RESOURCES

Analysis

The goals and strategies that are common to all action alternatives include policy guidance on a variety of topics that would have an impact on natural resources. These topics include park boundaries, climate change, ocean stewardship, partnerships, Redwood Creek Vision, Sharp Park, transportation, trails, and park collections. In general, all of the guidance that is included would have a beneficial impact on natural resources.

For example, the park boundaries policy (see Volume I, Part 3) contains goals for science-based land and water acquisition that would improve the integrity of natural resources. It also includes the proposed acquisition of several parcels of land and water in San Mateo County as well as potential future boundary adjustments across the park.

The policy on climate change includes goals for greenhouse gas emissions reduction and responding to the effects of climate change on natural resources. The management approach that is included seeks to reduce environmental stressors, maintain biological diversity, and develop adaptation responses to build resiliency in natural systems and species.

The ocean stewardship policy includes management strategies and objectives that would help to protect ocean resources through improved research and collaborative management with other state and federal agencies.

The partnerships policy would assist the National Park Service in developing collaborative arrangement with other park partners whose programs have shared goals, including preservation of natural resource management.

The Native American engagement policies could have minor, adverse impacts on vegetation and wildlife impacts due to the collection of natural materials. Coordination between Native Americans and park staff would ensure that habitat integrity would be maintained.

The transportation policy includes goals for multimodal and alternative transportation, which would assist the National Park Service in reducing its carbon footprint and air quality concerns in the Bay Area.

The trails policy includes goals on sustainable trail design and best management practices, which would assist the National Park Service in improving habitat quality and integrity by reducing impacts from erosion, exotic and invasive species, and habitat fragmentation.

The park collections policy would benefit natural resources by ensuring that natural resource specimens (whether geologic, botanical, etc.) are properly protected and managed.

Conclusion

Overall, impacts to natural resources resulting from these policies would be long term, beneficial, and would range from negligible to moderate, throughout Golden Gate National Recreation Area and Muir Woods National Monument.

CULTURAL RESOURCES

Analysis

Development of new or improved maintenance hubs, a public safety hub, satellite maintenance offices, and parking areas, as well as expanding the park's trail system and improving connectivity and accessibility, could adversely impact the park's archeological resources, historic structures, and cultural landscapes. As appropriate, archeological surveys and/or monitoring would precede any ground disturbance. National register eligible or national register listed archeological resources would be avoided to the greatest extent possible. If such resources could not be avoided, an appropriate mitigation strategy would be developed in consultation with the California state historic preservation office and, if necessary, associated American Indian tribes. If during construction, previously unknown archeological resources were discovered, all work in the immediate vicinity of the discovery would be halted until the resources could be identified and documented; if the resources could not be preserved *in situ*, an appropriate mitigation strategy would be developed in consultation with the state historic preservation office and associated American Indian tribes. Because national register eligible or national register listed archeological resources would be avoided to the greatest extent possible, any adverse effects would be expected to be minor to moderate in intensity and permanent.

Archeological resources adjacent to or easily accessible from trails and developed areas could be vulnerable to surface disturbance, inadvertent damage, and vandalism. A loss of surface archeological materials, alteration of artifact distribution, and a reduction of contextual evidence could result. However, continued ranger patrol and emphasis on visitor education would help to discourage vandalism and inadvertent destruction of cultural remains, and any adverse impacts would be expected to be negligible to minor.

Every effort would be made to establish new or improved maintenance hubs, a public safety hub, satellite maintenance offices, and parking facilities in existing developed areas or in rehabilitated historic buildings whose architectural values are protected and preserved. Careful design of new facilities would ensure that new structures would minimally affect the scale and visual relationships among existing landscape features or circulation patterns and features. In addition, the topography, native vegetation patterns, and land use patterns would remain largely unaltered. Any adverse impacts would be long term and of minor intensity. Improved maintenance facilities and programs would enable the park to conduct more comprehensive cultural resource preservation and maintenance programs and thus enhance protection of the park's cultural resource values—a beneficial impact.

Inclusion of the San Mateo County properties (Gregerson Property adjacent to Rancho Corral de Tierra, Vallemar Acres, and Highway Frontage in the West Cattle Hill vicinity) and potential future boundary adjustments (the Marin City Ridge, Pacifica Conservation

Area, Montara Mountain Complex, San Mateo County gateway, and Bolinas Lagoon) would result in enhanced identification, protection, and interpretation of archeological resources, historic structures, and cultural landscape values in those areas per NPS cultural resource policies, but only if appropriate funding and FTEs were to be expended on them.

Implementation of the park's climate change policy and action plan would result in 1) an understanding of how to protect and preserve the park's archeological resources, historic structures, and cultural landscapes by reducing current stressors to such resources, 2) assisting in development of triage criteria for prioritizing preservation treatments and other management actions for cultural resources, such as relocation coupled with sustainable mitigation efforts for shoreline resources, and 3) guiding managed retreat programs when the triage process indicated that preservation treatment or relocation was not a feasible option.

Establishing a curatorial and research facility that meets NPS standards and can accommodate the majority of the park collection will have a long-term beneficial impact to the preservation of the collections. Strengthening the collection policy and implementing actions to connect people with the park's museum will have a beneficial impact by increasing public stewardship opportunities, access to the park's history, and integration of the park collections into the park's visitor experience.

Implementation of the park's Ocean Park Stewardship Policy would result in improved identification, understanding, protection, and preservation of the park's archeological (i.e., submerged) resources.

Ongoing NPS efforts to establish and foster effective partnerships would result in beneficial impacts on the park's archeological resources, historic structures, and cultural landscapes because partnerships 1) create appreciation and support for the park's resources and 2) increase avenues through which communities and visitors can engage with the park to preserve and enhance those resources.

Implementation of the Redwood Creek Vision would result in enhanced collaborative efforts to identify, protect/preserve, and interpret archeological resources, historic structures, and cultural landscapes in the Redwood Creek watershed.

Ongoing and enhanced Native American engagement programs and protocols by the park with the Federated Indians of Graton Rancheria and Ohlone tribes and individuals would result in improved cultural resource management of archeological and ethnographic sites, collaborative interpretation and education activities, and revitalization of Native American communities, traditions, and heritage.

Additionally, improving ferry access to Alcatraz Island and establishing ferry routes to other park sites within San Francisco Bay would result in better preservation of the cultural resources by minimizing transportation impacts to its cultural landscape values.

Execution of implementation plans for Alcatraz, such as preparation of a cultural landscape report, historic resource study, and baseline inventory and Historic American Buildings Survey recovery plan, would provide the National Park Service with the knowledge to better preserve and more effectively interpret the multiple layers of historic development associated with the island's significant archeological resources, ethnographic sites, historic structures, and cultural landscapes.

Conclusion

Because national register eligible or national register listed archeological resources would be avoided to the greatest extent possible, any adverse effects would be expected to be minor to moderate in intensity and permanent. A loss of surface archeological materials, alteration of artifact distribution, and a reduction of contextual evidence could result. However, continued ranger patrol and emphasis on visitor education would discourage vandalism and inadvertent destruction of cultural remains, and any adverse impacts would be expected to be negligible to minor. Careful design of new facilities would ensure that new structures would minimally affect the scale and visual relationships among existing landscape features or circulation patterns and features. In addition, the topography, native vegetation patterns, and land use patterns would remain largely unaltered. Any adverse impacts would be long term and of minor intensity. Improved maintenance facilities and programs would enable the park to conduct more comprehensive cultural resource preservation and maintenance programs and thus enhance protection of the park's cultural resource values—a beneficial impact.

Actions common to all alternatives would generally have beneficial impacts on the protection and preservation of archeological resources, ethnographic sites, historic structures, and cultural landscapes in Golden Gate National Recreation Area including Alcatraz Island. Any adverse effects to archeological resources and ethnographic resources would be expected to be negligible to moderate in intensity and permanent. Any adverse impacts to cultural landscape resources (including historic structures) would be long term and of minor intensity.

Concerning the actions common to all alternatives, the Section 106 determination of effect on archeological resources, ethnographic sites, historic structures, and cultural landscapes in Golden Gate National Recreation Area including Alcatraz Island is *adverse effect*.

Because there would be no major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Golden Gate National Recreation Area; 2) key to the natural or cultural integrity of the park; or 3) identified as a goal in the park's general management plan or other relevant NPS planning documents, there would be no impairment of Golden Gate National Recreation Area's resources or values.

VISITOR USE AND EXPERIENCE

Analysis

In addition to the specific proposals in the action alternatives, some of the recommendations and policies that are common to all action alternatives would have a beneficial impact on visitor use and experience at both Golden Gate National Recreation Area and Muir Woods National Monument. Several of the proposed boundary adjustments would provide new lands for recreation, expanding the diversity of settings, and new lands for access purposes, facilitating better access options to various park sites; both of these would have a beneficial impact on visitor use and experience. The recommendations for educating visitors on climate change and ocean stewardship would

have a beneficial impact on visitor experience by providing visitors with direct access to the latest research and knowledge, providing increased awareness and inspiration regarding these important subjects. Actions that improve the preservation and visitor access to the park collection would strengthen the park's interpretive and education programs. The new public safety office proposed at Sheldance Nursery would have a beneficial impact on visitor safety by providing shorter response times and a constant NPS presence in the southern portion of Golden Gate National Recreation Area. The partnership strategy will ensure that NPS partnerships continue to serve the needs of visitors with high-quality services, facilities, and opportunities. If the park ends up owning or managing portions of Sharp Park that are contiguous to lands managed by the National Park Service, visitors would benefit from additional trail-based recreation and educational opportunities. These actions would have a long-term, moderate beneficial impact on the visitor experience to the park.

The transportation strategy emphasizes the goal of providing sustainable, multimodal access to many park sites, which would benefit visitors by reducing traffic congestion and use conflicts, and facilitating more efficient access to and between park sites. Finally, the trails strategy emphasizes the goal of providing an enduring trail system that serves as a sustainable network of access within and between park sites. Trails provide one of the most important ways that visitors experience and enjoy the park and discover its diverse settings. Providing a long-term strategy to perpetuate a coordinated and sustainable trail and transportation system would result in a long-term, moderate, beneficial impact to the visitor experience.

Conclusion

The recommendations and policies that are described in the actions common to all alternatives will have a long-term, moderate, beneficial influence on the visitor experience at the park. Visitors would be provided enhanced access throughout the park by improved trails and transportation systems, increased opportunities for interpretation and education supported by the park collections and new programs related to climate change and ocean stewardship. Strengthening the park partnership programs and preservation of park resources by potential expansion of park boundaries and expanded increased public safety facilities would contribute to improvements to the visitor experience.

SOCIAL AND ECONOMIC ENVIRONMENT

Analysis

The improvement of community connectivity to Golden Gate National Recreation Area park sites via an expanded transportation system, multimodal opportunities, and enhanced regional trail network could improve the quality of life of residents in the area. More residents of local communities would be able to visit the park to exercise, enjoy the natural coastal settings, participate in outdoor recreational activities, educational and stewardship programs, or simply have a place to escape the urban environment. These improved community connections with the park could result in an impact that is long

term, minor to moderate, and beneficial for the local gateway communities and adjacent counties.

In addition, a comprehensive education and stewardship program would be developed to engage the public in natural and cultural stewardship issues and educate them about park resources and the threats to their preservation. With more and more residents of the community becoming more aware and engaged in these important issues, communities could benefit as residents and organizations take actions that move toward sustainability, decrease waste and pollution, and other measures that could contribute to improvements to the community's quality of life. This education and stewardship effort would be pursued in all alternatives, resulting in an impact that could be long term, minor, and beneficial in the context of the local gateway communities and three adjacent counties.

All actions that are common to all alternatives would continue to improve the National Park Service's efforts at maintaining a healthy and productive relationship with Native American communities in the area. These efforts would codify and continue the park's policy to work with Coast Miwok and Ohlone communities in activities related to cultural resource management, interpretation and education, and the revitalization of community and tradition. This effort to maintain and improve communication with the Native Americans in the region would be pursued in all alternatives, resulting in an impact that would be long term, minor, and beneficial for the local gateway communities, adjacent counties, and the Bay Area as a whole.

The actions common to all alternatives maintain a strong commitment and strategy for using park partnerships as a tool to provide park programs, preservation activities, and community engagement in park issues while also contributing to the success of the park partner organizations and agencies. For the National Park Service, this commitment would provide a cost-effective way to enhance park services, improve visitor opportunities, and engage the community. For the various partners, this commitment and strategy would help build and expand organization success and outreach. This emphasis on partnerships would also increase programs and opportunities for the public to enjoy, which could increase the quality of life for local residents. This effort would be maintained and improved in all alternatives, resulting in an impact that would be long term, moderate, and beneficial for the local gateway communities. The impact would be long term, minor to moderate, and beneficial for the three adjacent counties.

In addition to the actions described in the section "Actions Common to All Alternatives," each alternative also includes a proposed action that would ultimately close the Sheldance Nursery (a commercial operation in Pacifica). This may be considered an adverse impact to quality of life for some community members who have actively visited the nursery in the past. In addition, this closure could be considered an adverse impact to local economy due to job loss, sales tax revenue loss, and the loss of the multiplier effect of the business monies and its employee salaries. The collective result would be an impact that is long term, minor, and adverse for the local gateway communities. The impact to the three adjacent counties would be negligible. However, it should be noted that the programs and facilities that may eventually replace the nursery would likely offset some of these impacts by creating employment and community involvement opportunities.

Conclusion

The overall impact to the social and economic environment from actions that are common to all alternatives could be long term, minor to moderate, and beneficial with an affected area that ranges from the local gateway communities to the overall Bay Area. The beneficial impacts would result from the policies and guidance for boundary changes, climate change, ocean stewardship, museum collections, and partnership strategy. Improved parkland accessibility via multimodal transportation and regional trail systems would also yield beneficial impacts by enhancing connections between communities and the park. The park staff commitments to the Native American community and park partners increase the connections and opportunities in preserving park resources and providing visitor opportunities. All these actions contribute to improving the quality of life and local economy.

The closure of Shelldance Nursery would have a long-term, minor, adverse impact to the local gateway community.

TRANSPORTATION

Analysis

Common to all areas are improved wayfinding systems that include effective directional signs, site identification, and other wayfinding signs that would facilitate safe and efficient access by all modes of transportation.

Marin County

In terms of transportation improvements, actions that are common to all alternatives would pursue multimodal transportation access opportunities to additional park sites. One example of this pursuit is the National Park Service collaboration with the Water Emergency Transportation Authority in developing multiple park access points to this Bay Area ferry system (e.g., between Fort Baker, Fort Mason, and the Presidio and potentially other park sites).

In the southwest coast area (Muir Beach to Point Bonita), beach and trail access to Muir Beach would be improved while preserving the area's natural setting. Regional trail connections would be enhanced; where possible, trail improvements would connect to the California Coastal Trail. Cumulatively, these measures would provide a long-term, minor to moderate, beneficial impact on visitor access to the park through improved trails.

Increased transit, including increased Muir Woods Shuttle service, would reduce congestion, minimize impacts on natural resources, and provide a way to get to the beach without a car. A new and increased transit service could also reduce parking demand within park locations, increasing it at transit access points adjacent to or outside of park lands. Increased transit would yield a long-term, moderate, beneficial impact to transportation by increasing the number and capacity of connections and availability of non-auto modes of travel.

The park staff would also continue to work with the community and Marin County to manage parking and reduce traffic in Stinson Beach using congestion management tools. In the developed beach area, the parking lot would be replaced by a more sustainable

parking facility. This would have a long-term, minor to moderate, beneficial impact on visitor access to the park, depending on the success of the congestion management efforts. Also at Stinson Beach, the park staff would explore ways to improve non-auto access to the beach, such as promoting public transportation on weekends during the peak season.

Park managers would work with Marin County and state parks to explore realignment of Muir Woods Road to reduce impacts to Redwood Creek. A realignment of Muir Woods Road would have a short-term, moderate, adverse effect on access to the monument for the duration of construction activities.

San Francisco County

All action alternatives for San Francisco County include the following transportation measures:

Trails would be improved to China Beach and Fort Funston. Safer and more direct trail access to East Fort Miley would be created. The trail system in Lands End would be improved to provide access to the shoreline and vistas, as well as connections to the community and adjacent park areas. All of these measures, both individually and cumulatively, would result in a long-term, minor, beneficial impact on circulation both to and within these park areas.

At Upper Fort Mason the visitor circulation and wayfinding improvements would be implemented in response to new adjacent bus transit and ferry connections. This would have a long-term, minor, beneficial impact on connecting people arriving by transit to this site.

At Ocean Beach the park would collaborate with the City of San Francisco to enhance the Ocean Beach corridor with improved amenities including improved parking facilities. This may have a long-term, minor, beneficial impact on the transportation system by increasing parking availability.

San Mateo County

All action alternatives for San Mateo County would include improvements to connect park lands to local communities, improve trails between and within park sites, and add trailheads and parking with improved wayfinding. Specific common improvements include new or improved trails provided along the beach, dunes, and cliffs extending from San Francisco's Fort Funston south to Mussel Rock. Also, modest visitor access facilities (trails, trailheads) to beaches, scenic overlooks, and along the California Coastal Trail between Thornton State Beach to south of Mussel Rock, would be added. Possible trail improvement at Milagra Ridge could include connections to Oceana Boulevard, the Pacific Coast, Skyline Boulevard, and Sweeney Ridge. The Sheldance Nursery site would transition from a commercial nursery to an area providing a variety of visitor services including possible enhanced trailhead parking serving Sweeney Ridge and Mori Point. Access from State Route 1 and the trail connection to Mori Point would be improved. The developed portion of Picardo Ranch would see trailhead and parking improvements.

Trailheads and trails would be developed and enhanced to improve accessibility and connections to the California Coastal Trail and adjacent public lands.

From Phleger Estate, trail connections to adjacent lands and the regional trail system would be pursued in collaboration with San Mateo County and San Francisco Public Utilities Commission. These connections would include the Bay Area Ridge Trail and a potential multiuse trail connection between Cañada Road and Skyline Boulevard north of Phleger Estate.

All of these measures would provide, individually and cumulatively, a long-term, moderate, beneficial impact on accessibility of these remote sites by trails connected to neighborhoods and to larger regional trails. Improved and new trailheads, trailhead parking, and improved directional signs, site identification, and wayfinding signs would also add considerable benefits. Long-term, minor, beneficial effects would be gained through slightly increasing parking at Sheldance Nursery and Sweeney Ridge.

Conclusion

Throughout Golden Gate National Recreation Area, there would be long-term, minor to moderate, beneficial effects on visitor connections to the park sites by land through improved and enhanced trail systems. The potential to increase the transit frequency to park sites in Marin and San Mateo counties would have a long-term, minor to moderate, beneficial impact on connectivity by transit. In San Francisco and San Mateo counties, there would be a long-term, minor to moderate, beneficial enhancement of transportation functionality through slightly increased parking for San Francisco sites and moderately increased parking for San Mateo sites. In Marin County, parking management tools, in connection with increased transit services, could result in a long-term, moderate, beneficial effect on improving access to Tennessee Valley and Stinson Beach, especially for those who do not have access to a car.

PARK MANAGEMENT, OPERATIONS, AND FACILITIES

Analysis

There are many proposed changes identified in the “actions common to all actions alternatives” section that would influence park management, operations, and facilities. While designed to contribute to the protection of resources and the enhancement of visitor opportunities, the proposed changes will achieve these ends only if staffing and operating funds are increased in accordance with the expanded services and management required to implement the alternatives. If funding and needed staffing levels are not made available when these actions are implemented, the following proposed actions would have long-term, moderate, adverse effects on park operations:

- Proposed boundary changes: Currently staff is unable to meet all of the needs of the existing land base. Additional land will require an increase in the number of park staff and an increase in facility management funds.
- Implementation of the climate change policy and the Ocean Stewardship Program: These changes would require additional staff and funds for baseline information, monitoring, and adaptive management actions; new infrastructure for alternative energy production (although some of these initial costs would result in lower costs in the long run); and additional funding and staff to implement the education aspect of these programs.

- Transportation goals and trail planning and development: water shuttle, ferry, and Bay Trail proposals would require extensive inter-agency collaboration and potential development related to access; these actions would require additional long-term staffing and funding increases. The park's trail goals also would require increased staffing, coordination with partners, and funding for trails and maintenance.

Many of the proposed changes identified in the “actions common to all actions alternatives” would address problems associated with operations and maintenance and thereby have a positive, long-term, minor to moderate, beneficial effect on park management, operations, and facilities:

- The removal of facilities not contributing to the mission of the park would have a long-term, minor to moderate, beneficial effect on park operations. While removal of properties would require additional staff time during demolition, the long-term effect would be a reduced need for maintenance and other staff attention.
- Implementation of the park collections policy, and particularly the introduction of a curatorial and research facility for park collections, would benefit park operations. Collections would be consolidated from 15 current locations, improving access for both park staff and the public and preservation of the collections. Development of the proposed park collection facility would result in long-term, moderate, beneficial impact to park operations.
- The proposed new maintenance hubs in the Capehart residential area and in the Presidio of San Francisco would allow for reuse of existing buildings and would consolidate some maintenance needs. This would achieve noticeable efficiencies. On the other hand, the Capehart location has a potential to conflict with neighboring residents and would also cause the loss of some of the park housing units, unless the units are replaced by other housing in the park. Development of the maintenance hubs would result in long-term, moderate, beneficial impacts to operations.
- The establishment of a public safety hub at Fort Baker would allow for faster multi-agency response to locations north of the Golden Gate Bridge. The hub would preserve an existing historic building and would meet space, size, function, mobility, and security requirements not currently met by available facilities. Development of the public safety hub would result in long-term, moderate, beneficial impacts to park operations.
- The park's commitment to working with partners would have a continued impact on the park's ability to complete projects and programs in all areas of park operations. Facility rehabilitation and restoration, and even maintenance, could not be accomplished at the current level without partner funding and volunteer efforts. This continued commitment would result in long-term, moderate, beneficial impacts to the operations of the park.
- Collocating offices with San Mateo County would improve efficiencies in interpretation and education as well as facility use. Collocated offices would provide a long-term, moderate, beneficial impact to the operations.

- At Alcatraz Island, the expanded maintenance area within the Quartermaster Warehouse would improve the ability to accomplish maintenance work on the island. The expansion and improvement to the maintenance area would result in a long-term, moderate, beneficial impact to operations.
- At Muir Woods National Monument, moving the maintenance operations from the Old Inn and Lower Conlon Avenue to a new facility in Kent Canyon, pending an interagency agreement, would improve efficiencies with both the monument and state park operations, reduce site impacts at Muir Woods National Monument, and provide for a more modern facility from which to base maintenance activities at the monument. The shared facility would moderately benefit operations over the long term.

Conclusion

Many of the actions common to all alternatives would result in moderate, beneficial impacts to park management, operations, and facilities. However, if funding and staffing levels are inadequate, other actions would result in long-term, major, adverse effects to park management, operations, and facilities.

GOLDEN GATE NATIONAL RECREATION AREA, INCLUDING ALCATRAZ ISLAND

NATURAL RESOURCES – PHYSICAL RESOURCES

Carbon Footprint and Air Quality

No-action Alternative

Analysis

The continuation of current conditions and management would continue to result in adverse impacts to air quality/carbon footprint. Baseline greenhouse gas (GHG) emissions (2008) for Golden Gate National Recreation Area (park lands in Marin and San Francisco counties only; no data is available for San Mateo County) are estimated at 5,249 MTCE. Emissions from mobile combustion represent about 50% of gross emissions.

At Alcatraz Island, mobile combustion associated with the operation of the ferry concession would continue to be the largest contributor of island GHG emissions. Stationary combustion associated with power generation using diesel generators would be eliminated and converted to conventional power supply from the mainland and onsite generated renewable energy, thereby reducing total emissions. Total GHG emissions for Alcatraz Island under the no-action alternative would be 1,675 MTCE.

Total gross emissions of the entire Golden Gate National Recreation Area/Alcatraz Island (excluding San Mateo) would be 6,924 MTCE.

Greenhouse Gas emissions from visitors and NPS operations do contribute to elevated ozone and other air quality concerns. The National Park Service would continue to reduce greenhouse gas emissions by reducing energy consumption and replacing high-emitting apparatus with green technology—a beneficial impact.

Overall, when compared to background levels of air pollution and GHG emissions in the region or the nation (estimated at 6 billion in 2007), impacts to air quality from the no-action alternative would be long term, adverse, and negligible.

Conclusion

Total gross emissions of the entire Golden Gate National Recreation Area and Alcatraz Island (excluding San Mateo) would be 6,924 MTCE, resulting in long-term, minor to moderate, adverse impacts to the park's carbon footprint. Overall, when compared to background levels of air pollution and GHG emissions in the region or the nation (estimated at 6 billion in 2007), impacts to air quality from the no-action alternative would be long term, adverse, and negligible.

No impairment of air resources would result from this alternative.

Alternative 1: Connecting People with the Parks (NPS Preferred Alternative for Park Sites in Marin, San Francisco, and San Mateo Counties)

Analysis

Although visitor opportunities would be expanded and enhanced under alternative 1, the levels and patterns of visitor use and travel within the park under alternative 1 would remain substantially the same as under the no-action alternative; consequently, the impacts to air quality/carbon footprint resulting from visitor use at Golden Gate National Recreation Area would be the same as under the no-action alternative.

Impacts to air quality/carbon footprint from new recreational development under alternative 1 would result in short-term, minor, adverse impacts due to emissions associated with construction activities. Long-term, adverse impacts on air quality/carbon footprint would also be expected due to increases in energy consumption and related emissions attributed to these new facilities.

Beneficial impacts would occur from the removal of a modest number of facilities and structures that use energy for their operation and maintenance, resulting in long-term reductions in air quality emissions and the carbon footprint. Short-term adverse impacts to air quality would occur as a result of the construction activities needed to remove the facilities and reclaim the disturbed sites.

Under alternative 1, gross emissions for the three-county area of Golden Gate National Recreation Area would be reduced by 3% to 5,104 MTCE.

At Alcatraz Island, visitor opportunities would be expanded and there would be access to more areas on the island, resulting in increased ferry transportation and visitor use. This would result in slightly increased emissions associated with the ferry concession (mobile combustion) and wastewater treatment. Emissions associated with energy use would also increase due to increases in facility usage and energy demand. Gross emissions for Alcatraz Island under alternative 1 could increase by about 15% to 1,936 MTCE.

The combined effect of the actions included in alternative 1 would increase the gross emissions of the entire park (the three-county area and Alcatraz Island) by 2% to 7,040 MTCE. This would result in long-term, minor, adverse impacts on the Park Service's carbon footprint. As in the no-action alternative, impacts to air quality (when compared to background levels of air pollution in the region and nation) would be negligible.

Conclusion

The combined effect of the actions included in alternative 1 would increase the gross emissions of the entire park (the three-county area and Alcatraz Island) by 2% to 7,040 MTCE. This would result in long-term, minor, adverse impacts on the National Park Service's carbon footprint. As in the no-action alternative, impacts to air quality (when compared to background levels of air pollution in the region and nation) would be negligible.

No impairment of air resources would result from this alternative.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

Although visitor opportunities would be expanded and enhanced under alternative 2, the levels and patterns of visitor use and travel within Golden Gate National Recreation Area would remain substantially the same as under the no-action alternative; consequently, the impacts to air quality/carbon footprint resulting from visitor use would be the same as under the no-action alternative.

Impacts to air quality/carbon footprint from new recreational development under alternative 2 would result in short-term, minor, adverse impacts due to emissions associated with construction activities. Long-term, adverse impacts on air quality/carbon footprint would also be expected due to increases in energy consumption and related emissions attributed to these new facilities.

Beneficial impacts would occur from the removal of certain facilities and structures that use energy for their operation and maintenance, resulting in long-term reductions in air quality emissions and the carbon footprint. Short-term adverse impacts to air quality would occur as a result of the construction activities needed to remove the facilities and reclaim the disturbed sites.

Under alternative 2, gross emissions for the three-county area of Golden Gate National Recreation Area would be reduced by 10% to 4,708 MTCE, the lowest of all of the alternatives for the three-county area.

At Alcatraz Island, visitor opportunities would be expanded and would result in increased ferry transportation and visitor use on the island. This would result in slightly increased emissions associated with the ferry concession (mobile combustion) and wastewater treatment. Emissions associated with energy use would also increase due to increases in facility usage and energy demand. Gross emissions for Alcatraz Island under alternative 2 would increase by about 7% to 1,798 MTCE, the lowest of the three action alternatives for Alcatraz Island.

The combined effect of the actions included in alternative 2 would reduce the gross emissions of the entire park (the three-county area and Alcatraz Island) by 6% to 6,506 MTCE, the lowest of all of the alternatives. This would result in long-term, minor, beneficial impacts on the park's carbon footprint. As in the no-action alternative, impacts to air quality (when compared to background levels of air pollution in the region and nation) would be negligible.

Conclusion

The combined effect of the actions included in alternative 2 would reduce the gross emissions of the entire park (the three-county area and Alcatraz Island) by 6% to 6,506 MTCE, the lowest of all of the alternatives. This would result in long-term, minor, beneficial impacts on the park's carbon footprint. As in the no-action alternative, impacts to air quality (when compared to background levels of air pollution in the region and nation) would be negligible.

No impairment of air resources would result from this alternative.

***Alternative 3: Focusing on National Treasures
(NPS Preferred Alternative for Alcatraz Island)***

Analysis

Although visitor opportunities would be expanded and enhanced under alternative 3, the levels and patterns of visitor use and travel within the park under alternative 1 would remain substantially the same as under the no-action alternative; consequently, the impacts to air quality/carbon footprint resulting from visitor use would be the same as under the no-action alternative.

Impacts to air quality/carbon footprint from new recreational development under alternative 3 would result in short-term, minor, adverse impacts due to emissions associated with construction activities. Long-term, adverse impacts on air quality/carbon footprint would also be expected due to increases in energy consumption and related emissions attributed to these new facilities.

Beneficial impacts would occur from the removal of certain facilities and structures that use energy for their operation and maintenance, resulting in long-term reductions in air quality emissions and the carbon footprint. Short-term adverse impacts to air quality would occur as a result of the construction activities needed to remove the facilities and reclaim the disturbed sites.

Under alternative 3, gross emissions for the three-county area of the park would be reduced by 9% to 4,799 MTCE.

At Alcatraz Island, visitor opportunities would be expanded and would result in increased ferry transportation and visitor use on the Island. This would result in slightly increased emissions associated with the ferry concession (mobile combustion) and wastewater treatment. Emissions associated with purchased electricity would also increase due to increases in facility usage and energy demand. Gross emissions for Alcatraz Island under alternative 3 would increase by about 8% to 1,810 MTCE.

The combined effect of the actions included in alternative 3 would reduce the gross emissions of the entire park (the three-county area and Alcatraz Island) by 5% to 6,609 MTCE. This would result in long-term, minor, beneficial impacts on the park's carbon footprint. As in the no-action alternative, impacts to air quality (when compared to background levels of air pollution in the region and nation) would be negligible.

Conclusion

The combined effect of the actions included in alternative 3 would reduce the gross emissions of the entire park (the three-county area and Alcatraz Island) by 5%, to 6,609 MTCE. This would result in long-term, minor, beneficial impacts on the park's carbon footprint. As in the no-action alternative, impacts to air quality (when compared to background levels of air pollution in the region and nation) would be negligible.

No impairment of air resources would result from this alternative.

Soils and Geologic Resources and Processes

No-action Alternative

Analysis

Under the no-action alternative, the presence and maintenance of existing facilities (including structures, roads, and trails) would continue to cause parkwide impacts to soils and geologic resources due to the permanent loss and function of these resources and from erosion associated with unsustainable trails and roads (including road cuts and gullies along Conzelman Road, Milagra Ridge, and State Route 1). The impact of these activities would be long term, minor, adverse, and localized, but would occur throughout the park.

Coastal geologic resources and processes would continue to be affected by the presence of facilities and structures located in geologically sensitive areas, such as at Stinson Beach (parking lot and dune interface) and Slide Ranch in Marin County, Ocean Beach (seawall and infrastructure) and Fort Funston in San Francisco County, and at Devil's Slide (road infrastructure) in San Mateo County. The facilities and land uses present at these areas, as well as NPS management activities to protect infrastructure, would continue to inhibit natural shoreline processes. The impact of these activities would be long term, moderate, adverse, and localized.

Projects to improve natural habitat values and ecosystem function, such as those at Big Lagoon (estuarine restoration), Lower Redwood Creek (wetland restoration), Marin Headlands (gully repair), in off-shore marine areas (sand deposits and management), and at Land's End and Mori Point (trail/road removal and repair), would have beneficial effects on soils and geologic resources and processes because they would improve or restore the functionality of natural processes—the impact would be long term, minor to moderate, beneficial, and localized.

Recreational use would continue to cause compaction and erosion of soils, resulting in long-term, minor, adverse, localized impacts throughout the park.

Park Service efforts to provide educational and participatory stewardship programs would continue to have a beneficial effect on geologic resources and soils due to increased public understanding and support for resource protection and management—the impact would be long term, minor, beneficial, and parkwide.

At Alcatraz Island, the presence and maintenance of existing structures on Alcatraz Island would continue to destabilize slopes and affect natural erosion and geologic processes. The National Park Service would continue to implement building stabilization techniques that would result in long-term, minor, adverse, localized impacts to soils and geologic resources and processes.

Conclusion

Overall, the impact to geologic resources and soils from the no-action alternative would be long term, range from minor adverse to moderate beneficial, and be localized and parkwide. Adverse impacts would occur from the presence and maintenance of existing facilities and visitor use. Beneficial impacts would occur from restoration and education and stewardship activities.

No impairment of geologic resources would result from this alternative.

Alternative 1: Connecting People with the Parks (NPS Preferred Alternative for Park Sites in Marin, San Francisco, and San Mateo Counties)

Analysis

Under alternative 1, a variety of management zones would be used that would assist in the protection of soils and geologic resources and processes. Approximately 77% of the park would be zoned using the Natural and Sensitive Resources management zones.

Alternative 1 would reduce soil erosion by eliminating unsustainable trails and roads, resulting in long-term, minor, beneficial, localized impacts.

The removal of facilities or structures, and the reclamation of disturbed building sites (such as at the Capehart housing area and Tennessee Valley in Marin County; Fort Miley and Fort Funston in San Francisco County; and Milagra Ridge, Mori Point, and Phleger Estate in San Mateo County); dune restoration at Fort Funston; managed retreat from sea level rise at Ocean Beach; and creek restoration at Eastkoot Creek, Capehart Creek, and Lower Redwood Creek in Marin County where about 8 acres would be improved and restored to natural conditions, and at Rancho Corral de Tierra in San Mateo County would improve soil function and integrity and restore natural geologic processes. The impact of these activities would be long term, minor to moderate, beneficial, and localized. Short-term, minor, adverse impacts (such as increased erosion or compaction in adjacent areas) would occur during construction activities.

Visitor access and use at specific park sites would be expanded under alternative 1, resulting in increased soil compaction and erosion; however, compared to use patterns under the no-action alternative, only slight adverse impacts would be expected. Most impacts would be contained within defined visitor use areas and on trails. The impact, especially in areas off-trail, would be long term, minor, adverse, and localized. This impact would occur in areas throughout the park.

New recreational development would have long-term, adverse, localized impacts on soils and geologic resources throughout the park due to the permanent loss of soil function and integrity resulting from new development and increased erosion from facility construction and maintenance. The intensity of the impact would range from negligible to moderate. In some areas (such as at Upper Fort Mason, Fort Miley, China Beach, and Fort Funston in San Francisco County and Sheldance Nursery and Devil's Slide in San Mateo County) adverse impacts would be negligible to minor because the development would occur in previously developed or disturbed sites. In other areas (such as at Stinson Beach, Kirby Cove, Forts Barry and Cronkhite, Slide Ranch, Golden Gate Dairy, Tennessee Valley, and Marin City Ridge/Gerbode Valley and along State Route 1, Conzelman, McCullough, and Bunker Roads in Marin County and at Sweeney Ridge and Rancho Corral de Tierra in San Mateo County) new development would cause minor to moderate adverse impacts to soils and geologic resources because these areas are undeveloped and the impacts would be new.

Impacts from NPS educational and stewardship programs would generally be the same as those described in the no-action alternative.

At Alcatraz Island, the existing structures would be rehabilitated, which would require additional stabilization measures that would impact natural geologic processes. This would result in long-term, minor, adverse, localized impacts.

Conclusion

The elimination of unsustainable roads and trails would reduce soil erosion, resulting in long-term, minor, beneficial, localized impacts to soils. The removal of facilities and structures would result in long-term, minor to moderate, beneficial, localized impacts, although new recreational development would have long-term, adverse, localized impacts on soils and geologic resources. During the removal or construction period, short-term, minor, adverse impacts (such as increased erosion or compaction in adjacent areas) would occur.

Overall, adverse impacts would occur from new recreational development and expanded visitor use. Beneficial impacts would occur from trail and road maintenance, the restoration of disturbed sites and creeks, and improved resource understanding and public support.

No impairment of geologic resources would result from this alternative.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

Under alternative 2, a variety of management zones would assist in the protection of soils and geologic resources and processes. Approximately 92% of the park—the largest amount in any of the alternatives—would be zoned using the Natural and Sensitive Resources management zones.

Alternative 2 would reduce soil erosion by eliminating unsustainable trails and roads and removing and restoring unneeded management roads, resulting in long-term, minor to moderate, beneficial, localized impacts.

Beneficial impacts to soils and geological resources and processes from the removal of facilities/structures and restoration of natural areas would be greater than under the no-action alternative. In addition to the actions included in alternative 1, the National Park Service in alternative 2 would 1) remove portions of and restore the Capehart housing area to a natural setting, 2) relocate Slide Ranch out of a sensitive geologic hazard area, 3) work with Marin County to realign the highway and minimize impacts to Redwood Creek, and 4) work with Caltrans to further protect geologic processes on the coast of Marin County, including the potential abandonment of a small segment of State Route 1. These activities would restore soil function, integrity, and natural geologic processes; when combined with those actions included in alternative 1, would result in long-term, moderate, beneficial, and localized impacts.

Impacts from visitor access and use at specific park sites would be the same as those described in alternative 1, resulting in long-term, minor, adverse, and localized impacts.

The type of adverse impacts associated with new recreational development under alternative 2 would be the same impacts as described in alternative 1 although the amount and distribution of proposed facilities is reduced, resulting in minor, adverse, localized impacts to soils and geologic resources.

Impacts from NPS educational and stewardship programs would generally be the same as those described in the no-action alternative.

At Alcatraz Island, the existing structures would be stabilized, but coastal erosion processes would be allowed to evolve naturally. This would result in long-term, minor, beneficial, localized impacts to geologic resources and processes.

Conclusion

The elimination of unsustainable trails and roads and the removal and restoration of unneeded management roads, would reduce soil erosion, resulting in long-term, minor to moderate, beneficial, localized impacts.

The removal of facilities/structures and restoration of a large number of natural areas would result in long-term, moderate, beneficial, and localized impacts.

Overall, adverse impacts would occur from new recreational development and expanded visitor use. Beneficial impacts would occur from trail and road maintenance, and the restoration of disturbed sites and creeks.

No impairment of geologic resources would result from this alternative.

***Alternative 3: Focusing on National Treasures
(NPS Preferred Alternative for Alcatraz Island)***

Analysis

Under alternative 3, a variety of management zones would be used that would assist in the protection of soils and geologic resources and processes. Approximately 88% of the park would be zoned in the Natural and Sensitive Resources zones.

Impacts to soils from reducing soil erosion would be the same as described in the alternative 1, resulting in long-term, minor, beneficial, localized impacts.

Impacts to soils and geologic resources and processes from the removal of facilities and structures and the reclamation of disturbed building sites under alternative 3 would be the same as those described in alternative 1, resulting in long-term, minor to moderate, beneficial, and localized impacts.

Impacts from visitor access and use at specific park sites would be the same as those described in alternative 1, resulting in long-term, minor, adverse, and localized impacts.

Impacts from new recreational development under alternative 3 would generally be the same as those described in alternative 1. Although the distribution of new development may be slightly different, the resulting impact to soils and geologic resources and processes would remain long term, minor to moderate, adverse, and localized.

Impacts from NPS educational and stewardship programs would generally be the same as those described in the no-action alternative.

At Alcatraz Island, the existing structures would be rehabilitated, which would require additional stabilization measures that would impact natural geologic processes. This would result in long-term, minor, adverse, localized impacts.

Conclusion

The reduction in soil erosion and the reclamation of disturbed building sites would result in long-term, minor to moderate, beneficial, localized impacts. Impacts from new recreational development would be long term, minor to moderate, adverse, and localized.

Overall, beneficial impacts would occur from trail and road maintenance, the restoration of disturbed sites and creeks, and improved resource understanding and public support. Adverse impacts would occur from new recreational development and expanded visitor use.

No impairment of geologic resources would result from this alternative.

Water Resources and Hydrologic Processes

No-action Alternative

Analysis

Under the no-action alternative, the presence and maintenance (or lack of maintenance in some cases) of existing facilities (including structures, roads, and trails) would continue to cause localized impacts to water quality due to pollution from urban runoff and turbidity from soil erosion. The impact of these activities would be long term, minor to moderate, adverse, and localized, but would occur throughout the park.

Structures would remain in the 100-year floodplains of several creeks resulting in adverse impacts. In Marin County, park facilities at Stinson Beach (parking lots and picnic areas) and Muir Beach (parking lot and Pacific Way) would continue to affect floodplain function along Easkoot Creek and Redwood Creek. In San Mateo County, horse stables located in the lower portion of the Rancho Corral de Tierra property are located in the San Vicente Creek floodplain and would continue to affect floodplain function. Retention of these facilities would continue to slightly affect the flow of water during floods and the capacity of the floodplain to store floodwaters. The impact would be long term, minor, adverse, and localized.

Projects to improve natural habitat values and ecosystem function, such as those at Big Lagoon (estuarine restoration), Lower Redwood Creek (wetland restoration), Marin Headlands (gully repair), and Land's End and Mori Point (trail/road removal and repair), would have beneficial effects on water resources and hydrologic processes because they would improve and restore the function and integrity of natural hydrologic systems—the impact would be long term, minor to moderate, beneficial, and localized.

Recreational use would continue to cause erosion of soils resulting in turbidity. Vehicle use at parking areas and on roadways throughout the park would continue to affect water quality from runoff that contains chemical contaminants. These activities would result in long-term, minor, adverse, localized impacts to water quality throughout the park.

Park Service efforts to provide educational and participatory stewardship programs would continue to have a beneficial effect on water resources and hydrologic processes due to increased public understanding and support for resource protection and management—the impact would be long term, minor, beneficial, and parkwide.

At Alcatraz Island, visitor use and NPS operations (including the cleaning of bird guano) would continue to contribute nutrients and sediment to the adjacent marine waters through runoff. Runoff from impervious surfaces on the island, such as existing structures, would also contribute to this issue. Vessels, primarily the passenger ferry, traveling to the island would impact water quality by introducing hydrocarbons and other chemicals into the Bay, as well as increasing turbidity near the docking station on the

island. These activities would result in long-term, minor, adverse, localized impacts to water quality.

Conclusion

The continued existence of structures and facilities in some areas of the park would have long-term, minor to moderate, adverse, and localized impacts on water resources and hydrologic processes.

Projects to improve natural habitat values and ecosystem function would have long-term, minor to moderate, beneficial, and localized impacts on water resources and hydrologic processes.

Generally, adverse impacts would occur from the continued presence and maintenance of existing facilities, the continued presence of the existing volume of vehicular traffic, and continued patterns of visitor use. Beneficial impacts would occur from restoration of natural areas and from education and stewardship activities.

No impairment of water resources would result from this alternative.

Alternative 1: Connecting People with the Parks (NPS Preferred Alternative for Park Sites in Marin, San Francisco, and San Mateo Counties)

Analysis

Under alternative 1, a variety of management zones would be used that would assist in the protection of water resources and hydrologic processes. Approximately 77% of the park would be zoned using the Natural and Sensitive Resources zones.

Impacts to water-related resources from the continued presence and maintenance of existing facilities (including structures, roads, and trails) under alternative 1 would be less than the no-action alternative because impacts to water quality caused by erosion from unsustainable trails and roads would be reduced. Alternative 1 would develop a sustainable trail system and remove and restore unneeded and unsustainable roads and trails, as well as maintain all trails and roads. These activities would result in long-term, minor to moderate, beneficial, localized impacts on water quality. Short-term, minor, adverse impacts to water quality could occur from sedimentation and runoff during construction activities.

The removal of facilities and structures and the reclamation of disturbed building sites (such as at the Capehart housing area and Tennessee Valley in Marin County) and dune restoration at Fort Funston would improve natural hydrologic processes. The impact of these activities would be long term, minor to moderate, beneficial, and localized.

Beneficial effects on stream character, water quality, wetlands, floodplains, and watershed processes would occur from creek restoration at Stinson Beach (Eastkoot Creek), Rancho Corral de Tierra, and in the Lower Tennessee Valley. At Stinson Beach, restoration projects would include the removal of nonnative invasive vegetation and the restoration and enlargement of riparian habitat. In Lower Tennessee Valley, creek projects would include the restoration of riparian habitat, improvements to hydrologic functions, and the removal of the dam at Tennessee Pond. At Rancho Corral de Tierra, projects would include extensive removal of nonnative invasive vegetation, riparian habitat restoration, and possibly more extensive creek channel restoration that could reconnect steelhead habitat with the ocean and restore many functional components of the

natural hydrologic regime. However, these more substantial creek restoration efforts at Ranch Corral de Tierra would likely be dependent on the success of park partnerships, since other entities have proprietary interests in portions of the creek channel and water rights. If these more substantial efforts are accomplished, the overall stream character and function would be improved by creating a more natural watercourse that would reduce the potential for erosion, re-create floodplain connectivity, restore wetland functions, and contribute to improvements in restoring watershed processes and water quality. Overall, the impact of these creek restoration activities would be long term, minor to moderate, beneficial, and localized.

Impacts to floodplains would be the same as those described in the no-action alternative.

Visitor access and use would be expanded throughout the park under alternative 1, potentially resulting in some increase in erosion along trails and at primary visitor use areas that could have impacts on water quality—the impact would be long term, negligible to minor, adverse, and localized.

New and/or improved recreational development—including new visitor facilities and amenities at 1) Stinson Beach, Kirby Cove, Forts Barry and Cronkhite, Slide Ranch, Golden Gate Dairy, Tennessee Valley, and Marin City Ridge / Gerbode Valley along State Route 1 and Conzelman, McCullough, and Bunker Roads in Marin County; at 2) Upper Fort Mason, Fort Miley, China Beach, and Fort Funston in San Francisco County; and at 3) Milagra Ridge, Sweeney Ridge, Phleger Estate, and Rancho Corral de Tierra in San Mateo County—would have short-term, negligible to minor, adverse, localized impacts on water quality from increased erosion and sedimentation, and the potential for chemical contamination resulting from inadvertent chemical spills from heavy equipment at construction sites. Similar impacts to water quality could occur over the long term due to the increased potential for urban pollutants to runoff from parking lots and other developed features.

In some areas (such as at Shelldance Nursery and Devil's Slide in San Mateo County) adverse impacts would be negligible to minor because the development would occur in previously developed or disturbed sites. In other areas (such as at Rancho Corral de Tierra in San Mateo County), adverse impacts to water resources would be minor to moderate because new development would occur in undisturbed sites.

Impacts from NPS educational and stewardship programs would generally be the same as those described in the no-action alternative.

At Alcatraz Island, impacts from visitor use and NPS operations (including the cleaning of bird guano) would be greater than those described in the no-action alternative because greater emphasis would be placed on visitor access and the cleaning of more primary use areas, resulting in increased potential for water quality impacts such as nutrient and sediment inputs into marine waters. Turbidity and chemical contamination may also increase due to increased vessel traffic in the Bay. Impacts from these activities would result in long term, minor to moderate, adverse, localized impacts to water quality.

Conclusion

The removal and reclamation of facilities and structures, the re-creation of natural hydrologic regimes, and restoration of watershed processes would result in long-term minor to moderate, beneficial impacts to water quality, while the construction,

maintenance or removal of trails and facilities would have short-term, minor to moderate, adverse impacts to water quality.

There would be long-term minor to moderate, adverse, localized impacts to water quality on Alcatraz Island resulting from cleaning of primary visitor use areas and increased vessel traffic in San Francisco Bay.

Generally, adverse impacts would occur from new recreational development and expanded visitor use. Beneficial impacts would occur from trail and road maintenance and the restoration of disturbed sites and creeks.

No impairment of water resources would result from this alternative.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

Under alternative 2, a variety of management zones would be used that would assist in the protection of water resources and hydrologic processes. Approximately 92% of the park would be zoned using the Natural and Sensitive Resources zones.

Alternative 2 would reduce impacts to water quality by eliminating erosion from unsustainable trails and unneeded management roads, resulting in long-term, minor to moderate, beneficial, localized impacts. Short term, minor, adverse impacts to water quality could occur from sedimentation and runoff during construction activities.

The magnitude of beneficial impacts associated with the removal of facilities/structures and the reclamation of disturbed building sites would be greater than under the no-action alternative. In alternative 2, in addition to the actions included in alternative 1, the National Park Service would completely remove and restore the Capehart housing area; work with Marin County to realign the highway and minimize impacts to Redwood Creek; and could remove or relocate all horse stable stables from the Rancho Corral de Tierra property. These activities would improve natural hydrologic processes; when combined with the actions included in alternative 1, they would result in long-term, moderate, beneficial, and localized impacts on water resources and hydrologic processes.

Beneficial effects on stream character, water quality, wetlands, floodplains, and watershed processes would occur from creek restoration at Stinson Beach (Eastkoot Creek) and especially at Rancho Corral de Tierra. Incised creek banks that adversely impact floodplain function by restricting creek sinuosity would be restored, thereby expanding and enhancing wetlands and improving water quality. The overall stream character and function would be improved by creating a more natural watercourse that would reduce the potential for erosion, re-create the natural hydrologic regime, and contribute to improvements in restoring watershed processes and regional water quality. Collaborating with municipalities to increase water storage would benefit water resources by increasing water quantity with park streams. The impact of these activities would be long term, moderate, beneficial, and localized.

Impacts to floodplains would be less than those described in the no-action alternative because the removal of the lower horse stable from the 100-year floodplain of San Vicente Creek at Rancho Corral de Tierra would improve floodplain function and integrity—resulting in a long-term, minor, beneficial, localized impact.

Impacts from visitor access and use would be the same as those described in alternative 1, resulting in long-term, minor, adverse, and localized impacts.

The magnitude of adverse impacts associated with new recreational development under alternative 2 would be less than under alternative 1 because the amount and distribution of proposed facilities is reduced. However, the types of impacts would generally be the same and would result in minor, adverse, localized impacts to water quality and water resources.

Impacts from NPS educational and stewardship programs would generally be the same as those described in the no-action alternative.

At Alcatraz Island, impacts from visitor use and NPS operations would be less than those described in the no-action alternative because greater portions of the island would be left to natural reclamation and the focus on maintaining visitor use areas (including the cleaning of bird guano) would be reduced. Therefore, nutrient and sediment inputs into marine waters would be reduced. Water quality impacts associated with vessel traffic would be expected to be the same as in the no-action alternative. These actions would result in long-term, minor, beneficial, localized impacts to water quality.

Conclusion

The removal of unsustainable trails and unneeded management roads, removal of facilities and structures, creek restorations, realignment of small sections of roadway, and the relocation of horse stables away from adjacent creeks would result in long-term, minor to moderate, beneficial impacts to water resources, wetlands, floodplains, and overall hydrologic processes. However, the construction, maintenance, or removal activities associated with these changes would have short-term, minor to moderate, adverse impacts to water quality.

Leaving greater portions of Alcatraz Island to natural reclamation and reducing the visitor use area on the island would result in long-term, minor, beneficial, localized impacts to water quality. The visitor use area would be reduced providing for a larger area of the island to naturally reclaim and thereby reduce water quality impacts caused by human use.

Generally, adverse impacts would occur from new recreational development and expanded visitor use. Beneficial impacts would occur from trail and road maintenance, and the restoration of disturbed sites, creeks, and floodplains.

No impairment of water resources would result from this alternative.

Alternative 3: Focusing on National Treasures (NPS Preferred Alternative for Alcatraz Island)

Analysis

Under alternative 3, a variety of management zones would be used that would assist in the protection of water resources and hydrologic processes. Approximately 88% of the park would be zoned using the Natural and Sensitive Resources zones.

As described in alternative 1, impacts to water quality from reducing erosion from unsustainable trails and roads would be reduced when compared to the no-action alternative, resulting in long-term, minor to moderate, beneficial, localized impacts. Short

term, minor, adverse impacts to water quality could occur from sedimentation and runoff during construction activities.

As described in alternative 1, the removal of facilities/structures and the reclamation of disturbed building sites would result in long-term, minor to moderate, beneficial, and localized impacts to water resources and hydrologic processes.

As described in alternative 1, creek restoration would result in enhanced wetlands, improved water quality, and overall improvements to stream character and function. The impact of these activities would be long term, moderate, beneficial, and localized.

Impacts to floodplains would be the same as those described in the no-action alternative.

Visitor access and use would be expanded under alternative 3, potentially resulting in some increase in erosion along trails and at primary visitor use areas that could have impacts on water quality—the impact would be long term, negligible to minor, adverse, and localized.

Impacts from new recreational development would generally be the same as described in alternative 1, resulting in short-term, negligible to minor, adverse, localized impacts on water quality from increased erosion and sedimentation, and the potential for chemical contamination resulting from inadvertent chemical spills from heavy equipment at construction sites. Similar impacts to water quality could occur over the long term due to the increased potential for urban pollutants to runoff from parking lots and other developed features.

Impacts from NPS educational and stewardship programs would generally be the same as those described in the no-action alternative.

At Alcatraz Island, impacts from visitor use and NPS operations (including the cleaning of bird guano) would be greater than those described in the no-action alternative because greater emphasis would be placed on visitor access and the cleaning of more primary use areas, resulting in increased potential for water quality impacts such as nutrient and sediment inputs into marine waters. Water quality impacts, such as turbidity and chemical contamination, from increased vessel traffic in the Bay may also increase. Additional impacts associated with the scale of historic structure rehabilitation and facility improvements under alternative 3 could result in increased impacts to water quality. Impacts from these activities would result in long-term, minor to moderate, adverse, localized impacts to water quality.

Conclusion

The removal and natural restoration of unsustainable trails and unneeded management roads, the removal of facilities and structures, and creek restoration efforts would result in long-term, minor to moderate, beneficial impacts to water resources and hydrologic process. However, the construction, maintenance, or removal of trails and facilities would have short-term, minor to moderate, adverse impacts to water quality.

The scale of historic structure rehabilitation and facility improvements on Alcatraz Island could result in increased impacts to water quality. The cleaning of the primary visitor use areas and the increased vessel traffic in San Francisco Bay would result in long-term minor to moderate, adverse, localized impacts to water quality on Alcatraz Island.

Adverse impacts would occur from new recreational development and expanded visitor use. Beneficial impacts would occur from trail and road maintenance and the restoration of disturbed sites and creeks. No impairment of water resources would result from this alternative.

No impairment of water resources would result from this alternative.

NATURAL RESOURCES – BIOLOGICAL RESOURCES

Habitat (Vegetation and Wildlife)

No-action Alternative

Analysis

Under the no-action alternative, the presence and maintenance (or lack of maintenance in some cases) of existing facilities (including structures, roads, and trails) would continue to cause localized impacts to vegetation and wildlife habitat by fragmenting natural areas and increasing the potential for exotic plant species to displace native species and affect native habitat. Maintaining facilities and structures in coastal interface areas would continue to disrupt natural shoreline habitat values resulting in impacts to species that depend on these areas and diminished biodiversity in general. The impact of these activities would be long term, minor to moderate, adverse, and localized, but would occur throughout the park.

Projects to improve natural habitat values and ecosystem function, such as those at Big Lagoon (estuarine restoration), Lower Redwood Creek (wetland restoration), Marin Headlands (gully repair), Kirby Cove (45 acres of exotic plant removal), Fort Funston (20 acres of exotic plant removal), in off-shore marine areas (sand deposits and management), and at Land's End and Mori Point (trail/road removal and repair), would have beneficial effects on vegetation, wildlife, and wildlife habitat because they would reduce the impacts of exotic plant species, improve or restore the functionality of natural processes, and improve specific habitat components that are required by the affected species. These kinds of activities would reduce environmental stressors and increase the resiliency of species and systems to the effects of climate change. Rehabilitating disturbed sites would improve the integrity and diversity of habitats available to aquatic and terrestrial organisms. Ongoing vegetation management and monitoring of plants and wildlife allows the National Park Service to improve native habitat conditions. The use of spatial and temporal closures would continue to protect wildlife and wildlife habitat. The impact of these activities would be long term, minor to moderate, beneficial, and localized.

Recreational use would continue to reduce habitat integrity by trampling plants, introducing and increasing the spread of exotic species, causing disturbance (flushing and displacement) to animals, and increasing the potential for human-wildlife conflict resulting from habituation due to the presence of humans and the introduction of unnatural food sources. Recreational use also generates noise and unnatural light sources that affect wildlife. These activities would result in long-term, minor to moderate, adverse, localized impacts throughout the park.

Park Service efforts to provide educational and participatory stewardship programs would continue to have a beneficial effect on vegetation and wildlife habitat due to increased public understanding and support for resource protection and management—the impact would be long term, minor, beneficial, and parkwide.

At Alcatraz Island, waterbirds would continue to be affected by visitor use (day use, special events, etc.) and NPS operations, including managing gulls and other waterbirds in visitor use areas. Boat traffic in the marine waters adjacent to the island would continue to cause disturbance to nesting birds. These activities would result in long-term, minor, adverse, localized impacts. At the same time, the National Park Service would continue to protect nesting habitat and bird use areas on the Island using seasonal closures, especially the preferred habitats on the western perimeter of the island. This would result in long-term, moderate, beneficial, localized impacts to waterbird populations. Given the combined effects of disturbance and protective actions, the numbers of breeding pairs of waterbirds on the Island have steadily increased over the last decade. This trend is expected to continue. Collectively, impacts to waterbirds as a result of the no-action alternative would be long term, minor to moderate, adverse, and localized.

Conclusion

The conditions related to existing facilities would continue to cause fragmentation of habitat and the potential for exotic plant species to displace native species. The continuation of current recreational use also would reduce habitat integrity. The impacts would be long term, minor to moderate, adverse, and localized but would occur throughout the park.

Habitat restoration efforts and educational and participatory stewardship programs would result in long-term, minor to moderate, beneficial impacts that would occur both at the local level (habitat restoration) and parkwide (stewardship programs).

Impacts to waterbirds would be long term, minor to moderate, adverse, and localized.

Generally, adverse impacts would occur from the presence and maintenance of existing facilities and visitor use. Beneficial impacts would occur from restoration and ongoing management and monitoring activities.

No impairment of vegetation or wildlife resources would result from this alternative.

Alternative 1: Connecting People with the Parks (NPS Preferred Alternative for Park Sites in Marin, San Francisco, and San Mateo Counties)

Analysis

Under alternative 1, a variety of management zones would be used that would assist in the protection of vegetation and wildlife habitat. Approximately 77% of the park would be zoned as a Natural and Sensitive Resources zone.

Sensitive Resource zones at Bird Island and Point Bonita Cove would serve to protect seabirds and pinnipeds, a beneficial impact when compared to the no-action alternative.

The impacts to vegetation and wildlife from the continued presence and maintenance of existing facilities (including structures, roads, and trails) under alternative 1 would be less than the no-action alternative because impacts to vegetation and wildlife habitat caused

by erosion from unsustainable trails and roads would be reduced. Alternative 1 would develop a sustainable trail system and eliminate unneeded and unsustainable roads and trails, as well as maintain all trails and roads. Impacts to native habitat from fragmentation and exotic species would be reduced. These activities would result in long-term, minor, beneficial, localized impacts on vegetation and wildlife.

The removal of facilities/structures and the reclamation of disturbed building sites (such as at the Capehart housing area and Tennessee Valley in Marin County); dune restoration at Fort Funston; vegetation restoration on old roads and trails at Phleger Estate; and extensive exotic plant removal at Ranch Corral de Tierra. Creek restoration at Stinson Beach (Eastkoot Creek), and especially at Rancho Corral de Tierra would improve vegetation and wildlife habitat by improving habitat structure and the diversity of habitats available to support various species' needs. These kinds of activities would reduce environmental stressors and increase the resiliency of species and systems to the effects of climate change. The impact of these activities would be long term, moderate, beneficial, and localized.

Visitor access and use would be expanded under alternative 1, potentially resulting in additional impacts to vegetation (trampling) and wildlife (disturbance) along trails and at primary visitor use areas—the impact would be long term, minor, adverse, and localized.

New and/or improved recreational development including new visitor facilities and amenities at 1) Stinson Beach, Kirby Cove, Forts Barry and Cronkhite, Slide Ranch, Golden Gate Dairy, Tennessee Valley, and Marin City Ridge / Gerbode Valley along State Route 1 and Conzelman, McCullough, and Bunker Roads in Marin County; at 2) Upper Fort Mason, Fort Miley, China Beach, and Fort Funston in San Francisco County; and at 3) Milagra Ridge, Sweeney Ridge, Phleger Estate, and Rancho Corral de Tierra in San Mateo County would have long-term, minor, adverse, localized impacts on vegetation and wildlife due to the permanent loss of plants and wildlife habitat. Short-term, minor, adverse impacts to vegetation would also occur from injury or loss of plants during construction activities; however, the area would be replanted with native plants and the natural habitat would be reclaimed. Similarly, short-term adverse impacts to wildlife, such as disturbance, would occur during construction. The rehabilitation and use of Pier 4 at Fort Mason would result in impacts (habitat disturbance during construction) to marine resources—the impact would be short term, minor, adverse, and localized.

Impacts from NPS educational and stewardship programs would generally be the same as those described in the no-action alternative. Similarly, impacts from vegetation and wildlife management and monitoring activities under alternative 1 would be the same as those described in the no-action alternative. However, the establishment of a native plant nursery would provide additional capacity to improve native vegetation and wildlife habitat and expand stewardship efforts—resulting in a beneficial impact.

At Alcatraz Island, adverse impacts to waterbirds under alternative 1 would be greater than those described in the no-action alternative because new visitor amenities (namely food service, modest overnight accommodations, and special events) would cause increased disturbance to nesting waterbirds and human-wildlife conflict. Additionally, historic restoration of the Parade Grounds and removal of the rubble piles would cause habitat loss and disturbance to waterbird populations. Expanded visitor use of the Agave Trail would affect use of the tidepools by foraging birds. As in the no-action alternative, the National Park Service would continue to protect nesting and roosting habitats and

initiate habitat enhancements in other areas of the island where possible—resulting in beneficial impacts. The marine waters within the vicinity of the colonial nesting birds would be closed to boating during the breeding season, resulting in beneficial impacts. Given the combined effects of disturbance and protective actions, the numbers of breeding pairs of waterbirds on the island could decrease over time depending on the frequency and intensity of expanded visitor activity. Collectively, these activities would result in long-term, moderate, adverse, localized to regional impacts to waterbirds on the island.

Conclusion

The development of a sustainable trail system and elimination of unneeded and unsustainable roads and trails, the removal of facilities/structures with reclamation of disturbed building sites, and habitat restoration efforts would result in long-term, minor to moderate, beneficial, localized impacts on vegetation and wildlife.

The expansion of visitor access and use and the development of new or improved recreational facilities would result in long-term, minor, adverse, and localized impacts. The construction activities related to these developments would result in short-term, minor, and adverse impacts.

Impacts from NPS educational and stewardship programs would generally be the same as those described in the no-action alternative. Similarly, impacts from vegetation and wildlife management and monitoring activities under alternative 1 would be the same as those described in the no-action alternative. However, the establishment of a native plant nursery would provide additional capacity to improve native vegetation and wildlife habitat and expand stewardship efforts—a beneficial impact.

Habitat restoration efforts and educational and participatory stewardship programs would result in long-term, minor to moderate, beneficial impacts that would occur both at the local level (habitat restoration) and parkwide (stewardship programs). An additional beneficial impact would result from the establishment of a native plant nursery.

Impacts to waterbirds would be long-term, moderate, adverse, and localized to regional.

Generally, adverse impacts would occur from the presence and maintenance of existing facilities and visitor use. Beneficial impacts would occur from natural resource restoration and ongoing management and monitoring activities.

No impairment of vegetation or wildlife resources would result from this alternative.

If it becomes evident that implementation of the actions in alternative 1 at both the Parade Ground and at the north end of the island (in the vicinity of the New Industries/Model Industries Buildings) are having substantial adverse effects and would result in long-term or permanent loss of waterbird nesting colonies, the park staff would use adaptive management techniques and take the necessary measures to ensure the continued viability of breeding populations of these species on the island. These steps could include allowing only nonbreeding season access to the Parade Ground or limiting the types and scale of uses in the north end of the island during nesting seasons. These actions would ensure that adverse impacts do not exceed the moderate intensity threshold, and thereby avoid impairment of park resources.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

Under alternative 2, a variety of management zones would be used that would assist in the protection of vegetation and wildlife habitat. Approximately 92% of the park would be zoned using the Natural and Sensitive Resources zones.

Sensitive Resource zones at Bird Island and Point Bonita Cove would serve to protect seabirds and pinnipeds, a beneficial impact when compared to the no-action alternative.

The impacts to vegetation and wildlife from the continued presence and maintenance of existing facilities (including structures, roads, and trails) under alternative 2 would be less than the no-action alternative because impacts to vegetation and wildlife habitat caused by erosion from unsustainable trails and roads would be reduced. Alternative 2 would develop a sustainable trail system and eliminate and rehabilitate unneeded trails and management roads, as well as maintain all trails and roads. Impacts to native habitat from fragmentation and exotic species would be reduced. These activities would result in long-term, minor, beneficial, localized impacts on vegetation and wildlife.

The magnitude of beneficial impacts associated with the removal of facilities/structures and the reclamation of disturbed building sites, as well as from creek restoration, would be greater than under the no-action alternative. In alternative 2, in addition to the actions included in alternative 1, the National Park Service would completely remove and restore the Capehart housing area; work with Marin County to realign the highway and minimize impacts to Redwood Creek; remove structures and restore about 10 acres at Slide Ranch, as well as convert about 3.5 acres of existing farmland to native habitat; restore about 18 acres of uplands at Golden Gate Dairy; remove the nonnative forest and improve natural habitat conditions at Fort Miley; and improve or remove all horse stable stables from the Rancho Corral de Tierra property. These kinds of activities would reduce environmental stressors and increase the resiliency of species and systems to the effects of climate change. These activities would also improve habitat structure and the diversity of habitats available to support various species' needs, and when combined with those actions included in alternative 1, would result in long-term, moderate, beneficial, and localized impacts.

Visitor access and use would be expanded under alternative 2, potentially resulting in additional impacts to vegetation (trampling) and wildlife (disturbance) along trails and at primary visitor use areas—the impact would be long term, minor, adverse, and localized.

The type of adverse impacts associated with new recreational development under alternative 2 would be the same impacts as described in alternative 1 although the number and distribution of proposed facilities is reduced resulting in minor, adverse, localized impacts to vegetation and wildlife habitat.

Impacts from NPS educational and stewardship programs would generally be the same as those described in the no-action alternative, with one exception. Partnering with other agencies to manage visitor access and promote restoration and habitat management as part of the UNESCO Biosphere Reserve would elevate this issue and could result in benefits to vegetation and wildlife habitat. Impacts from vegetation and wildlife management and monitoring activities under alternative 2 would be the same as those described in the no-action alternative. The establishment of a native plant nursery would

provide additional capacity to improve native vegetation and wildlife habitat and expand stewardship efforts—resulting in a beneficial impact.

At Alcatraz Island, adverse impacts to waterbirds under alternative 2 would be fewer than those described in the no-action alternative because waterbird nesting and use areas would be allowed to expand and conflicts with visitor use and NPS operations would be reduced. Visitor use areas would be expanded and visitor activities would be highly controlled on the Island. The Model Industries Building and New Industries Building would be stabilized and would provide additional habitat to nesting birds. Park operations near the Power Plant would be modified to reduce conflicts with nesting birds. The marine waters within the vicinity of the colonial nesting birds would be closed to boating during the breeding season, resulting in beneficial impacts. The allowance of modest overnight accommodations on the Island would increase the potential for human-wildlife conflict, an adverse impact. As in the no-action alternative, the National Park Service would continue to protect nesting and roosting habitats and initiate habitat enhancements in other areas of the Island where possible—resulting in beneficial impacts. Given the combined effects of disturbance and protective actions, the numbers of breeding pairs of waterbirds on the Island would be expected to be maintained or increase over time. Collectively, these activities would result in long-term, moderate, beneficial, localized impacts to waterbirds on the island.

Conclusion

The development of a sustainable trail system and the elimination of unneeded roads, and the removal of a large number of structures and the restoration of natural vegetation in these areas would result in long-term, minor, beneficial, localized impacts on vegetation and wildlife.

The expansion of visitor access and use and the development of new or improved recreational facilities would result in long-term, minor, adverse, and localized impacts. The construction activities related to these developments would result in short-term, minor, and adverse impacts.

Habitat restoration efforts and educational and participatory stewardship programs would result in long-term, minor to moderate, beneficial impacts that would occur both at the local level (habitat restoration) and parkwide (stewardship programs). Additional beneficial impacts would result from the establishment of a native plant nursery and partnering with other agencies to manage visitor access and promote restoration and habitat management as part of the UNESCO Biosphere Reserve.

Impacts to waterbirds on the island would be long term, moderate, beneficial, and localized.

Generally, adverse impacts would occur from the presence and maintenance of existing facilities and visitor use. Beneficial impacts would occur from restoration and ongoing management and monitoring activities.

No impairment of vegetation or wildlife resources would result from this alternative.

**Alternative 3: Focusing on National Treasures
(NPS Preferred Alternative for Alcatraz Island)**

Analysis

Under alternative 3, a variety of management zones would be used that would assist in the protection of vegetation and wildlife habitat. Approximately 88% of the park would be zoned using the Natural and Sensitive Resources zones.

The impacts to vegetation and wildlife from the continued presence and maintenance of existing facilities (including structures, roads, and trails) under alternative 3 would be less than the no-action alternative because impacts to vegetation and wildlife habitat caused by erosion from unsustainable trails and roads would be reduced. Alternative 3 would develop a sustainable trail system and eliminate and rehabilitate unneeded and unsustainable roads and trails, as well as maintain all trails and roads. Impacts to native habitat from fragmentation and exotic species would be reduced. These activities would result in long-term, minor, beneficial, localized impacts on vegetation and wildlife.

Natural resource restoration includes the dune restoration that involves the removal of 30 acres of European beach grass at Fort Funston; restoration of a large tract of second-generation redwood forest at Phleger Estate; and extensive exotic plant removal at Ranch Corral de Tierra. The managed retreat from sea level rise at Ocean Beach would improve the integrity of natural habitats and processes. Creek restoration at Stinson Beach (Eastkoot Creek), and especially at Rancho Corral de Tierra would improve vegetation and wildlife habitat by improving habitat structure and the diversity of habitats available to support various species' needs. These kinds of activities would reduce environmental stressors and increase the resiliency of species and systems to the effects of climate change. The impact of these activities would be long term, moderate, beneficial, and localized.

Visitor access and use would be expanded under alternative 3, potentially resulting in additional impacts to vegetation (trampling) and wildlife (disturbance) along trails and at primary visitor use areas—the impact would be long-term, minor, adverse, and localized.

New and/or improved recreational development including new visitor facilities and amenities at 1) Stinson Beach, Kirby Cove, Forts Barry and Cronkhite, Slide Ranch, Golden Gate Dairy, Tennessee Valley, and Marin City Ridge / Gerbode Valley and along State Route 1 and Conzelman, McCullough, and Bunker Roads in Marin County; at 2) Upper Fort Mason, Fort Miley, China Beach, and Fort Funston in San Francisco County; and at 3) Milagra Ridge, Sweeney Ridge, Phleger Estate, and Rancho Corral de Tierra in San Mateo County would have long-term, minor, adverse, localized impacts on vegetation and wildlife due to the permanent loss of plants and wildlife habitat. Short-term, minor, adverse impacts to vegetation would occur from injury or loss of plants during construction activities; however, the area would be replanted with native plants and the natural habitat would be reclaimed. Similarly, short-term adverse impacts to wildlife, such as disturbance, would occur during construction.

Impacts from NPS educational and stewardship programs would generally be the same as those described in the no-action alternative. Similarly, impacts from vegetation and wildlife management and monitoring activities under alternative 3 would be the same as those described in the no-action alternative. The establishment of a native plant nursery

would provide additional capacity to improve native vegetation and wildlife habitat and expand stewardship efforts—a beneficial impact.

At Alcatraz Island, adverse impacts to waterbirds under alternative 3 would be greater than those described in the no-action alternative because new visitor amenities (namely food service, modest overnight accommodations, and special events) would cause increased disturbance to nesting waterbirds and human-wildlife conflict. The utilization of Pier 4 at Fort Mason as the primary point of embarkation for visitor transportation to the Island would result in additional impacts to seabirds caused by the proximity of vessel traffic and increased garbage and marine debris. Gulls would be more highly managed in primary visitor use areas, which would take up more of the island under alternative 3, resulting in disturbance and displacement of gulls. Additionally, the level of historic restoration to the Island (i.e., Parade Ground, building restoration, and adaptive reuse) would cause habitat loss and disturbance to waterbird populations. As in the no-action alternative, the National Park Service would continue to protect nesting and roosting habitats and initiate habitat enhancements in other areas of the island where possible; these actions would result in beneficial impacts. The Model Industries Building and New Industries Building, both of which are proximate to sensitive waterbird breeding areas, would be managed in a way that minimizes human-induced disturbance and predation by western gulls and protects the waterbird breeding colonies on the north end of the island. The marine waters within the vicinity of the colonial nesting birds would be closed to boating during the breeding season, resulting in beneficial impacts. Given the combined effects of disturbance and protective actions, the numbers of breeding pairs of waterbirds on the island could change over time depending on the frequency and intensity of expanded visitor activity, but minimum numbers of nesting pairs would support the maintenance of viable populations. Collectively, these activities would result in long-term, moderate, adverse, localized to regional impacts to waterbirds on the island.

Conclusion

The development of a sustainable trail system and the elimination of unneeded roads and the restoration of natural vegetation in these areas would result in long-term, minor, beneficial, localized impacts on vegetation and wildlife.

The expansion of visitor access and use and the development of new or improved recreational facilities would result in long-term, minor, adverse, and localized impacts. The construction activities related to these developments would result in short-term, minor, and adverse impacts.

Natural resource restoration would result in long-term, moderate, beneficial, and localized impacts.

Habitat restoration efforts and educational and participatory stewardship programs would result in long-term, minor to moderate, beneficial impacts that would occur both at the local level (habitat restoration) and parkwide (stewardship programs).

Impacts to waterbirds on the island would be long term, moderate, adverse, and localized to regional.

Generally, adverse impacts would occur from the presence and maintenance of existing facilities and visitor use. Beneficial impacts would occur from restoration and ongoing management and monitoring activities.

No impairment of vegetation or wildlife resources would result from this alternative.

If it becomes evident that implementation of the actions in alternative 3 at both the Parade Ground and at the north end of the island (in the vicinity of the New Industries/Model Industries Buildings) are having substantial adverse effects and would result in long-term or permanent loss of waterbird nesting colonies, the park staff would use adaptive management techniques and take the necessary measures to ensure the continued viability of breeding populations of these species on the island. These steps could include allowing only nonbreeding season access to the Parade Ground or limiting the types and scale of uses in the north end of the island during nesting seasons. These actions would ensure that adverse impacts do not exceed the moderate intensity threshold, and thereby avoid impairment of park resources.

Special Status Species (Federal and State Threatened and Endangered Species)

No-action Alternative

Introduction

In general, many of the impacts to vegetation and wildlife previously described in the habitat section would apply to special status species. For example, visitor use and new development would result in changes that would have adverse impacts to listed species and their habitats. Likewise, vegetation management and creek restoration would result in beneficial impacts to listed species and their habitats. Keeping this in mind, the analysis provided below generalizes about the effects of land management priorities and, where possible, focuses on the impacts that specific actions included in the alternatives may have on listed species and their habitats.

Federal Threatened and Endangered Species

California red-legged frog (*Rana aurora draytonii*). Wetland restoration and management, such as the project completed at Mori Point, would continue to improve habitat for the frog—resulting in a beneficial impact. Creek restoration in Marin County would improve wetlands and riparian habitat that could serve as potential future habitat for the frog. Exotic plant removal, especially in riparian and wetland areas, could also improve the structure and condition of vegetation that supports frogs. All of these activities should improve and protect breeding and foraging habitat by improving conditions for emergent riparian vegetation and other vegetation conditions preferred by the California red-legged frog, such as dense, shrubby riparian areas. Controlling and managing visitor use would reduce impacts to frogs, such as habitat alteration and direct impacts from recreational use and development; however, some adverse impacts would continue. Long-term park operations and short-term project specific construction impacts to the species may occur. These may involve “take” associated with removal and translocation of individuals outside construction areas or impacts of existing roadways/trails and their maintenance. The National Park Service would continue to monitor frog populations and survey potential habitat. The primary threat to the frog would continue to be habitat loss – an adverse impact associated with increased urbanization of the region. There has not been any designated critical habitat in Marin or San Mateo counties managed by Golden Gate National Recreation Area (Federal Register 71: 19244–19346). Collectively, impacts to the California red-legged frog resulting from NPS actions that are part of the no-action alternative (the continuation of current

management and trends) would be long term, beneficial, minor, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, likely to adversely affect*” for project specific actions in the short term, and “*may affect, not likely to adversely affect*” for land use and park management over the long term. Consultation for specific projects would occur as necessary.

Mission blue butterfly (*Icaricia icaroides missionensis*). Coastal scrub habitat and grassland restoration, including exotic plant removal and vegetation management, in the Marin Headlands and at Milagra Ridge and Sweeney Ridge in San Mateo County, would continue to improve conditions for lupine plants that support Mission blue butterflies. The *Marin Headlands-Fort Baker Plan* being implemented in cooperation with the Federal Highways Administration would cause some adverse impacts and loss of habitat (which is being mitigated) in the vicinity of Conzelman and Bunker Roads due to construction; however, it would result in long-term benefits to butterfly habitat. The use of prescribed fire, an action analyzed under the park’s fire management plan / EIS, would also continue to have short-term adverse effects on butterflies and butterfly habitat with long-term beneficial effects. Conditions at park lands in San Mateo County, such as the widespread presence of exotic plants, would continue to cause adverse impacts to potential butterfly habitat. Controlling and managing visitor use in known habitat areas throughout the park would reduce impacts to butterflies, such as the trampling of host and nectar plants and direct impacts to larvae and pupae from recreational use and development; however, some adverse impacts would continue. The National Park Service would continue to monitor butterfly populations and survey potential habitat. The primary threat to the butterfly would continue to be habitat loss—resulting in an adverse impact associated with increased urbanization of the region. Collectively, impacts to the Mission blue butterfly resulting from NPS actions that are part of the no-action alternative (the continuation of current management and trends) would be long term, beneficial, minor, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, likely to adversely affect*” for project specific actions in the short term, and “*may affect, not likely to adversely affect*” for land use and park management over the long term. Consultation for specific projects would occur as necessary.

Tidewater goby (*Eucyclogobius newberryi*). Because tidewater gobies are currently only found in Rodeo Lagoon within the planning area, impacts would be restricted to this location. Park Service management of Rodeo Lagoon is compatible with tidewater goby activities and requirements. Throughout its range, the primary threats to gobies include loss and modification of habitat, water diversions, predatory and competitive introduced fish species, habitat channelization, and degraded water quality. National Park Service activities, such as vegetation management, wetland enhancement, and efforts to improve water quantity and quality within the watershed near Rodeo Creek would have beneficial impacts on maintaining appropriate habitat characteristics that support gobies in Rodeo Lagoon. The National Park Service would continue to monitor goby populations and habitat and inventory potential habitat. Collectively, impacts to the tidewater goby resulting from NPS actions that are part of the no-action alternative (the continuation of current management and trends) would be long term, beneficial, minor, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, likely to adversely affect*” for project specific actions in the short term, and

“may affect, not likely to adversely affect” for land use and park management over the long term. Consultation for specific projects would occur as necessary.

San Francisco garter snake (*Thamnophis sirtalis tetrataenia*). Because San Francisco garter snakes are currently restricted to localities in San Mateo County (the only documented occurrence is at Mori Point / Sharp Park). Two other locations within the planning area (Milagra Ridge and Rancho Corral de Tierra) appear to have suitable habitat to support breeding populations of San Francisco garter snakes (Swaim Biological Inc. 2006). In addition, two other sites (Sweeny Ridge and Cattle Hill) can provide connectivity between known snake populations or between high-quality aquatic habitats that potentially support San Francisco garter snakes (Swaim Biological Inc. 2006). Therefore, impacts would be restricted to these locations. Because California red-legged frogs are an important prey item for this species, effects on red-legged frogs are expected to have cascading effects on the snake.

Wetland restoration and management at Mori Point could have short-term adverse impacts on California red-legged frogs and the San Francisco garter snake, but would result in long-term habitat improvements – a beneficial impact. Some types of exotic tree removal would also improve the structure and condition of habitat that supports snakes. Controlling and managing visitor use would reduce impacts to snakes, such as habitat alteration and direct impacts from recreational use and development; however, some adverse impacts would continue. The National Park Service would continue to monitor snake populations and survey potential habitat – resulting in a beneficial impact. The primary threat to the snake would continue to be habitat loss and alteration – an adverse impact associated with increased urbanization of the region. Collectively, impacts to the San Francisco garter snake resulting from NPS actions that are part of the no-action alternative (the continuation of current management and trends) would be long term, beneficial, minor to moderate, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “may affect, likely to adversely affect” for project specific actions in the short term, and “may affect, not likely to adversely affect” for land use and park management over the long term. Consultation for specific projects would occur as necessary.

San Bruno elfin butterfly (*Callophrys mossii bayensis*). Because the San Bruno elfin butterfly is currently only known to occur at Milagra Ridge within the planning area, impacts would be restricted to this location. Other suitable habitat may be present at other locations in San Mateo County.

Exotic plant removal and vegetation management would continue to improve conditions for *Sedum spathulifolium*, the succulent plant that hosts butterfly larvae. Controlling and managing visitor use in known habitat areas would reduce impacts to butterflies, such as the trampling of host plants and direct impacts to larvae and pupae from recreational use and development; however, some adverse impacts would continue. The National Park Service would continue to monitor butterfly populations and survey potential habitat – resulting in a beneficial impact. The primary threat to the butterfly would continue to be habitat loss – an adverse impact associated with increased urbanization of the region. Collectively, impacts to the San Bruno elfin butterfly resulting from NPS actions that are part of the no-action alternative (the continuation of current management and trends) would be long term, beneficial, minor, and localized. The determination of effect under

Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

Coho salmon, Central California Coast (*Oncorhynchus kisutch*) and steelhead trout, Central California Coast (*O. mykiss*). These two listed salmonid species are analyzed together because of the similarities in their life characteristics, habitat requirements, and the effects of impacts on the two species.

Coho salmon are restricted to Redwood Creek and Eastkoot Creek in Marin County, estuarine sites such as Bolinas Lagoon, as well as the nearshore waters of the Pacific Ocean. Steelhead trout are restricted to Redwood Creek and the drainages to Bolinas Lagoon and Rodeo Lagoon in Marin County and West Union Creek, a tributary to San Francisquito Creek, in San Mateo County. Therefore, impacts would be restricted to these locations.

National Park Service activities, such as vegetation management, creek restoration, and efforts to improve water quantity and quality within the Redwood Creek watershed would have beneficial impacts on maintaining habitat characteristics that support anadromous fish. Projects in Marin County at the Lower Redwood Creek property (floodplain restoration), Big Lagoon (estuarine and wetland restoration), Stinson Beach (stream and wetland restoration) and Muir Woods National Monument (vegetation management) would have beneficial impacts on habitat parameters required by the two species. These projects would improve riparian vegetation and in-stream habitat complexity – resulting in improvements to spawning, rearing, and migratory habitats. Critical habitat would be affected by restoration activities. Within the immediate project area, short-term, minor, adverse, localized impacts to nearly all essential features of critical habitat (substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions) would be expected. However, these short-term impacts would be outweighed by the beneficial impacts expected to occur over the long term. The National Park Service would continue to monitor coho and steelhead populations and inventory potential habitat.

Controlling and managing visitor use would reduce impacts to coho and steelhead, such as habitat alteration and direct impacts from recreational use and development; however, some adverse impacts would continue. The primary threats to coho and steelhead would continue to be loss and modification of habitat, water diversions, habitat channelization, sedimentation, and degraded water quality—adverse impacts associated with increased urbanization of the region. Collectively, impacts to coho salmon and steelhead trout resulting from NPS actions that are part of the no-action alternative (the continuation of current management and trends) would be long term, beneficial, minor, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, likely to adversely affect*” for project specific actions in the short term, and “*may affect, not likely to adversely affect*” for land use and park management over the long term. Consultation for specific projects would occur as necessary.

Western snowy plover (*Charadrius alexandrinus nivosus*). The western snowy plover nests in coastal Marin County at Point Reyes National Seashore and Dillon Beach. Nonbreeding snowy plovers regularly use habitat within the planning area at Ocean Beach. Snowy plovers are occasionally observed at Rodeo Beach, though these birds tend

to remain only for short periods. Therefore, impacts would be restricted to these locations.

Seasonal visitor use restrictions requiring dogs to be on leash on a portion of Ocean Beach would continue to assist in the protection of plovers—resulting in a beneficial impact. However, visitor use (especially dogs off-leash) would continue to disturb foraging or roosting birds resulting in long-term, minor, adverse, localized impacts. The National Park Service would continue to restrict park management activities in plover habitat and provide guidance for beach patrol activities and is currently developing a shorebird plover docent program—all of which assist with plover protection and provide beneficial impacts. The National Park Service would continue to monitor plover populations and survey potential habitat. The primary threat to the plover within the region would continue to be habitat loss—an adverse impact associated with increased urbanization of the region and the loss or alteration of beach habitat. Collectively, impacts to the western snowy plover resulting from NPS actions that are part of the no-action alternative (the continuation of current management and trends) would be long term, minor, adverse, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, likely to adversely affect.*”

Northern spotted owl (*Strix occidentalis caurina*). Suitable habitat for northern spotted owls includes all evergreen forested habitat north of State Route 1 in Marin County. Within the planning area, known spotted owl populations are currently limited to Muir Woods National Monument, Homestead Valley, and the Bolinas Lagoon watershed. Therefore, impacts would be restricted to these locations.

Vegetation management actions designed to protect and enhance coniferous forest, including old-growth, second growth and remnant stands, would provide potential roosting, feeding, and nesting habitat for the owl—resulting in a beneficial impact. The National Park Service would continue to monitor owl populations and survey potential habitat. Visitor use in the area would continue to disturb owls. Barred owls would also likely continue to invade preferred spotted owl habitats—an adverse impact. Ongoing actions to reduce human-created noise and light at Muir Woods National Monument would result in improvements to habitat conditions. The primary threat to the northern spotted owl in the region would continue to be the loss of habitat—an adverse impact associated with increased urbanization of the region. Other threats include expansion in the range of the barred owl, West Nile virus, changes in habitat due to Sudden Oak Death, and recreational pressure. Locally, in Muir Woods National Monument, the primary threat is from barred owls. Collectively, impacts to the northern spotted owl resulting from NPS actions that are part of the no-action alternative (the continuation of current management and trends) would be long term, minor, beneficial and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

San Francisco lessingia (*Lessingia germanorum*). Vegetation management, including exotic plant removal, would continue to improve conditions for the San Francisco lessingia. Restoration projects at Fort Funston (about 20 acres of ice plant removal) in areas that should contain open sandy soils and dunes would reduce competition with nonnative vegetation. Since the lessingia does not currently occur there, these actions at Fort Funston would result in a beneficial impact if a new population of lessingia is reintroduced there, as proposed in the U.S. Fish and Wildlife Services’ *Recovery Plan for*

Coastal Plants of the Northern San Francisco Peninsula. Controlling and managing visitor use in known habitat areas would reduce impacts to the lessingia, such as the trampling of plants; however, some adverse impacts would continue. The National Park Service would continue to monitor lessingia populations and survey potential habitat—resulting in a beneficial impact. The primary threat to the lessingia would continue to be habitat loss—an adverse impact associated with increased urbanization of the region—and habitat alteration resulting in increases in invasive, nonnative plants. Collectively, impacts to the San Francisco lessingia resulting from NPS actions that are part of the no-action alternative (the continuation of current management and trends) would be long term, beneficial, minor, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

State Threatened and Endangered Species

Bank swallow (*Riparia riparia*). The only known nesting location for bank swallows within the park is in the coastal bluffs at Fort Funston. The National Park Service would continue to maintain natural geologic processes that erode the cliffs and provide suitable nesting habitat—resulting in a beneficial impact. Visitor use in the vicinity of the nest sites, as well as the defacing of the sandy cliffs themselves, would continue to disturb individual birds and affect nesting activity and success—an adverse impact. The National Park Service would continue to monitor bank swallow populations and survey potential habitat—resulting in a beneficial impact. The primary threat to the bank swallow would continue to be habitat loss—resulting in an adverse impact associated with increased urbanization, conversion of natural habitats, and channelization of waterways in the region. Collectively, impacts to the bank swallow resulting from NPS actions that are part of the no-action alternative (the continuation of current management and trends) would be long term, beneficial, minor, and localized. However, it should be noted that bank stabilization work conducted by the City of San Francisco in the vicinity of the bank swallow colony (both on and off park lands) could continue under the no-action alternative. If so, it could continue to have notable adverse effects on bank swallow habitat.

Conclusion

Table 16: Potential Impacts to Special Status Species of Golden Gate National Recreation Area, No-action Alternative

Species	Status	ESA Determination
California red-legged frog (<i>Rana aurora draytonii</i>)	Federal threatened	“ <i>may affect, likely to adversely affect</i> ” for project specific actions in the short term, and “ <i>may affect, not likely to adversely affect</i> ” for land use and park management over the long term
Mission blue butterfly (<i>Icaricia icaroides missionensis</i>)	Federal endangered	“ <i>may affect, likely to adversely affect</i> ” for project specific actions in the short term, and “ <i>may affect, not likely to adversely affect</i> ” for land use and park management

Species	Status	ESA Determination
		over the long term
Tidewater goby (<i>Eucyclogobius newberryi</i>)	Federal endangered	“may affect, likely to adversely affect” for project specific actions in the short term, and “may affect, not likely to adversely affect” for land use and park management over the long term
San Francisco garter snake (<i>Thamnophis sirtalis tetrataenia</i>)	Federal endangered; State endangered	“may affect, likely to adversely affect” for project specific actions in the short term, and “may affect, not likely to adversely affect” for land use and park management over the long term
San Bruno elfin butterfly (<i>Callophrys mossii bayensis</i>)	Federal endangered	“may affect, not likely to adversely affect”
Coho salmon, Central California Coast (<i>Oncorhynchus kisutch</i>)	Federal threatened; State endangered	“may affect, likely to adversely affect” for project specific actions in the short term, and “may affect, not likely to adversely affect” for land use and park management over the long term
Steelhead trout, Central California Coast (<i>Oncorhynchus mykiss</i>)	Federal threatened	“may affect, likely to adversely affect” for project specific actions in the short term, and “may affect, not likely to adversely affect” for land use and park management over the long term
Western snowy plover (<i>Charadrius alexandrinus nivosus</i>)	Federal threatened	“may affect, likely to adversely affect”
Northern spotted owl (<i>Strix occidentalis caurina</i>)	Federal threatened	“may affect, not likely to adversely affect”
San Francisco lessingia (<i>Lessingia germanorum</i>)	Federal endangered; State endangered	“may affect, not likely to adversely affect”
Bank swallow (<i>Riparia riparia</i>)	State threatened	long-term, beneficial, minor, and localized

No impairment of listed species would result from this alternative.

Alternative 1: Connecting People with the Parks (NPS Preferred Alternative for Park Sites in Marin, San Francisco, and San Mateo Counties)

Introduction

Under alternative 1, a variety of management zones would be used that would assist in the protection of special status species. Approximately 77% of the park would be zoned as Natural and Sensitive Resources zones.

Federal Threatened and Endangered Species

California red-legged frog (*Rana aurora draytonii*). Impacts to California red-legged frogs and their habitat from alternative 1 would be the same as under the no-action alternative with the exception of impacts to habitat from expanded restoration of natural areas. The removal of the dam at Tennessee Pond and other infrastructure, and the restoration of riparian habitat in Lower Tennessee Valley would result in beneficial effects. Also, vegetation management, including exotic plant removal, especially in riparian and wetland areas in San Mateo County, would be greater than under the no-action alternative, creating improvements to vegetative structure and condition that could improve breeding and foraging habitat—resulting in a beneficial impact. Impacts to the frog from new recreational development under alternative 1 would not occur because any new facilities would be sited to avoid existing or potential frog habitat. Impacts to the California red-legged frog resulting from NPS actions that are part of the alternative 1 would be long term, beneficial, minor, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

Mission blue butterfly (*Icaricia icaroides missionensis*). Impacts to mission blue butterflies and their habitat from alternative 1 would be the same as the no-action alternative with the exception of vegetation management actions in San Mateo County and new recreational development in San Mateo and Marin counties. Vegetation management, including exotic plant removal, in San Mateo County park lands would improve conditions that support the host lupine – resulting in a beneficial impact. However, increased visitor use in this area could also cause adverse impacts to host plants and butterfly larvae and pupae. New recreational development in known habitat in Marin and San Mateo counties would slightly increase the adverse impacts that are described under the no-action alternative. Impacts to the Mission blue butterfly resulting from NPS actions that are part of alternative 1 would be long term, beneficial, minor, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

Tidewater goby (*Eucyclogobius newberryi*). Impacts to tidewater gobies and their habitat from alternative 1 would be the same as the no-action alternative. Impacts to the tidewater goby resulting from NPS actions that are part of alternative 1 would be long term, beneficial, minor, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

San Francisco garter snake (*Thamnophis sirtalis tetrataenia*). Impacts to the San Francisco garter snake and their habitat under alternative 1 would be the same as under the no-action alternative with the exception of habitat improvements in San Mateo County. Vegetation management, including exotic plant removal in riparian and wetland

areas, would improve the structure and condition of vegetation that supports snakes—resulting in a beneficial impact. Impacts to the San Francisco garter snake resulting from NPS actions that are part of alternative 1 would be long term, beneficial, minor to moderate, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

San Bruno elfin butterfly (*Callophrys mossii bayensis*). Impacts to the San Bruno elfin butterfly and their habitat under alternative 1 would be the same as under the no-action alternative, with the exception of habitat improvements at Milagra Ridge and other park lands in San Mateo County. Habitat restoration activities at Milagra Ridge (including earthwork and native plantings covering about 20 acres) could improve conditions for host plant recruitment and butterfly use. Vegetation management, including exotic plant removal, elsewhere in San Mateo County would improve the structure and condition of vegetation and could increase the potential for local range expansion into additional suitable habitat – resulting in a beneficial impact. Impacts to the San Bruno elfin butterfly resulting from NPS actions that are part of alternative 1 would be long term, beneficial, minor to moderate, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

Coho salmon, Central California Coast (*Oncorhynchus kisutch*) and steelhead trout, Central California Coast (*O. mykiss*). Adverse impacts to coho salmon and steelhead trout and their habitat would be the same as those described under the no-action alternative. The types of beneficial impacts described under the no-action alternative would be the same under alternative 1 but the scale would be greater, resulting in increased beneficial impacts. Restoration activities in the Redwood Creek watershed in Marin County and at various creeks within San Mateo County would improve habitat characteristics that support anadromous fish. The goal of reconnecting creeks to the ocean on San Mateo County park lands, and partnering with CalTrans to improve fish passage, would provide the habitat required to support the life cycle of these anadromous fish – resulting in a beneficial impact. Impacts to coho salmon and steelhead trout resulting from NPS actions that are part of alternative 1 would be long term, beneficial, moderate, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

Western snowy plover (*Charadrius alexandrinus nivosus*). Impacts to Western snowy plover and their habitat from alternative 1 would be the same as the no-action alternative. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

Northern spotted owl (*Strix occidentalis caurina*). Impacts to northern spotted owls and their habitat from alternative 1 would be the same as the no-action alternative. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

San Francisco lessingia (*Lessingia germanorum*). Adverse impacts to the San Francisco lessingia and its habitat would be the same as those described under the no-action alternative. The types of beneficial impacts described under the no-action alternative would be the same under alternative 1, but the scale would be greater, resulting in increased beneficial impacts due to expanded vegetation management and native plant habitat restoration. Impacts to the San Francisco lessingia resulting from

NPS actions that are part of alternative 1 would be long term, beneficial, minor, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

State Threatened and Endangered Species

Bank swallow (*Riparia riparia*). Impacts to bank swallows and their habitat from alternative 1 would be the same as the no-action alternative. Impacts from NPS actions would be long term, beneficial, minor, and localized. However, as noted under the no-action alternative, adverse impacts to bank swallow from City of San Francisco bank stabilization work on and off park lands could continue.

Conclusion

Table 17: Potential Impacts to Special Status Species of Golden Gate National Recreation Area, Alternative 1

Species	Status	ESA Determination
California red-legged frog (<i>Rana aurora draytonii</i>)	Federal threatened	“ <i>may affect, not likely to adversely affect</i> ”
Mission blue butterfly (<i>Icaricia icaroides missionensis</i>)	Federal endangered	“ <i>may affect, not likely to adversely affect</i> ”
Tidewater goby (<i>Eucyclogobius newberryi</i>)	Federal endangered	“ <i>may affect, not likely to adversely affect</i> ”
San Francisco garter snake (<i>Thamnophis sirtalis tetrataenia</i>)	Federal endangered; State endangered	“ <i>may affect, not likely to adversely affect</i> ”
San Bruno elfin butterfly (<i>Callophrys mossii bayensis</i>)	Federal endangered	“ <i>may affect, not likely to adversely affect</i> ”
Coho salmon, Central California Coast (<i>Oncorhynchus kisutch</i>)	Federal threatened; State endangered	“ <i>may affect, not likely to adversely affect</i> ”
Steelhead trout, Central California Coast (<i>Oncorhynchus mykiss</i>)	Federal threatened	“ <i>may affect, not likely to adversely affect</i> ”
Western snowy plover (<i>Charadrius alexandrinus nivosus</i>)	Federal threatened	“ <i>may affect, not likely to adversely affect.</i> ”
Northern spotted owl (<i>Strix occidentalis caurina</i>)	Federal threatened	“ <i>may affect, not likely to adversely affect</i> ”

Species	Status	ESA Determination
San Francisco lessingia (<i>Lessingia germanorum</i>)	Federal endangered; State endangered	“may affect, not likely to adversely affect”
Bank swallow (<i>Riparia riparia</i>)	State threatened	long-term, beneficial, minor, and localized

No impairment of listed species would result from this alternative.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Introduction

Under alternative 2, a variety of management zones would be used that would assist in the protection of special status species. Approximately 92% of the park would be zoned using the Natural and Sensitive Resources zones.

Federal Threatened and Endangered Species

California red-legged frog (*Rana aurora draytonii*). Impacts to California red-legged frogs and their habitat from alternative 2 would be the same as the no-action alternative with the exception of impacts to habitat from expanded restoration of natural areas. Vegetation management, including exotic plant removal, especially in riparian and wetland areas in Marin and San Mateo counties, would be greater than under the no-action alternative, resulting in improvements to vegetative structure and condition that could improve breeding and foraging habitat—a beneficial impact. Impacts to the frog from new recreational development under alternative 2 would not occur because any new facilities would be sited to avoid existing or potential frog habitat. Impacts to the California red-legged frog resulting from NPS actions that are part of the alternative 2 would be long term, beneficial, minor, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “may affect, not likely to adversely affect.”

Mission blue butterfly (*Icaricia icaroides missionensis*). Impacts to mission blue butterflies and their habitat from alternative 2 would be the same as those of the no-action alternative, with the exception of impacts resulting from vegetation management actions and new recreation development in San Mateo County and from park land use in Marin County. Vegetation management, including exotic plant removal, in San Mateo County park lands would improve conditions that support the host lupine – resulting in a beneficial impact. However, increased visitor use in this area could also cause adverse impacts to host plants and butterfly larvae and pupae. New recreational development in known habitat in San Mateo County would slightly increase the adverse impacts that are described under the no-action alternative. Management zoning of known habitat in Marin County would provide greater protection of butterfly habitat than under the no-action alternative – creating a beneficial impact. Impacts to the Mission blue butterfly resulting from NPS actions that are part of alternative 2 would be long term, beneficial, minor, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “may affect, not likely to adversely affect.”

Tidewater goby (*Eucyclogobius newberryi*). Impacts to tidewater gobies and their habitat from alternative 2 would be the same as the no-action alternative, with the exception of greater beneficial impacts resulting from expanded restoration efforts and watershed protection. Impacts to the tidewater goby resulting from NPS actions that are part of alternative 2 would be long term, beneficial, minor, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

San Francisco garter snake (*Thamnophis sirtalis tetrataenia*). Impacts to the San Francisco garter snake and their habitat under alternative 2 would be the same as under the no-action alternative, with the exception of impacts created by habitat improvements in San Mateo County. Vegetation management, including exotic plant removal in riparian and wetland areas, would improve the structure and condition of vegetation that supports snakes—resulting in a beneficial impact. Impacts to the San Francisco garter snake resulting from NPS actions that are part of alternative 2 would be long term, beneficial, minor to moderate, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

San Bruno elfin butterfly (*Callophrys mossii bayensis*). Impacts to the San Bruno elfin butterfly and their habitat under alternative 2 would be the same as under the no-action alternative, with the exception of habitat improvements at Milagra Ridge and other park lands in San Mateo County. Habitat restoration activities at Milagra Ridge (including earthwork and native plantings covering about 20 acres) could improve conditions for host plant recruitment and butterfly use. Vegetation management, including exotic plant removal, elsewhere in San Mateo County would improve the structure and condition of vegetation and could increase the potential for local range expansion into additional suitable habitat—resulting in a beneficial impact. Impacts to the San Bruno elfin butterfly resulting from NPS actions that are part of alternative 2 would be long term, beneficial, minor to moderate, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

Coho salmon, Central California Coast (*Oncorhynchus kisutch*) and steelhead trout, Central California Coast (*O. mykiss*). Adverse impacts to coho salmon and steelhead trout and their habitat would be the same as those described under the no-action alternative. The types of beneficial impacts described under the no-action alternative would be the same under alternative 2 but the scale would be greater, resulting in increased beneficial impacts. Restoration activities in the Redwood Creek watershed in Marin County and at various creeks within San Mateo County would improve habitat characteristics that support anadromous fish. The goal of reconnecting creeks to the ocean on San Mateo County park lands, and partnering with CalTrans to improve fish passage, would provide the habitat required to support the life cycle of these anadromous fish—resulting in a beneficial impact. Impacts to coho salmon and steelhead trout resulting from NPS actions that are part of alternative 2 would be long term, beneficial, moderate, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

Western snowy plover (*Charadrius alexandrinus nivosus*). Impacts to western snowy plover and their habitat from alternative 2 would be the same as the no-action alternative.

The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

Northern spotted owl (*Strix occidentalis caurina*). Impacts to northern spotted owls and their habitat from alternative 2 would be the same as the no-action alternative. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

San Francisco lessingia (*Lessingia germanorum*). Adverse impacts to the San Francisco lessingia and its habitat would be the same as those described under the no-action alternative. The types of beneficial impacts described under the no-action alternative would be the same under alternative 2 but the scale would be greater, resulting in increased beneficial impacts due to expanded vegetation management and native plant habitat restoration. The removal of nonhistoric buildings at Fort Funston would provide an opportunity to restore dune habitat and create an area of expansion for the lessingia. Impacts to the San Francisco lessingia resulting from NPS actions that are part of alternative 2 would be long term, beneficial, minor, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

State Threatened and Endangered Species

Bank swallow (*Riparia riparia*). Impacts to bank swallows and their habitat from alternative 1 would be the same as the no-action alternative. Impacts from NPS actions would be long term, beneficial, minor, and localized. However, as noted under the no-action alternative, adverse impacts to bank swallow from City of San Francisco bank stabilization work on and off park lands could continue.

Conclusion

Table 18: Potential Impacts to Special Status Species of Golden Gate National Recreation Area, Alternative 2

Species	Status	ESA Determination
California red-legged frog (<i>Rana aurora draytonii</i>)	Federal threatened	“ <i>may affect, not likely to adversely affect</i> ”
Mission blue butterfly (<i>Icaricia icaroides missionensis</i>)	Federal endangered	“ <i>may affect, not likely to adversely affect</i> ”
Tidewater goby (<i>Eucyclogobius newberryi</i>)	Federal endangered	“ <i>may affect, not likely to adversely affect</i> ”
San Francisco garter snake (<i>Thamnophis sirtalis tetrataenia</i>)	Federal endangered; State endangered	“ <i>may affect, not likely to adversely affect</i> ”
San Bruno elfin butterfly (<i>Callophrys mossii bayensis</i>)	Federal endangered	“ <i>may affect, not likely to adversely affect</i> ”

Species	Status	ESA Determination
Coho salmon, Central California Coast (<i>Oncorhynchus kisutch</i>)	Federal threatened; State endangered	"may affect, not likely to adversely affect"
Steelhead trout, Central California Coast (<i>Oncorhynchus mykiss</i>)	Federal threatened	"may affect, not likely to adversely affect"
Western snowy plover (<i>Charadrius alexandrinus nivosus</i>)	Federal threatened	"may affect, not likely to adversely affect."
Northern spotted owl (<i>Strix occidentalis caurina</i>)	Federal threatened	"may affect, not likely to adversely affect"
San Francisco lessingia (<i>Lessingia germanorum</i>)	Federal endangered; State endangered	"may affect, not likely to adversely affect"
Bank swallow (<i>Riparia riparia</i>)	State threatened	long-term, beneficial, minor, and localized

No impairment of listed species would result from this alternative.

Alternative 3: Focusing on National Treasures (NPS Preferred Alternative for Alcatraz Island)

Introduction

Under alternative 3, a variety of management zones would be used that would assist in the protection of special status species. Approximately 88% of the park would be zoned using the Natural and Sensitive Resources zones.

Federal Threatened and Endangered

California red-legged frog (*Rana aurora draytonii*). Impacts to California red-legged frogs and their habitat from alternative 3 would be the same as the no-action alternative with the exception of impacts to habitat from expanded restoration of natural areas. Vegetation management, including exotic plant removal, especially in riparian and wetland areas in San Mateo County, would be greater than under the no-action alternative, creating improvements to vegetative structure and condition that could improve breeding and foraging habitat—resulting in a beneficial impact. Impacts to the frog from new recreational development under alternative 3 would not occur because any new facilities would be sited to avoid existing or potential frog habitat. Impacts to the California red-legged frog resulting from NPS actions that are part of the alternative 3 would be long term, beneficial, minor, and localized. The determination of effect under Section 7 of the Endangered Species Act would be "may affect, not likely to adversely affect."

Mission blue butterfly (*Icaricia icaroides missionensis*). Impacts to mission blue butterflies and their habitat from alternative 3 would be the same as the no-action

alternative with the exception of vegetation management actions and new recreational development in San Mateo County, and park land uses in Marin County. Vegetation management, including exotic plant removal, in San Mateo County park lands would improve conditions that support the host lupine—a beneficial impact. However, increased visitor use in this area could also cause adverse impacts to host plants and butterfly larvae and pupae. New recreational development in known habitat in Marin and San Mateo counties would slightly increase the adverse impacts that are described under the no-action alternative. Treatments to restore cultural landscapes in known habitat in Marin County could have adverse impacts (i.e. loss or conversion of habitat) on native coastal shrub habitats and grasslands that support lupine and butterflies; however, butterfly habitat protection objectives would be included in any plans to change existing conditions in this area. Impacts to the Mission blue butterfly resulting from NPS actions that are part of alternative 3 would be long term, adverse, minor, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

Tidewater goby (*Eucyclogobius newberryi*). Impacts to tidewater gobies and their habitat from alternative 3 would be the same as the no-action alternative. Impacts to the tidewater goby resulting from NPS actions that are part of alternative 3 would be long term, beneficial, minor, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

San Francisco garter snake (*Thamnophis sirtalis tetrataenia*). Impacts to the San Francisco garter snake and their habitat under alternative 3 would be the same as under the no-action alternative with the exception of habitat improvements in San Mateo County. Vegetation management, including exotic plant removal in riparian and wetland areas, would improve the structure and condition of vegetation that supports snakes—a beneficial impact. Impacts to the San Francisco garter snake resulting from NPS actions that are part of alternative 3 would be long term, beneficial, minor to moderate, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

San Bruno elfin butterfly (*Callophrys mossii bayensis*). Impacts to the San Bruno elfin butterfly and their habitat under alternative 3 would be the same as under the no-action alternative, with the exception of habitat improvements at Milagra Ridge and other park lands in San Mateo County. Habitat restoration activities at Milagra Ridge (including earthwork and native plantings covering about 20 acres) could improve conditions for host plant recruitment and butterfly use. Vegetation management, including exotic plant removal, elsewhere in San Mateo County would improve the structure and condition of vegetation and could increase the potential for local range expansion into additional suitable habitat—resulting in a beneficial impact. Impacts to the San Bruno elfin butterfly resulting from NPS actions that are part of alternative 3 would be long term, beneficial, minor to moderate, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

Coho salmon, Central California Coast (*Oncorhynchus kisutch*) and steelhead trout, Central California Coast (*O. mykiss*). Adverse impacts to coho salmon and steelhead trout and their habitat would be the same as those described under the no-action alternative. The types of beneficial impacts described under the no-action alternative would be the same under alternative 3 but the scale would be greater, resulting in

increased beneficial impacts. Restoration activities in the Redwood Creek watershed in Marin County and at various creeks within San Mateo County would improve habitat characteristics that support anadromous fish. The goal of reconnecting creeks to the ocean on San Mateo County park lands, and partnering with CalTrans to improve fish passage, would provide the habitat required to support the life cycle of these anadromous fish—resulting in a beneficial impact. Impacts to coho salmon and steelhead trout resulting from NPS actions that are part of alternative 3 would be long term, beneficial, moderate, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

Western snowy plover (*Charadrius alexandrinus nivosus*). Impacts to western snowy plover and their habitat from alternative 3 would be the same as the no-action alternative. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

Northern spotted owl (*Strix occidentalis caurina*). Impacts to northern spotted owls and their habitat from alternative 3 would be the same as the no-action alternative. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

San Francisco lessingia (*Lessingia germanorum*). Adverse impacts to the San Francisco lessingia and its habitat would be the same as those described under the no-action alternative. The types of beneficial impacts described under the no-action alternative would be the same under alternative 3 but the scale would be greater, resulting in increased beneficial impacts due to expanded vegetation management and native plant habitat restoration. Impacts to the San Francisco lessingia resulting from NPS actions that are part of alternative 3 would be long term, beneficial, minor, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

State Threatened and Endangered

Bank swallow (*Riparia riparia*). Impacts to bank swallows and their habitat from alternative 3 would be the same as the no-action alternative. Impacts from NPS actions would be long term, beneficial, minor, and localized. However, as noted under the no-action alternative, adverse impacts to bank swallow from City of San Francisco bank stabilization work on and off park lands could continue.

Conclusion

Table 19: Potential Impacts to Special Status Species of Golden Gate National Recreation Area, Alternative 3

Species	Status	ESA Determination
California red-legged frog (<i>Rana aurora draytonii</i>)	Federal threatened	“ <i>may affect, not likely to adversely affect</i> ”
Mission blue butterfly (<i>Icaricia icaroides missionensis</i>)	Federal endangered	“ <i>may affect, not likely to adversely affect</i> ”

Species	Status	ESA Determination
Tidewater goby (<i>Eucyclogobius newberryi</i>)	Federal endangered	"may affect, not likely to adversely affect"
San Francisco garter snake (<i>Thamnophis sirtalis tetrataenia</i>)	Federal endangered; State endangered	"may affect, not likely to adversely affect"
San Bruno elfin butterfly (<i>Callophrys mossii bayensis</i>)	Federal endangered	"may affect, not likely to adversely affect"
Coho salmon, Central California Coast (<i>Oncorhynchus kisutch</i>)	Federal threatened; State endangered	"may affect, not likely to adversely affect"
Steelhead trout, Central California Coast (<i>Oncorhynchus mykiss</i>)	Federal threatened	"may affect, not likely to adversely affect"
Western snowy plover (<i>Charadrius alexandrinus nivosus</i>)	Federal threatened	"may affect, not likely to adversely affect."
Northern spotted owl (<i>Strix occidentalis caurina</i>)	Federal threatened	"may affect, not likely to adversely affect"
San Francisco lessingia (<i>Lessingia germanorum</i>)	Federal endangered; State endangered	"may affect, not likely to adversely affect"
Bank swallow (<i>Riparia riparia</i>)	State threatened	long-term, beneficial, minor, and localized

No impairment of listed species would result from this alternative.

CULTURAL RESOURCES

Historic Structures, Historic Districts, and Cultural Landscapes

No-action Alternative

Analysis

Under this alternative, the park would continue to manage park lands as outlined in the 1980 General Management Plan. The no-action alternative would result in few changes to contributing features of historic structures, districts and cultural landscapes within the project area. The park would continue to stabilize, preserve, and rehabilitate historic

structures, districts and cultural landscapes in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*, though much of this work would be subject to funding availability.

The park would continue to seek partner opportunities for assisting in this work when possible. Historic buildings would continue to be rehabilitated and reused by the park and park partners for various public and private purposes including administration and operations; staff housing; offices; commercial ventures; historic residence leasing programs; recreation, educational, and interpretive programs. For structures and buildings where neither funding nor a park partner were available for rehabilitating these resources, the park would stabilize and potentially mothball those buildings until such funds became available. This could result in a local, long term, minor adverse impact on historic structures which would be vacant and subject to further deterioration and wear over time.

Projects and plans currently underway which include some preservation treatments for historic structures, districts and cultural landscapes within the park, such as improvements to the Marin Headlands' transportation infrastructure and the *Marin Equestrian Plan Environmental Assessment*, would be implemented. In addition, the park would continue to inventory and assess properties identified as potentially eligible for listing on the national register of historic places, and develop subsequent treatment strategies as needed for historic structures, districts and cultural landscapes. Overall, the impact under the no-action alternative would be long-term, negligible to minor, adverse and beneficial to historic structures, districts, and cultural landscapes.

Specific properties within the area of potential effect with the potential to be impacted by implementation of the no-action alternative are discussed below:

Parkwide

Seacoast Fortifications of San Francisco Bay (Draft) – The park would continue to conduct stabilization and preservation maintenance of the contributing coastal fortifications and their historic settings. Some of these structures would continue to be accessible to visitors, while others would remain secured with minimal stabilization work performed to address deterioration and safety needs. This would result in a long term, negligible to minor, adverse effect.

Marin County

Forts Baker, Barry, and Cronkhite – Historic structures and their settings would be preserved or rehabilitated for recreation, education, and other uses, including park operations. Compatible adaptive reuse of historic structures would continue to be implemented by the park and park partners to preserve buildings and their settings while offering programs that further the park's mission. Planned road, trail, and transit projects would be implemented to improve visitor access and facilitate building reuse. This would result in a long-term, negligible to minor, beneficial and adverse impacts on contributing structures and landscapes of this historic district.

Point Bonita Historic District – The lighthouse and its contributing structures and landscape setting would continue to be preserved and open to visitors. Ongoing stabilization and preservation work would continue and have a long-term, negligible, beneficial and a long-term minor, adverse impact on the district.

Sara Seaver Randall House – Management would continue to be by Point Reyes National Seashore. No actions would be taken that would have an impact on the site.

Hill 640 Military Reservation - The World War II fire control stations and associated historic landscape would be monitored and active preservation steps would be taken if there are signs of deterioration. This would result in a negligible impact.

Ranch M (Golden Gate Dairy) – The historic ranch buildings and landscape would continue to support an equestrian operation; facilities would be preserved and rehabilitated. This would result in a long-term, minor to moderate, beneficial impact and a long-term minor, adverse impact to the historic structures and landscape features of the former ranch.

Ranch A/B (Miwok) – The historic ranch would continue to house an equestrian operation. Historic structures and landscape features that contribute to the property's integrity would be preserved and rehabilitated in accordance with the recommendations in the *Marin Equestrian Plan*. This would result in a long-term, minor to moderate, beneficial impact and a long-term, minor, adverse impact.

Bolinas Copper Mine – Management would continue to be by Point Reyes National Seashore. No actions would be taken under the no-action alternative that would have an impact on the site.

Miwok Trail – Cultural landscape resources associated with the Miwok Trail would be preserved and protected; this would have a long-term, negligible, beneficial impact and a long-term, minor, adverse impact.

San Francisco County

Alcatraz Island NHL – The marine environment, weather, and lack of significant capital investment dollars has resulted in some deterioration and loss of historic fabric of the island's historic buildings and landscape features over time. Under this alternative, historic resources which contribute to the NHL status would continue to be stabilized and preserved and improvements incrementally implemented as opportunities and funding arise. The potential lack of investment into some of the historic structures in a timely manner to arrest further deterioration could result in an adverse impact on these resources. In addition, deterioration of buildings and landscapes would continue to limit visitor access.

The arrival area would remain much the same as it is today. Portions of Building 64 would be used for administrative functions. The lighthouse would continue to be preserved for its historic function. The Main Prison Building and adjacent areas would continue to be managed as part of the visitor experience while several areas, such as the Citadel, would remain closed to the public. Adjacent landscapes to the Main Prison area would continue to be minimally preserved while providing habitat for sea birds. The National Park Service would continue to employ sustainable infrastructure technologies, whenever possible, to reduce the island's energy and operating needs which could result in some minor, adverse effects on historic buildings and the landscape. Past studies on the island's historic buildings and features, including the recently completed cultural landscape report (CLR) for Alcatraz Island, would guide stabilization and preservation activities. Implementation of the CLR preservation treatments would have widespread minor to moderate beneficial impacts.

Overall, these changes could diminish the overall integrity of some of the contributing resources to the national historic landmark but would not result in a loss of NHL eligibility for the island. Taken together, beneficial effects such as ongoing preservation and implementation of the CLR treatment recommendations with other work would render long-term, minor to moderate, beneficial and adverse impacts to Alcatraz Island.

San Francisco Port of Embarkation National Historic Landmark – The National Park Service would continue to use Building 201 as the park headquarters. Lower Fort Mason would continue to be managed by the Fort Mason Foundation who would perform ongoing preservation and rehabilitation work on the contributing resources, informed by the cultural landscape report for Fort Mason Center. The impact would be long term, minor, beneficial and adverse. Potential future water shuttle access may be provided at one of the piers, but the effects of that proposal as well as the proposed F-Line rail extension, would be addressed in a separate environmental analysis. The anticipated impacts from these respective actions are long term, minor to moderate, and adverse (water shuttle) and long term, moderate, and adverse (F-line).

Fort Mason Historic District – Many of the historic structures would continue to be preserved and rehabilitated for use by park operations as well as a variety of park partners. Uses would include office, maintenance functions, community garden, a hostel, and residences. The cultural landscape would be preserved and rehabilitated over time. This would result in a long-term, minor, beneficial and adverse impact.

Fort Miley Military Reservation – Historic structures and landscape features would continue to be maintained and preserved. Park maintenance would continue to use some of the historic structures. No major improvements would be made to either the facilities or landscape. This would result in a long-term, minor, adverse impact.

Camera Obscura – Operations and maintenance under this alternative would result in minor, beneficial, and minor, adverse impacts.

Six-inch Gun No. 9 – Operations and maintenance under this alternative would result in minor, beneficial, and minor, adverse impacts.

San Francisco Veterans Affairs Medical Center – Continued operation of the park maintenance facility, picnic areas, and other visitor areas at adjacent Fort Miley would have negligible impacts on the Veterans medical center historic district, which is owned and managed by the Department of Veterans' Affairs.

China Beach – This area would be preserved for ongoing recreational use and enjoyment. Historic features would be preserved resulting in a long-term, negligible, beneficial, and minor, adverse impact.

Marine Exchange Lookout Station (Octagon House) – This structure would remain unoccupied and would be stabilized rather than rehabilitated; no landscape rehabilitation would be undertaken, resulting in a local, long-term, minor, adverse impact.

O'Shaughnessy Seawall – The historic seawall and promenade on Ocean Beach would be preserved and the area would continue to provide a long trail connection between Fort Funston and the Cliff House. The seawall's preservation and maintenance would result in a long-term, negligible, beneficial, and long-term minor, adverse impact.

San Mateo County

Point Montara Light Station – The site would continue to be managed for use by a hostel and would include ongoing preservation and maintenance work to the contributing buildings and landscape features to support this use. This would have a long term, minor, beneficial and adverse impact to the district.

Rancho Corral de Tierra – Limited public access for recreational uses would continue in this area. Any trail or site improvements for these uses would be designed in a manner so as to be compatible with, and protect and preserve any contributing historic resources. This would have a long term, minor, adverse impact.

San Francisco Bay Discovery Site National Historic Landmark – The site would continue to be protected and preserved by the National Park Service, resulting in a long-term, negligible, beneficial impact.

Shelldance Nursery – This area would be managed for park trail access and would accommodate some park operations functions as well as a commercial nursery. Reuse plans for this area would continue to preserve and protect potential contributing historic structures and landscape features, and would result in long-term, minor, beneficial and adverse impacts.

Conclusion

When combined with the effects of the actions that are common to all alternatives, the impact to historic structures, districts and cultural landscapes under the no-action alternative would be long-term, negligible to minor, adverse and beneficial. Overall, the impacts to historic buildings, structures, and landscape features on Alcatraz Island under this alternative would be long term, minor to moderate, beneficial and adverse.

Under the no-action alternative, the Section 106 determination of effect on historic buildings, structures, districts and cultural landscapes in Golden Gate National Recreation Area, excluding Alcatraz Island National Historic Landmark, would be *adverse effect*. On Alcatraz Island, the Section 106 determination of effect on historic buildings, structures and cultural landscapes would be *adverse effect*.

Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Golden Gate National Recreation Area; 2) key to the natural or cultural integrity of the park; or 3) identified as a goal in the park's general management plan or other relevant NPS planning documents, there would be no impairment of the park's historic structures or districts or cultural landscapes.

Alternative 1: Connecting People with the Parks

Analysis

Actions under Alternative 1 would focus on maximizing opportunities for adaptive reuse and rehabilitation of historic structures, districts and cultural landscapes in a manner that would support overall park visitor enjoyment, understanding and community connections. One of the goals of this alternative would be to preserve and protect cultural resources while allowing visitors to connect with and better understand and appreciate these resources and their stories.

Under Alternative 1, the park would rehabilitate existing facilities to improve their condition to better welcome and support park visitors than exist today. Park partners would continue to play an important role in preserving historic resources through adaptive reuse of buildings and structures throughout the park to provide programs and services to visitors in support of the park's mission. Any historic building and landscape rehabilitation would be in accordance with the *Secretary's Standards for Historic Rehabilitation*. In some cases, building rehabilitation may also include construction of a compatible addition to accommodate a new use. Historic structures reports and cultural landscape reports would be prepared, as needed, in advance of preservation and rehabilitation project implementation.

Improved orientation and information services would be a key component of this alternative, which could require the introduction of new site furnishings and features in the park's landscape. In addition, some new visitor amenities (restrooms, parking lots, trailheads, etc.) and facilities would be constructed to enhance the overall visitor experience as well as day to day park operations (particularly in Marin and San Mateo counties). For any new development within a historic district or cultural landscape setting, an appropriate level of historic research, resource inventory and assessment would be conducted in advance of design. In addition, design guidelines for a specific area would be prepared in advance when necessary to assure compatibility of any new planning, design and construction within the historic setting. The park's cultural resources staff would continue to conduct historic resource surveys, research, and determinations of eligibility for historic structures, districts and landscapes that may be eligible for listing in the National Register of Historic Places. This information would help to guide informed decision making in the future regarding how historic structures, districts, and landscapes and their contributing features should be managed. Careful design would ensure that the rehabilitation of historic buildings, structures and landscapes, the development of new facilities such as parking areas, and the expansion or development of trails would minimally affect the scale and visual relationships among significant landscape features. In addition, the topography, vegetation, circulation features, and land use patterns of any significant cultural landscape would remain largely unaltered.

Specific properties within the Area of Potential Effect with the potential to be impacted by implementation of the Alternative 1 are discussed below:

Parkwide

Seacoast Fortifications of San Francisco Bay (Draft) – Under this alternative, the park would pursue an ongoing program of stabilization, preservation and interpretation of the seacoast fortifications that contribute to the NHL eligible district. A preservation strategy for the park's seacoast fortifications would be prepared to guide the long term treatment and management of these resources, given that each fortification is in a varying state of repair and provides different interpretive opportunities. As an example, restoration may be the preferred preservation treatment in some instances such as at Battery Townsley. Battery Mendell and the Bird Rock Overlook area in the Marin Headlands would be rehabilitated and interpreted for visitor use. In addition to the stabilization and preservation of fortifications in Marin, those contributing historic seacoast fortifications on Milagra Ridge, Sweeney Ridge, and other locations in San Mateo County would be also be preserved and interpreted. Overall, these preservation treatments for the historic

fortifications and their landscaped settings would have long-term, minor to moderate, beneficial and minor adverse impacts.

Marin County

Forts Baker, Barry, and Cronkhite – Under this alternative, no actions are proposed for Fort Baker. However, actions are contemplated for Forts Barry and Cronkhite. Within the historic district, Alternative 1 includes the following actions that could affect the cultural landscape of the district: comprehensive sets of improvements to trails, overlooks, visitor amenities; the rehabilitation and introduction of transit and orientation facilities; broad programs of natural resource enhancements; the introduction of new and expanded programs; associated facilities for activities such as camping and picnicking. Some of these actions would enhance the historic setting while introducing compatible new elements into the landscape, while others would be noticeable changes that could potentially alter a character-defining feature of the landscape. Therefore, these actions would result in both long-term minor to moderate adverse impacts and minor to moderate beneficial impacts.

Actions that could affect historic structures, as well as the surrounding historic landscape, include the removal of some of the Capehart housing units, whose historic significance and integrity needs to be assessed; some new construction at different locations for residential use, visitor facilities, overnight accommodations, and operational needs; adaptive reuse of historic structures; and preservation of coastal fortifications. These would result in both long term, minor to moderate, adverse and beneficial impacts. Modifications to historic structures and landscape features would follow the *Secretary of the Interior's Standards for the Treatment of Historic Properties* so as to minimize adverse impacts to the historic resources.

Overall these modifications would be noticeable and would result in a visual change to the district and to the individual landscape areas within the district. Although they would result in an adverse effect on individual contributing resources, taken together they would not result in an adverse effect on the integrity of the national register district. Under this alternative—with the incorporation of mitigation measures including the preparation of cultural landscape reports, historic structures reports, and design guidelines to ensure compatible new construction as described in Part 8 of this document—the long-term impact would be minor to moderate, adverse and beneficial.

Point Bonita Historic District - Historic buildings and landscape features in the Point Bonita Historic District would continue to be preserved and interpreted, resulting in long-term, minor, beneficial and adverse impacts.

Sara Seaver Randall House – Management would continue to be by Point Reyes National Seashore. No actions would be taken that would have an impact on the site.

Hill 640 Military Reservation - Under this alternative, the historic structures and cultural landscape features associated with the historic coastal defense fortifications at the Hill 640 Military Reservation would continue to be stabilized and preserved. This would result in a long-term, negligible, beneficial, and long-term, minor, adverse impact.

Ranch M (Golden Gate Dairy) – Similar to the no-action alternative, in alternative 1 the area would be managed to retain the pastoral character of the area while historic buildings and landscape features that contribute to the ranch's national register eligibility at the

Golden Gate Dairy would be rehabilitated and adaptively used for equestrian use. Other site improvements would include a small trailhead and public transit stop. Taken together, these improvements would result in a long term, minor to moderate, beneficial impact, and a long-term, minor, adverse impact due to the addition of new features and other modifications.

Ranch A/B (Miwok) - Similar to the no-action alternative, in this alternative historic buildings and landscape features that contribute to the former ranch's national register eligibility would be rehabilitated and adaptively used for equestrian use. This would result in a long-term, minor to moderate, beneficial, and long-term, minor, adverse impact. Site improvements (such as restrooms, improved parking, and visitor orientation/information) at the nearby Tennessee Valley trailhead parking area would have an indirect, local, long-term, negligible, adverse impact on the district.

Bolinas Copper Mine - Management would continue to be by Point Reyes National Seashore. No actions would be taken under alternative 1 that would have an impact on the site.

Miwok Trail - Cultural landscape resources associated with the Miwok Trail would be preserved and protected, which would have a long-term, negligible, beneficial, and long-term, minor, adverse impact.

San Francisco County

Alcatraz Island National Historic Landmark – Under this alternative, the park's management emphasis would improve the overall condition of historic buildings, structures, and landscapes across the island through preservation and rehabilitation and thus provide a greater variety of settings for visitor experiences. As a result, visitors would have access to the majority of the island's historic resources and landscapes, and many of the currently closed indoor and outdoor spaces would be reopened to the public. All of the primary buildings that contribute to the island's landmark status would be rehabilitated in accordance with the *Secretary of the Interior's Standards for Rehabilitation*, and other contributing structures would be stabilized and preserved. This would result in a long term, moderate, beneficial, and long-term, minor, adverse impact to historic structures.

Specific actions would include rehabilitation of Building 64 as a multipurpose facility for visitor services which could include overnight accommodations, and interpretive and administrative space. The Main Prison Area would be preserved to interpret the federal penitentiary period. The New Industries Building would be rehabilitated and adaptively used as multipurpose facility to host a variety of visitor services. The Guard House would be restored to the Civil War era through removal of the boathouse from a later time period, (resulting in a localized, long term, moderate adverse effect) and the remaining walls and foundations of the Post Exchange and Warden's House would be stabilized. The Power Plant and Quartermaster Warehouse, as well as a portion of the Model Industries Building, would be rehabilitated and adaptively used for maintenance, storage, public safety functions, and potentially to showcase alternative energy technologies. The lighthouse and surrounding area would be preserved, providing for improved visitor access and interpretation. Other historic buildings would be stabilized or rehabilitated all resulting in long term, minor to moderate, beneficial, and long-term, minor, adverse impacts.

Important landscaped areas that contribute to the national historic landmark's integrity, such as around the Main Prison Building and the Parade Ground, would be rehabilitated, and characteristic prison-era security features restored. Improvements would be in accordance with the treatment recommendations of the *Cultural Landscape Report for Alcatraz Island* and would comply with the *Secretary of the Interior's Standards for the Treatment of Historic Properties, with Guidelines for the Treatment of Cultural Landscapes*. This would have a beneficial impact on the landscape. There could also be local, minor, adverse impacts on individual cultural landscape features through either their deterioration or loss during the course of rehabilitation to accommodate visitor uses or through the decision to allow some areas to revert to a more natural state. Overall, these landscape changes would result in long term, minor to moderate, beneficial, and long term, minor, adverse impacts.

Historic buildings and landscapes on Alcatraz Island could be adversely impacted over time from the effects of increased visitation to the island, especially with the provision of overnight visitor stays. Unstaffed or minimally staffed structures could be more susceptible to vandalism. This would result in a long term, negligible to minor, adverse impact on historic structures and landscapes. However, the park would monitor the effects of increased visitation on historic resources and could modify visitor access and uses, or would use other techniques to further protect these resources from human impacts without hindering interpretation opportunities and overall visitor experience. In addition, the park's provision of regular patrols and visitor education programs about resource significance and protection (such as discouraging vandalism) would help to reduce these potential visitor impacts to no more than minor.

In conclusion, modifications to the contributing resources on Alcatraz Island would be noticeable. Although some actions could result in an adverse effect on some individual features, taken together they would not result in an adverse effect on the overall integrity of the national historic landmark. The impact to these historic resources under this alternative would be long term, minor to moderate, beneficial and long term, minor to moderate (for removal of the Boathouse) adverse.

San Francisco Port of Embarkation NHL – Similar to the no-action alternative, actions under alternative 1 would include the park's continued use of Building 201 as the park headquarters. Lower Fort Mason would continue to be managed by the Fort Mason Foundation who would perform ongoing preservation and rehabilitation work on the contributing resources as recommended in the *Cultural Landscape Report for Lower Fort Mason*. These treatments, including energy-saving infrastructure additions, would be designed to avoid adverse effect. The impact would be long term, negligible, beneficial, and long term, minor, adverse. Potential future water shuttle access may be provided at one of the piers, but the effects of that proposal as well as the proposed F-Line rail extension, would be addressed in a separate environmental planning process. The anticipated impacts from these respective actions are long term, minor to moderate, adverse (water shuttle), and long term, moderate, adverse (F-line).

Aquatic Park Historic District National Historic Landmark – Under alternative 1, site and circulation modifications to accommodate transit improvements on the Van Ness Avenue corridor, and overall wayfinding and park orientation signage, could have direct and indirect effects on the historic landscape of the district. Efforts would be made to minimize the effects on this historic landscape. Recommendations of a cultural landscape

report would guide these changes. The potential impact would be long term, minor, and adverse. This property is within and managed by San Francisco Maritime National Historical Park.

Fort Mason Historic District - The Fort Mason District would serve as a “portal to the park” using historic structures to welcome visitors in a setting that would remain a peaceful contrast to the adjacent city. This would be accomplished through the continued rehabilitation of historic buildings and the district’s historic designed landscape. Building uses would include visitor services (park orientation, information), food service, special event venues, residences, overnight accommodations, and park/partner offices and programs. Landscape improvements would be consistent with the treatment recommendations based upon the *Cultural Landscape report for Fort Mason* (2011) and would include rehabilitation of the overgrown gardens on the east and northeast slopes; the installation of identification, orientation, and wayfinding signs; opening up of important viewsheds; and considerable treatment of over-mature and (sometimes) hazardous trees. This action, along with other contemplated transit access improvements, would trigger the need for visitor circulation and associated site improvements within the district. Some actions may adversely impact individual features: the removal of trees and the time it takes for replacement trees to grow would result in short-term, minor, adverse impacts. However, taken as a whole—with the incorporation of mitigation measures such as the provision for the preparation of historic structure reports and design guidelines—these actions would have a long-term, negligible to moderate, beneficial, and long-term, minor, adverse impacts on the historic district.

Fort Miley Military Reservation – The historic structures of West Fort Miley would continue to be preserved and the landscape enhanced to provide better connections for visitors to adjacent resources and sites. Landscape changes would include the provision of picnicking and group camping facilities, which would be new features in the landscape. These changes would be designed to be compatible with the historic setting. Park maintenance functions would continue to occur in the East Fort Miley historic warehouse and batteries. These actions would result in a long term, minor, adverse impact.

Pumping Station #2, SF Fire Department Auxiliary Water Supply System – No impacts to this property are anticipated from alternative 1. This property is within Fort Mason but is owned and operated by the City of San Francisco.

Camera Obscura – Operations and maintenance under this alternative would result in minor, beneficial, and minor, adverse impacts.

Six-inch Gun No. 9 - Operations and maintenance under this alternative would result in minor, beneficial, and minor, adverse impacts.

San Francisco Veterans Affairs Medical Center – Continued operation of Fort Miley as a historic site (West) and park maintenance facility (East) would have negligible impacts on the adjacent Veterans medical center historic district, which is owned and managed by the Department of Veterans’ Affairs.

China Beach – Some improvements to the existing array of visitor facilities and access would be made to support continued use of this popular site. Impacts would be long term, negligible, beneficial, and long term, minor, adverse.

Marine Exchange Lookout Station (Octagon House) - The building and adjacent landscape would be rehabilitated for park or park partner uses and interpreted, which would have a long-term, moderate, beneficial, and long-term, minor, adverse impact.

O'Shaughnessy Seawall – The historic seawall on Ocean Beach would be preserved and protected. Adjacent amenities, such as the promenade, parking area, and restroom facilities that support visitor beach use of the area, would be improved. This would have long-term, negligible to minor, beneficial, and long-term, minor, adverse impacts.

Sutro District – Managed under an existing plan, no impacts to this property are anticipated from alternative 1. This district is managed by the park as a cultural resource but has been determined to not be eligible for the National Register of Historic Places in consultation with the California state historic preservation officer.

San Mateo County

San Francisco Bay Discovery Site National Historic Landmark – The site and its associated features would be preserved, enhanced, and interpreted. A hikers hut could be constructed in the vicinity as part of a system of trail amenities for the Bay Area Ridge Trail. Any new construction and development would be sited and designed away from the actual site so as not to directly affect the historic integrity of this site. Limited vehicular access to the discovery site would be permitted as well. This could result in increased visitation to the site, which would be monitored over time for any changes to the historic setting, landscape, and monuments to ensure long term preservation. Overall, these changes would result in a long-term, minor, adverse impact.

Point Montara Light Station - The Montara Lighthouse and associated historic buildings and landscape, would continue to function as a hostel and support day-use programs. The facilities would be preserved or rehabilitated as needed and the site interpreted. This would result in long term, minor, beneficial and adverse impacts.

Rancho Corral de Tierra - If determined eligible for listing in the National Register of Historic Places, contributing historic structures and cultural landscape resources associated with the rural agricultural landscape at Rancho Corral de Tierra in San Mateo County would be preserved in balance with natural resource restoration goals. New visitor amenities, including trailheads and trails, would be compatibly designed to blend in with the historic landscape. The preservation of these resources would have a long term, minor beneficial impact; however, the introduction of new elements and natural resource restoration activities could result in long term, minor, adverse impacts.

Shelldance Nursery - If determined eligible for listing in the National Register of Historic Places, transition from a commercial nursery to an area that provides a variety of visitor services and park operational needs would have a moderate, beneficial, and minor, adverse impact, if carried out according to the *Secretary of the Interior's Standards for Historic Preservation* and if removal of any structures that may be deemed historic is avoided.

Conclusion

In conjunction with the effects from the actions common to all alternatives, alternative 1 would result in local, long-term, negligible to moderate, adverse and beneficial impacts to historic structures, districts and landscapes. Impacts would be minimized by implementing mitigation measures. The park's management strategy for historic

buildings, districts, and cultural landscapes would generally be one of preservation and rehabilitation for new and continued uses. This would have a long term, beneficial, effect on these resources. In some instances, individual projects could result in adverse effects due to the level or amount of intervention and proposed modifications to a structure or site.

With regards to Alcatraz Island National Historic Landmark, although some actions could result in an adverse effect on some individual features, taken together the actions would not result in an adverse effect on the overall integrity of the national historic landmark. The impacts to historic structures and the cultural landscape would be long term, minor to moderate, beneficial, and long term, minor, adverse.

Under alternative 1, the Section 106 determination of effect on historic buildings, structures, districts and cultural landscapes in Golden Gate National Recreation Area, excluding Alcatraz Island National Historic Landmark, would be *adverse effect*. On Alcatraz Island, the Section 106 determination of effect on historic buildings, structures and cultural landscapes would be *adverse effect*.

Because there would be no major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Golden Gate National Recreation Area; 2) key to the natural or cultural integrity of the park; or 3) identified as a goal in the park's general management plan or other relevant NPS planning documents, there would be no impairment of the park's historic buildings and structures.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

Actions under alternative 2 would be similar to those under alternative 1 and would maximize opportunities for adaptive reuse and rehabilitation of historic structures, districts and cultural landscapes in a manner that would support the overall park mission. One of the goals of this alternative would be to preserve and protect cultural resources with support for their stewardship and interpretation.

Under alternative 2, the park would rehabilitate existing facilities to improve their condition to welcome and support park visitors. A focus of programs would be the preservation and enhancement of the park's interconnected coastal ecosystems in which marine resources are valued and featured in interpretation. Cultural resource sites and stories would emphasize human occupation of the coastal environment as reflected in lighthouses, coastal defense structures and other developed sites, and reflected in the area's European exploration, maritime history, as well as historic agricultural land uses.

Park partners would continue to play an important role in preserving historic resources through adaptive reuse of buildings and structures throughout the park to provide programs and services to visitors in support of the park's mission. Consistent with alternative 1, any historic building and landscape rehabilitation would be in accordance with the *Secretary's Standards for Historic Rehabilitation*. In some cases, building rehabilitation may also include construction of a compatible addition to accommodate a new use. Historic structures reports and cultural landscape reports would be prepared, as needed, in advance of preservation and rehabilitation project implementation.

Improved orientation and information services would be a key component of this alternative, which could require the introduction of new site furnishings and features in the park's landscape. In addition, some new visitor amenities (restrooms, parking lots, trailheads, etc.) and facilities would be constructed to enhance the overall visitor experience as well as day to day park operations (particularly in Marin and San Mateo counties). For any new development within a historic district or cultural landscape setting, an appropriate level of historic research, resource inventory and assessment would be conducted in advance of design. In addition, design guidelines for a specific area would be prepared when necessary in advance to assure compatibility of any new planning, design and construction within the historic setting. The park's cultural resources staff would continue to conduct historic resource surveys, research, and determinations of eligibility for historic structures, districts and landscapes that may be eligible for listing in the National Register of Historic Places. This information would help to guide informed decision making in the future regarding how historic structures, districts, and landscapes, and their contributing features should be managed. Careful design would ensure that the rehabilitation of historic buildings, structures and landscapes, the development of new facilities such as parking areas, and the expansion or development of trails would minimally affect the scale and visual relationships among significant landscape features. In addition, the topography, vegetation, circulation features, and land use patterns of any significant cultural landscape would remain largely unaltered.

Specific properties that could be affected by actions proposed under alternative 2 are further described below.

Parkwide

Seacoast Fortifications of SF Bay (Draft) – Similar to alternative 1, under this alternative the park would pursue an ongoing program of stabilization, preservation and interpretation of the seacoast fortifications that contribute to the NHL-eligible district. A preservation strategy for the park's seacoast fortifications would be prepared to guide the long-term treatment and management of these resources, given that each fortification is in a varying state of repair and provides different interpretive opportunities. Based on their condition, significance, and suitability for visitor access, interpretive and educational opportunities, or park operational use, historic seacoast fortifications in the Marin Headlands would be stabilized and in some cases rehabilitated. In addition to the stabilization and preservation of fortifications in Marin, those contributing historic seacoast fortifications on Milagra Ridge, Sweeney Ridge, and other locations in San Mateo County would be also be preserved and interpreted. Cultural landscape resources associated with historic coastal fortifications would be preserved and managed in balance with natural resource restoration goals to perpetuate their historic values. Overall, these preservation treatments for the historic fortifications and their landscaped settings would have long-term, minor to moderate, beneficial, and long-term, minor, adverse impacts.

Marin County

Forts Baker, Barry, and Cronkhite - Within this historic district, alternative 2 includes actions similar to those proposed under alternative 1. Historic buildings and landscapes at Forts Barry and Cronkhite in the Marin Headlands would be rehabilitated and continue to be adaptively used by the park and park partners for recreational, educational, and stewardship activities, resulting in long-term beneficial impacts. Specific actions that

could effect the cultural landscape of the district include: comprehensive sets of improvements to trails, overlooks, visitor amenities; the rehabilitation and introduction of transit and orientation facilities; broad programs of natural resource enhancements including habitat restoration that would be consistent with the preservation of the historic landscape; the introduction of new and expanded programs; associated facilities for activities such as camping and picnicking. Some of these actions would enhance the historic setting while introducing compatible new elements into the landscape, while others would be noticeable changes that could potentially alter a character-defining feature of the landscape. Therefore, these actions would result in both long-term, minor to moderate, adverse impacts and long-term, minor to moderate, beneficial impacts.

Actions that could affect historic structures, as well as the surrounding historic landscape, include the removal of the Capehart housing—which needs an assessment of historic significance and integrity—and some potential new construction for a park operations facility in the area; adaptive reuse of historic structure,s and the ongoing preservation of coastal fortifications. These actions would result in both long term, minor to moderate, adverse, and long-term, minor to moderate, beneficial impacts. Modifications to historic structures and landscape features would follow the *Secretary of the Interior's Standards for the Treatment of Historic Properties* so as to minimize adverse impacts to the historic resources.

Overall these modifications would be noticeable and would result in a visual change to the district and to the individual landscape areas within the district. Although they would result in an adverse effect on individual contributing resources, taken together they would not result in an adverse effect on the integrity of the national register district. Under this alternative—with the incorporation of mitigation measures including the preparation of cultural landscape reports, historic structures reports, and design guidelines to ensure compatible new construction as described in Part 8 of this document—the long-term impact would be minor to moderate, adverse, and beneficial.

Point Bonita Historic District – Management of this area would be the same as alternative 1 in which historic buildings and landscape features in the district would continue to be preserved and interpreted, resulting in long-term, minor, beneficial, and long-term, minor, adverse impacts.

Sara Seaver Randall House – Management would continue to be by Point Reyes National Seashore. No actions would be taken under alternative 2 that would have an impact on the site.

Hill 640 Military Reservation – Treatment of this area would be the same as in alternative 1. Historic structures and cultural landscape features associated with the historic coastal defense fortifications would continue to be stabilized, preserved, and interpreted, resulting in a long term, negligible, beneficial, and long-term, minor, adverse impact.

Ranch M (Golden Gate Dairy) - Similar to the no-action alternative, this area would be managed to retain the pastoral character of the area while historic buildings and landscape features that contribute to the ranch's national register eligibility would be rehabilitated and adaptively used for equestrian use. Under alternative 2, nonhistoric residences near the Golden Gate Dairy could be removed if they are not needed to support community services or park operations. Taken together, these improvements

would result in a long term, minor to moderate, beneficial and long-term, minor, adverse impact.

Ranch A/B (Miwok) - Similar to the no-action alternative, historic buildings and landscape features that contribute to the former ranch's national register eligibility would be rehabilitated and adaptively used for equestrian use. This would result in a long term, minor to moderate, beneficial, and long-term, minor, adverse impact. A minimal level of visitor facilities and an improved trailhead to support visitor access to the area's extensive network of trails would be provided at the nearby Tennessee Valley trailhead parking. This would have an indirect, local, long-term, negligible, adverse impact on the district.

Bolinas Copper Mine - Management would continue to be by Point Reyes National Seashore. No actions would be taken under alternative 2 that would have an impact on the site.

Miwok Trail - Cultural landscape resources associated with the Miwok Trail would be preserved and protected, which would have a long-term, negligible, beneficial, and long-term, minor, adverse impact.

San Francisco County

Alcatraz Island National Historic Landmark – Under alternative 2, many of the island's historic buildings and landscape features would only be stabilized while others would be rehabilitated and maintained (resulting in long-term, beneficial impacts because their deterioration would be halted). The island's changing natural and built landscape would continue to evolve, further enhancing habitat for nesting birds. Only those buildings and features necessary to maintain the island's landmark status would be preserved, while natural elements would reclaim other features.

Building 64 would be rehabilitated and adaptively used to support science, education, and stewardship programs, administrative functions, and potential overnight accommodations for program participants. The Main Prison Building, including the hospital wing, adjacent landscape, and the Recreation Yard, would be rehabilitated or potentially restored to reflect historically accurate conditions. The lighthouse and surrounding landscape area would be preserved and interpreted. These rehabilitation efforts would result in a long term, moderate, beneficial, and long-term, minor, adverse impact.

The Parade Ground would be allowed to become a "wild" landscape, and its rubble piles retained to serve as bird habitat. The New Industries Building and the Model Industries Building would be stabilized and no efforts would be made to avoid their loss to coastal erosion. In order to restore natural habitats on the island, some cultural landscape resources would be allowed to deteriorate or be removed, depending upon their condition. This would only occur after the features had been documented and recorded in accordance with the HABS/HAER/HALS standards. This would result in a long term, moderate to major, adverse effect on these structures and landscape resources. With the incorporation of mitigation measures, the effect could be reduced to moderate adverse. The interior spaces of the Quartermaster Warehouse and Power Plant would be used for park operations. The Post Exchange would be stabilized to preserve the exterior of the structure; an interior shell could be constructed within the structure for park operations. These building treatments would result in long-term, minor to moderate, beneficial, and long-term, minor, adverse impacts on these resources.

The long term impacts to particular historic structures, buildings, and landscapes on Alcatraz Island would include minor, moderate, and major, adverse impacts, as well as minor to moderate, beneficial impacts. Overall these modifications would be noticeable and would result in a visual change to the district and to the individual landscape areas within the district. Although they would result in adverse impacts on individual contributing resources, taken together they would not result in a major adverse impact on the landmark district, as it would continue to maintain its status as a national register landmark district.

Fort Point – Operations and maintenance under this alternative would result in minor to moderate, beneficial, and minor, adverse impacts.

Presidio – Operations and maintenance under this alternative would result in minor to moderate, beneficial, and minor, adverse impacts.

San Francisco Port of Embarkation NHL – Actions would be the same as alternative 1, with long term preservation of the contributing structures and landscapes of the district. Building 201 would continue to be used as the park headquarters and Lower Fort Mason would continue to be managed by the Fort Mason Foundation. The impact would be long term, negligible and beneficial. Potential future water shuttle access may be provided at one of the piers, but the effects of that proposal as well as the proposed F Line rail extension, would be addressed in a separate environmental planning process. The anticipated impacts from these respective actions are long term, minor to moderate, adverse (water shuttle), and long term, moderate, adverse (F-line).

Aquatic Park Historic District NHL – Actions would be similar to those in alternative 1. Potential site and circulation modifications to accommodate transit improvements on the Van Ness Avenue corridor and overall wayfinding and park orientation signs, could have direct and indirect effects on the historic landscape of the district. Efforts would be made to minimize the effects on this historic landscape. A cultural landscape report would guide these changes. The potential impact would be long term, minor, adverse. This property is within and managed by San Francisco Maritime National Historical Park.

Fort Mason Historic District – With respect to the effects on the historic structures and landscape of this district, alternative 2 would be similar to alternative 1. Historic buildings would be rehabilitated and adaptively used to serve as a portal to the park and provide for uses such as a hostel and other overnight accommodations, park headquarters, and park and park partner offices and programs. Cultural landscape resources in Upper Fort Mason would be preserved through rehabilitation. As a whole, with the incorporation of mitigation measures such as the provision for the preparation of historic structure reports and design guidelines, the actions proposed under this alternative would have a long-term, negligible to moderate, beneficial, and long-term, minor, adverse impact on the historic district.

Fort Miley Military Reservation – Same as alternative 1. The historic structures of West Fort Miley would continue to be preserved and the landscape enhanced to provide better connections for visitors to adjacent resources and sites. Landscape changes would include the provision of picnicking and group camping facilities and would be designed to be compatible with the historic setting. Park maintenance functions would continue to occur in the East Fort Miley historic warehouse and batteries. These actions would result in a long term, minor, adverse impact.

Pumping Station #2, SF Fire Department Auxiliary Water Supply System – Same as alternative 1. No impacts to this property are anticipated. This property is within Ft. Mason but is owned and operated by the City of San Francisco.

Camera Obscura – Operations and maintenance under this alternative would result in minor beneficial and minor adverse impacts.

Six-inch Gun No. 9 – Operations and maintenance under this alternative would result in minor beneficial and minor adverse impacts.

San Francisco Veterans' Affairs Medical Center – Continued operation of Fort Miley as a park maintenance facility would have negligible impacts on the adjacent Veterans medical center historic district, which is owned and managed by the Department of Veterans' Affairs.

China Beach – Same as alternative 1: some improvements to the existing array of visitor facilities and access would be made to support continued use of this popular site. Impacts would be long term, negligible, beneficial, and long-term, minor, adverse. This property needs to be assessed to determine national register eligibility.

Marine Exchange Lookout Station (Octagon House) – The Marine Exchange Lookout Station (Octagon House) would be rehabilitated and adaptively used to engage the public in the natural and human history of the coastal marine environment. which would have a long-term, moderate, beneficial. and long-term, minor, adverse impact. This property needs to be assessed to determine national register eligibility.

O'Shaughnessy Seawall – the historic seawall would be preserved and protected. Adjacent amenities such as the promenade, parking area, and restroom facilities that support visitor beach use of the area would be improved. This would have long-term, negligible to minor, beneficial, and long-term, minor, adverse impacts. This property needs to be assessed to determine national register eligibility.

Sutro District – Managed under an existing plan, no impacts to this property are anticipated under alternative 2. This district is managed by the park as a cultural resource but has been determined to not be eligible for the National Register of Historic Places in consultation with the California state historic preservation officer.

San Mateo County

SF Bay Discovery Site NHL – Cultural landscape resources associated with San Francisco Bay Discovery Site National Historic Landmark on Sweeney Ridge would be preserved, enhanced, and interpreted. This would result in a long term, negligible, beneficial impact.

Point Montara Light Station – Similar to alternative 1, the Montara Lighthouse and associated historic buildings and landscape would continue to function as a hostel and would support day-use programs for park stewardship and environmental education. The facilities would be preserved or rehabilitated as needed and the site interpreted. This would result in a long term, minor, beneficial, and long-term, minor, adverse impact.

Rancho Corral de Tierra – If determined eligible for listing in the National Register of Historic Places, contributing historic structures and cultural landscape resources associated with the rural agricultural landscape at Rancho Corral de Tierra in San Mateo County would be preserved in balance with natural resource restoration goals. Compared

to alternative 1, fewer and more primitive visitor amenities would be constructed. Unnecessary fire roads could be converted to trails or removed, if not identified as contributing landscape features. The preservation of these resources would have a long term, minor, beneficial impact; however, the introduction of new elements and natural resource restoration activities could result in long term, negligible to minor, adverse impacts. This property needs to be assessed to determine national register eligibility.

Shelldance Nursery – If determined eligible for listing in the National Register of Historic Places, transition from a commercial nursery to an area that provides a variety of visitor services and park operational needs would have a moderate beneficial and minor adverse impact, if carried out according to the Secretary of the Interior's Standards for Historic Preservation and if removal of any structures that may be deemed historic is avoided.

Conclusion

In conjunction with the effects from the actions common to all alternatives, alternative 2 would result in local, long term, negligible to moderate, adverse, and local, long term, negligible to moderate, beneficial impacts to historic structures, districts and landscapes. Impacts would be reduced by implementing mitigation measures. The park's management strategy for historic buildings, districts, and cultural landscapes encompass stabilization, preservation, and rehabilitation for new and continued uses. In general, this would have a long-term, beneficial effect on these resources. In some instances, individual projects could result in long-term, moderate to major, adverse impacts, due to the level or amount of proposed change.

Impacts to Alcatraz Island National Historic Landmark would include minor, moderate, and major, adverse impacts with the potential loss of some contributing resources (structures and landscapes); however, actions would also result in minor to moderate, beneficial impacts on other contributing resources. Although some actions could result in an adverse effect on some individual features, taken together the actions would not result in an adverse effect on the overall integrity of the national historic landmark. Overall, those key features that define the essence of the landmark's integrity would be preserved.

Under alternative 2, the Section 106 determination of effect on historic buildings, structures, districts and cultural landscapes in Golden Gate National Recreation Area, excluding Alcatraz Island National Historic Landmark, would be *adverse effect*. On Alcatraz Island, the Section 106 determination of effect on historic buildings, structures and cultural landscapes would be *adverse effect*.

Because there would be no major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Golden Gate National Recreation Area; 2) key to the natural or cultural integrity of the park; or 3) identified as a goal in the park's general management plan or other relevant NPS planning documents, there would be no impairment of the park's historic buildings and structures.

Alternative 3: Focusing on National Treasures (NPS Preferred Alternative for Alcatraz Island)

Analysis

Actions under alternative 3 would place an emphasis on the park's nationally important natural and cultural resources. The fundamental resources of each site would be showcased with the highest level of preservation, maximizing opportunities for adaptive reuse and rehabilitation of historic structures, districts and cultural landscapes for park visitor enjoyment and understanding.

Similar to the other action alternative, under alternative 3, the park and park partners would rehabilitate existing facilities to improve their condition to better welcome and support park visitors. Historic building and landscape rehabilitation would be in accordance with the *Secretary's Standards for Historic Rehabilitation* and, in some cases, may include construction of compatible additions or new features to accommodate a new use. Historic structures reports and cultural landscape reports would be prepared, as needed, in advance of preservation and rehabilitation project implementation.

Compared to existing conditions and the other action alternatives, alternative 3 would result in providing the greatest amount of public access to the park's numerous historic buildings and landscapes, allowing park visitors direct contact with these resources when possible. In San Mateo County, park managers would work with other land management agencies and communities to promote heritage tourism and explore opportunities for regional landscape management; these actions would have a beneficial impact on the long term preservation and protection of historic structures, districts, and cultural landscapes. In order to successfully immerse visitors in the park's compelling sites and history, improved orientation and information services would be a key component of this alternative, which could require the introduction of new site furnishings and features in the park's landscape. Park staff would continue to conduct historic resource surveys, research, and determinations of eligibility for historic structures, districts, and landscapes that may be eligible for listing in the National Register of Historic Places. This information would be used to guide decisions regarding how historic structures, districts, and landscapes and their contributing features should be managed. Some new visitor amenities and facilities (restrooms, parking lots, trailheads, etc.) would be constructed to enhance the overall visitor experience as well as day-to-day park operations (particularly in Marin and San Mateo counties). For any new development within a historic district or cultural landscape setting, an appropriate level of historic research, resource inventory, and assessment would be conducted in advance of design. In addition, design guidelines for a specific area would be prepared, when necessary, in advance to assure compatibility of any new planning, design, and construction within the historic setting. Careful design would ensure that the rehabilitation of historic buildings, structures, and landscapes would minimally affect the scale and visual relationships among significant landscape features.

Specific properties within the area of potential effect with the potential to be impacted by implementation of alternative 3 are discussed below:

Parkwide

Seacoast Fortifications of SF Bay (Draft) - Under alternative 3, the park would pursue an ongoing program of stabilization, preservation, and interpretation of the seacoast

fortifications that contribute to the NHL-eligible district. In cases where conditions warrant, restoration would be pursued as well, to provide for an immersive visitor experience that will help visitors understand the fortification's history. A preservation strategy for the park's seacoast fortifications would be prepared to guide the long-term treatment and management of these resources, given that each fortification is in a varying state of repair and provides different interpretive opportunities. As an example, restoration may be the preferred preservation treatment in some instances such as at Battery Townsley, Battery Mendell and the Bird Rock Overlook area in the Marin Headlands would be rehabilitated and interpreted for visitor use. In addition to the stabilization and preservation of fortifications in Marin, those contributing historic seacoast fortifications on Milagra Ridge, Sweeney Ridge, and other locations in San Mateo County would be also be preserved and interpreted. Overall, these preservation treatments for the historic fortifications and their landscaped settings would have long-term, minor to moderate, beneficial, and long-term, minor, adverse impacts.

Golden Gate Bridge (Draft) – Continued operation and maintenance of the Presidio by the park would have negligible impacts on the adjacent Golden Gate Bridge National Historic Landmark, which is owned and operated by the Golden Gate Bridge District.

Marin County

Forts Baker, Barry, and Cronkhite – Historic buildings at Forts Barry and Cronkhite would be rehabilitated, interpreted, and adaptively used and the coastal fortifications would be preserved to showcase the history of the military's presence here, and the area's conversion from military post to national park. Similar to the other action alternatives, historic buildings and landscapes would be rehabilitated and used for a variety of park programs and functions. Some structures may be restored to evoke a better understanding of specific periods of the military's era. Similar to alternative 1, the following actions could effect the cultural landscape of the district: comprehensive sets of improvements to trails, overlooks, visitor amenities; the rehabilitation and introduction of transit and orientation facilities; and natural resource enhancements. Some of these actions would enhance the historic setting while introducing compatible new elements into the landscape, while others would be noticeable changes that could potentially alter a character-defining feature of the landscape. Modifications to historic structures and landscape features would follow the *Secretary of the Interior's Standards for the Treatment of Historic Properties* so as to minimize adverse impacts to the historic resources. With an emphasis on historic resource preservation, all of these actions would result in both long-term, negligible to minor, adverse impacts and long-term, minor to major, beneficial impacts.

More noticeable actions that could affect historic structures, as well as the surrounding historic landscape, include the removal of some of the Capehart housing, which needs to be assessed for historic significance and integrity, accompanied by new replacement construction of park facilities on the south side of Bunker Road. This would result in a long term, minor to moderate, adverse impact.

Overall these modifications would be noticeable and would result in a visual change to the district and to the individual landscape areas within the district. Under alternative 3, with the incorporation of mitigation measures—including the preparation of cultural landscape reports, historic structures reports, and design guidelines to ensure compatible

new construction as described in Part 8 of this document—the long term impact would be minor to moderate, and both adverse and beneficial.

Point Bonita Historic District – the treatment of this historic district would be the same as in alternative 1. Historic buildings and landscape features in the Point Bonita Historic District would continue to be preserved and interpreted, resulting in long term, minor, beneficial, and long-term, minor, adverse impacts.

Sara Seaver Randall House – Management would continue to be by Point Reyes National Seashore. No actions would be taken under alternative 3 that would have an impact on the site.

Hill 640 Military Reservation – Under this alternative, the historic structures and cultural landscape features associated with the historic coastal defense fortifications at the Hill 640 Military Reservation would be preserved and interpreted. Compared to the other action alternatives, the park would perform more extensive preservation work to allow for increased visitor access and interpretation to this significant resource. This would result in a long term, negligible to minor, beneficial, and long term, negligible to minor, adverse impact.

Ranch M (Golden Gate Dairy) – Under alternative 3, this historic district would be managed to retain its pastoral landscape and historic structures. Buildings and landscape features that contribute to the ranch's national register eligibility would be rehabilitated and adaptively used for equestrian use and other recreational uses, park operations, and local community services. These improvements would result in a long term, minor to moderate, beneficial, and long-term, minor, adverse impact.

Ranch A/B (Miwok) – Equestrian, environmental education, and stewardship activities would continue in this area. Historic buildings and landscape features that contribute to the former ranch's national register eligibility would be rehabilitated and adaptively used for equestrian use. This would result in a long-term, minor to moderate, beneficial, and long-term, minor, adverse impact. The park would establish a visitor facility in the vicinity of the ranch to provide visitor orientation and basic amenities to support the recreational and educational uses nearby. These types of site changes (such as restrooms, improved parking, and visitor orientation/information) would have an indirect, local, long term, negligible to minor, adverse impact on the district.

Bolinas Copper Mine – Management would continue to be by Point Reyes National Seashore. No actions would be taken under alternative 3 that would have an impact on the site.

Miwok Trail – Cultural landscape resources associated with the Miwok Trail would be preserved and protected, which would have a long-term, negligible, beneficial, and long-term, minor, adverse impact.

San Francisco County

Alcatraz Island National Historic Landmark – Alternative 3 would immerse visitors extensively in all of the island's historic periods, utilizing as much as possible the historic resources as tangible evidence of the past. To accomplish this would require extensive stabilization, rehabilitation, and selective restoration work on the historic structures, buildings, and landscape features. This alternative would provide for most historic

buildings to be preserved in “good” condition, and for the key landscape features, including small-scale elements such as fences, paths, and railings, to be preserved.

Specific actions would include the restoration of portions of Building 64 to interpret the post office, canteen, and a prison-era guard apartment; and restoration of the Guardhouse to better reveal the early military prison period (including removal of the boathouse addition). Other areas at Building 64 and around the arrival area would be rehabilitated for visitor services and administrative uses, and could include dorm-like overnight accommodations for program participants. The Main Prison Building (which includes the main cellblock, hospital wing, administration wing, and basement citadel) and adjacent areas would be rehabilitated and portions restored to provide visitors with greater opportunities to explore the federal penitentiary’s history. The Post Exchange would be stabilized to allow visitors opportunities to explore its historic components. The lighthouse and surrounding area would be preserved with enhanced visitor access and interpretation. The Parade Ground would be rehabilitated to portray its historic periods and support year-round visitor exploration. Design for the Parade Ground’s rehabilitation would incorporate measures to protect wildlife habitat. These actions would result in a long-term, moderate to major, beneficial, and long-term, minor, adverse impact.

The New Industries Building would be rehabilitated as a multipurpose facility for uses such as interpretive programs, special events, classrooms, and meetings. The Model Industries Building and adjacent courtyard would be stabilized and closed to visitors and park uses to protect nearby sensitive habitat. The Quartermaster Warehouse would be rehabilitated for park operational functions, including a preservation stewardship workshop. The Power Plant would be stabilized and the adjacent yard preserved for park operational needs. Significant historic resources along the perimeter of the island would be stabilized and preserved. These actions would result in long-term, minor to moderate, beneficial, and long-term, minor, adverse impacts.

Historic buildings and landscapes on Alcatraz Island could be adversely impacted over time from the effects of increased visitation to the island, especially with the provision of overnight visitor stays. This would result in a long term, negligible to minor, adverse impact on historic structures and landscapes. However, the park would monitor the effects of increased visitation on historic resources and could modify visitor access and uses to further protect these resources and reduce this impact to negligible. In addition, the park’s provision of regular patrols and visitor education programs about resource significance and protection (such as discouraging vandalism) would help to reduce these potential visitor impacts to no more than minor.

In conclusion, modifications to the contributing resources on Alcatraz Island would be noticeable and would result in long-term, minor to major, beneficial, and long-term, minor, adverse impacts. There could also be a long term, negligible, adverse impact as a result of increased visitor access to sensitive resources.

San Francisco Port of Embarkation NHL – Building 201 at Upper Fort Mason would be rehabilitated for ongoing use the park’s headquarters and to incorporate a new museum to showcase the military history of Fort Mason and the 20th century San Francisco Port of Embarkation. Other actions would be similar to those of the no-action alternative in that the Fort Mason Foundation would continue to manage Lower Fort Mason and perform ongoing preservation and rehabilitation work on the contributing resources. The impacts on this landmark would be long term, minor, beneficial, and long term, minor, adverse.

Aquatic Park Historic District NHL – Actions would be the same as in alternative 1 and could result in greater visitation along the waterfront access from Van Ness corridor and Fisherman’s Wharf area to Pier 4, along with other potential site and circulation modifications to accommodate transit improvements in the area. New wayfinding and park orientation signs could have direct and indirect effects on the historic landscape of the district. Efforts would be made to minimize the effects on this historic landscape. A cultural landscape report would guide these changes. The potential impact would be long term, minor, adverse. This property is within and managed by San Francisco Maritime National Historical Park.

Fort Mason Historic District – Historic structures, buildings, and cultural landscape resources would be rehabilitated for interpretation of the installation’s military and civilian history and for adaptive use. Compared with the no-action alternative, alternative 3 would result in a broader range of visitor uses within the buildings, including expanded overnight accommodations and an orientation/visitor center. Fort Mason would serve as the primary visitor entrance to Golden Gate National Recreation Area in San Francisco. Actions that could affect the historic landscape include circulation and wayfinding changes to improve adjacent transit and ferry connections. Pier 4 would be rehabilitated for use by the Alcatraz Island ferry and would include the installation of interpretive exhibits. Landscape improvements would be consistent with the *Cultural Landscape Report For Fort Mason*. While some actions may adversely impact individual features, taken as a whole—with the incorporation of mitigation measures such as the provision for the preparation of historic structure reports and design guidelines—these actions would have a long-term, minor to moderate, beneficial, and long-term, minor, adverse impact on the historic district.

Fort Miley Military Reservation – Historic buildings and landscape features associated with West Fort Miley would be preserved to showcase the area’s military and maritime history. Similar to the no-action and other action alternatives, historic buildings at East Fort Miley would continue to be preserved for use by park maintenance and public safety operations. Significant character-defining features of the cultural landscape would be preserved while accommodating improved vehicle and trail access to East Fort Miley. These changes would be designed to be compatible with the historic setting. Overall, these actions would result in long-term, negligible to minor, beneficial, and long-term, minor, adverse impacts.

Pumping Station #2, SF Fire Department Auxiliary Water Supply System – Same as alternative 1, the historic Alcatraz pier (Pier 4), may be rehabilitated for use by the Alcatraz Island ferry which could result in modifications to the adjacent circulation system and landscape setting, as well as increased visitation along the immediate waterfront area. The historic building would not be directly impacted through these modifications, but these changes could result in a long term, negligible to minor, adverse impact. This property is within Ft. Mason but is owned and operated by the City of San Francisco.

Camera Obscura – Operations and maintenance under this alternative would result in minor beneficial and minor adverse impacts.

Six-inch Gun No. 9 – Operations and maintenance under this alternative would result in minor beneficial and minor adverse impacts.

San Francisco Veterans' Affairs Medical Center – Continued operation of Fort Miley as a park maintenance facility would have negligible impacts on the adjacent Veterans medical center historic district, which is owned and managed by the Department of Veterans' Affairs.

China Beach – Same as alternative 1: some improvements to the existing array of visitor facilities and access would be made to support continued use of this popular site. Impacts would be long term, negligible, beneficial, and long term, minor, adverse.

Marine Exchange Lookout Station (Octagon House) – The building and adjacent landscape would be rehabilitated and adaptively used to engage the public in the natural and human history of the coastal marine environment, which would have a long-term, moderate, beneficial, and long-term, minor, adverse impact.

O'Shaughnessy Seawall – the historic seawall would be preserved and protected. Adjacent amenities such as the promenade, parking area, and restroom facilities that support visitor beach use of the area would be improved. This would have a long-term, negligible to minor, beneficial, and long-term, minor, adverse impacts.

Sutro District – Managed under an existing plan, no impacts to this property are anticipated from alternative 3. This district is managed by the park as a cultural resource but has been determined to not be eligible for the National Register of Historic Places in consultation with the California state historic preservation officer.

San Mateo County

San Francisco Bay Discovery Site National Historic Landmark – Similar to alternative 1, under alternative 3 the site and its associated features would be preserved, enhanced, and interpreted. A hikers hut could be constructed in the vicinity, as part of a system of trail amenities for the Bay Area Ridge Trail. Any new construction and development would be sited and designed away from the actual site so as not to directly affect the historic integrity of this site. Limited vehicular access to the discovery site would be permitted as well. This could result in increased visitation to the site, which would be monitored over time for any changes to the historic setting, landscape, and monuments to ensure long-term preservation. Overall, these changes would result in a long-term, minor, adverse impact.

Point Montara Light Station – Under alternative 3, the park would restore the historic structures and landscape features, remove nonhistoric structures, and develop new visitor programs. Overnight accommodations would continue and provide an immersive visitor experience into the historic life of lighthouse keepers. These changes would result in a long term, moderate, beneficial, and long-term, minor, adverse impact.

Rancho Corral de Tierra – Actions proposed under alternative 3 would be similar to those under alternative 1. If determined eligible for listing in the National Register of Historic Places, contributing historic structures and cultural landscape resources associated with the rural agricultural landscape at Rancho Corral de Tierra in San Mateo County would be preserved in balance with natural resource restoration goals. New visitor amenities, including trailheads and trails, would be compatibly designed to blend in with the historic landscape. The preservation of these resources would have a long-term, minor, beneficial impact; however, the introduction of new elements and natural resource restoration activities could result in long-term, minor, adverse impacts.

Shelldance Nursery – If determined eligible for listing in the National Register of Historic Places, transition from a commercial nursery to an area that provides a variety of visitor services and park operational needs would have a moderate, beneficial, and minor, adverse impact, if carried out according to the *Secretary of the Interior’s Standards for Historic Preservation* and if removal of any structures that may be deemed historic is avoided.

Conclusion

Under alternative 3, the park’s management strategy for historic buildings, districts, and cultural landscapes would generally be one of preservation, rehabilitation for new and continued uses, and some restoration to enhance the overall historic immersion visitor experience goals of this alternative. In conjunction with the effects from the actions common to all alternatives, alternative 3 would result predominantly in long-term, negligible to moderate, beneficial impacts to historic structures, districts, and landscapes. In some instances, individual projects could result in local, long-term, negligible to minor, adverse effects due to the level or amount of intervention and proposed modifications to a structure or site. Adverse impacts would be minimized by implementing mitigation measures.

With regards to Alcatraz Island National Historic Landmark, although some actions in alternative 3 could result in an adverse effect on some individual features, taken together the actions would not result in an adverse effect on the overall integrity of the national historic landmark. The impacts to historic structures and the cultural landscape would be noticeable and would result in long term, minor to major, beneficial impacts. There could be a long term, negligible impact as a result of increased visitor access to sensitive resources. Taken together, all of these actions would not result in an adverse effect on the overall integrity of the national historic landmark.

Under alternative 3, the Section 106 determination of effect on historic buildings, structures, districts and cultural landscapes in Golden Gate National Recreation Area, excluding Alcatraz Island NHL, would be *adverse effect*. On Alcatraz Island, the Section 106 determination of effect on historic buildings, structures and cultural landscapes would be *adverse effect*.

Because there would be no major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Golden Gate National Recreation Area; 2) key to the natural or cultural integrity of the park; or 3) identified as a goal in the park’s general management plan or other relevant NPS planning documents, there would be no impairment of the park’s historic buildings and structures.

Archeological Resources

No-action Alternative

Analysis

Currently, 10% of Golden Gate National Recreation Area has been surveyed for prehistoric and historic archeological resources. To date, approximately 365

archeological sites have been inventoried, but the significance of those sites requires further study and evaluation. Furthermore, comprehensive consultations with American Indian tribes regarding archeological sites with ethnographic significance in the park will continue into the future. As a result of this need for additional survey work and consultation, archeological resources are subject to potential deterioration, lack of adequate protection in some cases, and possible loss of integrity from natural processes, ongoing agricultural and ranching operations, inadvertent visitor activity, and vandalism.

The Muir Beach Archeological District and the Point Lobos Archeological Sites are currently subject to erosion and possible loss of integrity from natural processes and human activities such as inadvertent damage and vandalism. Thus, this alternative could have a permanent, minor to moderate, adverse impact on these archeological resources. The *King Philip* and *Tennessee* shipwrecks and associated remains are currently subject to deterioration and loss of integrity from natural processes such as ocean surf and human activities such as vandalism; thus this alternative could have a permanent moderate adverse impact on these archeological resources.

On Alcatraz Island, not much is known about any prehistoric and historic archeological resources. A comprehensive professional baseline archeological survey of the island and consultations with American Indian tribes regarding archeological sites with ethnographic significance will continue to be needed. Park staff suspect that Alcatraz Island has potential for buried prehistoric and historic deposits associated with prehistoric, military, prison, and maritime commercial themes. On Alcatraz Island, just as with the rest of Golden Gate National Recreation Area, there is need for additional survey work and consultation; without this, archeological resources are subject to potential deterioration, lack of adequate protection in some cases, and possible loss of integrity from natural processes and human activities. The lack of survey and knowledge and possible loss of integrity from natural processes and human activities, as previously described, could have a permanent, minor to moderate, adverse impact on archeological resources.

Conclusion

Little information is available concerning prehistoric and historic archeological resources in Golden Gate National Recreation Area and on Alcatraz Island. A comprehensive professional archeological survey has been conducted for only approximately 10% of the park's acreage.

Actions under this alternative could have a permanent, minor to moderate, adverse impact on archeological resources associated with the Muir Beach Archeological District and the Point Lobos Archeological Sites, and could have permanent, moderate, adverse impacts on the *King Philip* and *Tennessee* shipwrecks and associated remains.

Alcatraz Island has the potential for a wide range of buried prehistoric and historic deposits associated with its prehistoric, military, prison, and maritime commercial themes. The park staff continues to work in protecting and preserving known archeological resources. The lack of survey and knowledge and possible loss of integrity from natural processes and human activities, as previously described, could result in a permanent, minor to moderate, adverse impact on archeological resources.

Based upon the above analysis, under this alternative the Section 106 determination of effect on archeological resources in Golden Gate National Recreation Area and on Alcatraz Island would be *adverse effect*.

Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Golden Gate National Recreation Area; 2) key to the natural or cultural integrity of the park; or 3) identified as a goal in the park's general management plan or other relevant NPS planning documents, there would be no impairment of the park's archeological resources or values.

Alternative 1: Connecting People with the Parks

Analysis

Archeological sites continually deteriorate, due primarily to the effects of weather and gravity. Left alone, sites will inevitably degrade over time. However, impacts from human visitation and use contribute to the effects of natural agents of deterioration, and can substantially increase the rate of site deterioration. Archeological resources adjacent to or easily accessible from visitor use areas or trails would continue to be vulnerable to inadvertent damage and vandalism. Inadvertent impacts would include picking up or otherwise displacing pottery sherds and other artifacts, the compaction of cultural deposits, and the creation of social trails (which can lead to erosion and destabilization of the original site architecture). Intentional vandalism includes removing artifacts and probing or digging in sites. Inadvertent damage or vandalism would result in a loss of surface archeological materials, alteration of artifact distribution, and a reduction of contextual evidence. Many such adverse impacts could be mitigated through additional stabilization of the site, the elimination of social trails to disturbed or vulnerable sites, and/or systematically collecting surface artifacts for long-term curation. Continued ranger patrol and emphasis on visitor education regarding the significance and fragility of such resources and how visitors can reduce their impacts to archeological resources, would discourage vandalism and inadvertent impacts and minimize adverse impacts. The actions under this alternative could result in permanent adverse impacts of minor to moderate intensity to archeological resources.

Prior to demolition of any national register listed or national register eligible building or structure, a survey for archeological resources in the general vicinity of the affected structure would be designed and conducted in consultation with the appropriate state historic preservation office. The excavation, recordation, and mapping of any significant cultural remains would be completed prior to demolition, to ensure that important archeological data that otherwise would be lost is recovered and documented. Adverse impacts to affected archeological resources would be permanent and of minor to moderate intensity.

Park staff would continue to work to protect archeological resources from unauthorized removal or other destructive actions. Modification or relocation of existing trails, and construction, development, or improvement of trails, roadways, pull-offs, picnic and camping areas, overlooks, buildings, parking areas, visitor amenities, and interpretive facilities could affect the integrity of some archeological resources, but every effort would be undertaken to avoid known or discovered archeological sites. If such sites could

not be avoided, mitigative procedures would be undertaken in consultation with the California state historic preservation office. Any adverse impacts would be permanent and of minor to moderate intensity.

Additionally, it is estimated that a substantial number of the park's archeological sites could be lost as a result of rising sea levels during the coming years. The National Park Service recognizes that archeological resources help connect visitors with the park and its values. Prehistoric archeological sites on park lands, which provide the last vestiges of sites associated with indigenous peoples in the region, were among the first sites in the park listed in the National Register of Historic Places. Mitigation is currently taking place for historic archeological sites, but to a lesser degree for prehistoric sites. Historic archeological resources may be impacted under this alternative, pursuant to consultation and in compliance with mitigative measures approved by the California state historic preservation office, whereas indigenous prehistoric sites under this alternative would be preserved intact in consultation with American Indian tribes and organizations. Any adverse impacts would be permanent and of minor to moderate intensity.

Under this alternative, the Muir Beach Archeological District would be in the Natural Management zone. Archeological resources would be identified and evaluated, and would be provided stabilization, security, or other protection commensurate with their significance and sensitivity; however, they would generally not be incorporated as visitor education opportunities in the park's interpretive programs. Although some archeological resources in the archeological district could be lost (resulting in permanent adverse impacts of minor intensity), these actions would generally result in beneficial impacts on archeological resources.

Under this alternative, the Point Lobos Archeological Sites would be in the Evolved Cultural Landscape zone. Archeological resources would be identified and stabilized as part of cultural landscape enhancement, and they would be used as visitor education opportunities to interpret human occupation of and interaction with the coastal environment. Although some archeological resources could be lost (resulting in permanent adverse impacts of minor intensity), these actions would generally result in beneficial impacts on archeological resources.

There are no proposed actions under this alternative that would affect the *King Philip* and *Tennessee* shipwreck sites and their associated remains. Thus, the impacts of this alternative on these sites would be the same as those listed in the no-action alternative – permanent, moderate, and adverse.

On Alcatraz Island, within the Diverse Opportunities, Evolved Cultural Landscape, and Historic Immersion zones, the archeological resources would be identified and may be stabilized for incorporation into visitor interpretive opportunities, thus enhancing their protection through increased awareness and understanding. In the Natural and Sensitive management zones, which generally cover the island's perimeter areas, archeological resources would be identified, evaluated, and provided stabilization, security, or other protection commensurate with their significance and sensitivity. Implementing management actions that survey and treat archeological resources would have a beneficial impact. In areas that are managed for natural resources, there could be minor impacts due to erosion and other natural processes. Any adverse impacts would be permanent and of minor to moderate intensity.

Conclusion

Actions under this alternative could result in long-term, beneficial impacts to the archeological resources in the Muir Beach Archeological District and the Point Lobos Archeological Sites and on Alcatraz Island. Permanent moderate, adverse impacts would continue to the *King Philip* and *Tennessee* shipwrecks and associated remains.

Under this alternative, the Section 106 determination of effect on archeological resources in Golden Gate National Recreation Area and on Alcatraz Island would be *no adverse effect*. Impacts to the *King Philip* and *Tennessee* shipwrecks and associated remains are the same as those under the no-action alternative. Therefore, the Section 106 determination of effects on these two archeological sites would be *adverse effect*.

Because there would be no major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Golden Gate National Recreation Area; 2) key to the natural or cultural integrity of the park; or 3) identified as a goal in the park's general management plan or other relevant NPS planning documents, there would be no impairment of the park's archeological resources or values.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

Actions under this alternative would result in impacts to archeological resources similar to those listed under alternative 1. Park staff would continue to work to protect archeological resources from unauthorized removal or other destructive actions. Coastal ecosystem restoration and rehabilitation of pastoral and rural landscapes could impact the integrity of some archeological resources. Accordingly, this alternative would require a detailed archeological resource stabilization and recovery plan to preserve the integrity of the park's archeological resources. As part of all earth-disturbing activities, every effort would be undertaken to avoid known or discovered archeological sites. If such sites could not be avoided, mitigative procedures would be undertaken in consultation with the California state historic preservation office. Additionally, prehistoric archeological sites, which represent the last vestiges of remnant sites associated with indigenous peoples in the region, would be preserved intact in consultation with American Indian tribes and organizations. Any adverse impacts would be permanent and of minor to moderate intensity.

Archeological resources, including the Muir Beach Archeological District and the Point Lobos Archeological Sites in the Natural and Sensitive Resources management zones, which cover much of the park land in this alternative, would be identified, evaluated, and provided stabilization, security, or other protection commensurate with their significance and sensitivity. However, they would generally not be incorporated as visitor education opportunities in the park's interpretive programs. Archeological resources in the Evolved Cultural Landscape and Historic Immersion zones would be identified and stabilized, as part of cultural landscape enhancement and used as visitor education opportunities to interpret human occupation of and interaction with the coastal environment. Although some archeological resources could be lost (resulting in permanent adverse impacts of minor intensity), these actions would generally result in beneficial impacts on archeological resources.

There are no proposed actions under this alternative that would affect the *King Philip* and *Tennessee* shipwreck sites and their associated remains. Thus, the impacts of this alternative on these sites would be the same as those listed in the no-action alternative—permanent, moderate, and adverse.

In addition to the actions identified in the above analysis, managing archeological resources on Alcatraz would require a detailed archeological resource stabilization and recovery plan. As part of all earth-disturbing activities, every effort would be undertaken to avoid known or discovered archeological sites. In the Evolved Cultural Landscape and Historic Immersion management zones, which form the central historical core of the island in this alternative, archeological resources would be identified and stabilized as part of cultural landscape enhancement and visitor interpretive opportunities. In the Natural and Sensitive Resources management zones, which cover much of the rest of the island in this alternative, archeological resources would be identified, stabilized, or provided protection commensurate with their significance and sensitivity. Although some archeological resources could be lost (resulting in permanent adverse impacts of minor intensity), these actions would generally result in beneficial impacts to archeological resources on Alcatraz Island.

Conclusion

Although actions under this alternative could result in permanent adverse impacts of moderate intensity to some archeological resources, including the *King Philip* and *Tennessee* shipwreck sites and their associated remains, this alternative would generally have beneficial impacts on archeological resources in the park, including the Muir Beach Archeological District, the Point Lobos Archeological Sites, and on Alcatraz Island.

Under this alternative, the Section 106 determination of effect on archeological resources in Golden Gate National Recreation Area and on Alcatraz Island would be *no adverse effect*. Impacts to the *King Philip* and *Tennessee* shipwrecks and associated remains are the same as those under the no-action alternative. Therefore, the Section 106 determination of effects on these two archeological sites would be *adverse effect*.

Because there would be no major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Golden Gate National Recreation Area; 2) key to the natural or cultural integrity of the park; or 3) identified as a goal in the park's general management plan or other relevant NPS planning documents, there would be no impairment of the park's archeological resources or values.

Alternative 3: Focusing on National Treasures (NPS Preferred Alternative for Alcatraz Island)

Analysis

Park staff would continue to work to protect archeological resources from unauthorized removal or other destructive actions. Generally, archeological resources under this alternative would be 1) stabilized for interpretation purposes or as part of cultural landscape enhancement, or 2) incorporated into historic immersion opportunities and stabilized and protected to allow public understanding without the threat of damage, removal, or vandalism. Although modification or development of facilities, and the rehabilitation or restoration of resources to immerse visitors in the compelling history and

stories of the park's cultural sites could affect the integrity of some archeological resources, every effort would be undertaken to avoid disturbance of known or discovered archeological sites. If such sites could not be avoided, mitigative procedures would be undertaken in consultation with the California state historic preservation office. Although some archeological sites could be lost (resulting in permanent adverse impacts of minor intensity), actions under this alternative would generally have beneficial impacts on archeological resources.

Archeological resources in the Natural zone, including the Muir Beach Archeological District, would be identified, evaluated, and provided stabilization, security, or other protection commensurate with their significance and sensitivity, but would generally not be incorporated as visitor education opportunities in the park's interpretive programs. Archeological resources in the Evolved Cultural Landscape zone, such as the Point Lobos Archeological Sites, would be identified and stabilized, as part of cultural landscape enhancement and used as visitor education opportunities to interpret human occupation of and interaction with the coastal environment. Although some archeological resources could be lost (resulting in permanent adverse impacts of minor intensity), these actions would generally result in beneficial impacts on archeological resources.

There are no proposed actions under this alternative that would affect the *King Philip* and *Tennessee* shipwreck sites and their associated remains. Thus, the impacts of this alternative on these sites would be the same as those listed in the no-action alternative—permanent, moderate, and adverse.

On Alcatraz Island, alternative 3 is designed to enhance the contributing features of Alcatraz Island National Historic Landmark. The analysis, cataloging, and proactive recovery of archeological resources on Alcatraz Island would be given a high priority. These activities would result in enhancement of the island's cultural resource research and interpretive programs and would contribute to its emerging/growing park collections. Archeological resources in the Evolved Cultural Landscape and Historic Immersion zones, which cover the majority of the island in this alternative, would be identified, protected, or stabilized. They then would be incorporated into historic immersion and visitor education interpretive opportunities or become a part of cultural landscape enhancement. Under this alternative, the preservation and interpretation of key archeological resources, and access to such resources illustrating the island's prehistoric and historic periods and themes, would be given high priority. As part of all earth-disturbing activities, every effort would be undertaken to avoid known or discovered archeological sites. If such sites could not be avoided, mitigative procedures would be undertaken in consultation with the California state historic preservation office. Although some archeological sites could be lost (resulting in permanent adverse impacts of minor intensity), actions under this alternative would generally have beneficial impacts on archeological resources on Alcatraz Island.

Conclusion

Although actions under this alternative could result in permanent adverse impacts of moderate intensity to some archeological resources, including the *King Philip* and *Tennessee* shipwreck sites and their associated remains, this alternative would generally have beneficial impacts on archeological resources in the park, including the Muir Beach Archeological District, the Point Lobos Archeological Sites, and on Alcatraz Island.

Under this alternative, the Section 106 determination of effect on archeological resources in Golden Gate National Recreation Area and on Alcatraz Island would be *no adverse effect*. Impacts to the *King Philip* and *Tennessee* shipwrecks and associated remains are the same as those under the no-action alternative. Therefore, the Section 106 determination of effects on these two archeological sites would be *adverse effect*.

Because there would be no major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Golden Gate National Recreation Area; 2) key to the natural or cultural integrity of the park; or 3) identified as a goal in the park's general management plan or other relevant NPS planning documents, there would be no impairment of the park's archeological resources or values.

Ethnographic Resources / Traditional Cultural Properties

No-action Alternative

Analysis

Currently, there are no identified ethnographic resources or traditional cultural properties within Golden Gate National Recreation Area or on Alcatraz Island. However, Alcatraz Island was occupied by “Indians of All Tribes” from November 1969 to June 1971 as an internationally publicized protest to focus attention on the plight of American Indians and to assert the need for Indian unity and solidarity for achieving self-determination and securing political rights. Thus, the occupation increased awareness of the American Indian's political, economic, and social concerns and provided the foundation for what would become a political movement—the American Indian Movement—to promote cultural pride and to secure and protect Indian rights. The occupation resulted in the nation's increased awareness of American Indian concerns and issues and the establishment of D-Q University (a tribal community college that focuses on indigenous peoples) at Davis, California, and other institutions throughout the nation. Tangible evidence of the occupation on Alcatraz Island includes graffiti and physical alterations attributed to the American Indians' activities. Since the occupation, the island has become a symbolic focal point of American Indian pride and solidarity among relocated American Indians in the San Francisco Bay Area, as well as in the nation at large. Thus, the National Park Service, in recognition of the ethnographic significance of Alcatraz Island for American Indians and the island's potential for listing in the National Register of Historic Places as a Traditional Cultural Property, is in consultation with American Indians regarding the identification, preservation, and interpretation of the island's ethnographic resources. This action would have a long-term, negligible to minor, beneficial impact to the resource.

Conclusion

Currently, there are no identified ethnographic resources or traditional cultural properties in Golden Gate National Recreation Area and on Alcatraz Island. However, the National Park Service recognizes the ethnographic significance of Alcatraz Island for American Indians as a result of the island's occupation from 1969 to 1971 and thus its potential for listing in the National Register of Historic Places as a traditional cultural property. This action would have a long-term, negligible to minor, beneficial impact to the resource.

Under this alternative, the Section 106 determination of effect on ethnographic resources / traditional cultural properties for Golden Gate National Recreation Area and Alcatraz Island would be *no adverse effect*.

No impairment of ethnographic resources would result from this alternative.

Alternative 1: Connecting People with the Parks (NPS Preferred Alternative for Park Sites in Marin, San Francisco, and San Mateo Counties)

Analysis

Although Alcatraz Island has ethnographic significance for American Indians, there are no identified or recognized potential ethnographic resources or traditional cultural properties in Golden Gate National Recreation Area. On Alcatraz Island, some archeological sites and features with ethnographic significance and some resources having associations with the occupation of 1969 to 1971 could be lost due to erosion or other natural processes such as weathering, under this alternative. This alternative's emphasis on connecting people with the park's resources and stories would build and expand upon the National Park Service's ongoing consultation efforts with American Indians for the identification, preservation, and interpretation of ethnographic resources on Alcatraz Island. This action would have a long-term, beneficial impact to the resource.

Conclusion

Although Alcatraz Island has ethnographic significance for American Indians, there are no identified or recognized potential ethnographic resources or traditional cultural properties in Golden Gate National Recreation Area. Identification, preservation, and interpretation of ethnographic resources on Alcatraz Island would be enhanced as a result of expanding NPS consultations with American Indians. This action would have a long-term, beneficial impact to the resource.

Under this alternative, the Section 106 determination of effect on ethnographic resources and traditional cultural properties in Golden Gate National Recreation Area and Alcatraz Island would be *no adverse effect*.

No impairment of ethnographic resources would result from this alternative.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

Although Alcatraz Island has ethnographic significance for American Indians, there are no identified or recognized potential ethnographic resources or traditional cultural properties in Golden Gate National Recreation Area.

On Alcatraz Island, some archeological sites and features with ethnographic significance and some resources having associations with the occupation of 1969-1971 could be lost due to erosion or other natural processes. A minimum amount of stabilization would be afforded ethnographic resources so that the island's integrity as a potential traditional cultural property would not be compromised. Additionally, this alternative's emphasis on providing visitors with opportunities to engage in Alcatraz Island's isolation, natural resources, and layers of history via ecotourism, outdoor learning, and natural and cultural

resource stewardship programming would build and expand upon the National Park Service's ongoing consultation efforts with American Indians for the identification, preservation, and interpretation of ethnographic resources on Alcatraz Island. This action would have a long-term, beneficial impact to the resource.

Conclusion

Although Alcatraz Island has ethnographic significance for American Indians, there are no identified or recognized potential ethnographic resources or traditional cultural properties in Golden Gate National Recreation Area. Ethnographic significance and some resources having associations with the occupation of 1969–1971 could be lost due to erosion or other natural processes such as weathering under this alternative; a minimum amount of stabilization would be afforded ethnographic resources so that the island's integrity as a potential traditional cultural property would not be compromised. This action would have a long-term, beneficial impact to the resource.

Under this alternative, the Section 106 determination of effect on ethnographic resources/traditional cultural properties in Golden Gate National Recreation Area and Alcatraz Island would be *no adverse effect*.

No impairment of ethnographic resources would result from this alternative.

***Alternative 3: Focusing on National Treasures
(NPS Preferred Alternative for Alcatraz Island)***

Analysis

Although Alcatraz Island has ethnographic significance for American Indians, there are no identified or recognized potential ethnographic resources or traditional cultural properties in Golden Gate National Recreation Area.

Under this alternative, which is designed to enhance the contributing features of Alcatraz Island National Historic Landmark, analysis and cataloging of ethnographic resources on Alcatraz Island in consultation with American Indian tribes and groups would be given a high priority, thereby enhancing the island's cultural resource research and interpretive programs and contributing to its emerging and growing park collections. The island's potential for listing as a traditional cultural property in the National Register of Historic Places would also be evaluated and studied in consultation with American Indian tribes and groups. This action would have a long-term, beneficial impact to the resource.

Ethnographic resources in the Evolved Cultural Landscape and Historic Immersion zones, which cover the majority of the island in this alternative, would be identified, protected, and stabilized. Ethnographic resources that are not archeological sites could be rehabilitated or restored. They would be incorporated into historic immersion/visitor education interpretive opportunities or become part of cultural landscape enhancement. Under this alternative, preservation and interpretation of, as well as public access to, key ethnographic resources illustrating the island's prehistoric and historic periods and themes would be given high priority. This action would have a long-term, beneficial impact to the resource.

Conclusion

Although Alcatraz Island has ethnographic significance for American Indians, there are no identified or recognized potential ethnographic resources or traditional cultural

properties in Golden Gate National Recreation Area. On Alcatraz Island, analysis and cataloging of ethnographic resources and the evaluation of the island's potential for listing in the National Register of Historic Places as a traditional cultural property in consultation with American Indian tribes and groups would be given higher priority than other areas of Golden Gate National Recreation Area. These actions would enhance the island's cultural resource research and interpretive programs and contribute to its emerging and growing park collections. This action would have a long-term, beneficial impact to the resource.

Under this alternative, the Section 106 determination of effect on ethnographic resources/traditional cultural properties in Golden Gate National Recreation Area and Alcatraz Island would be *no adverse effect*.

No impairment of ethnographic resources would result from this alternative.

Park Collections

No-action Alternative

Analysis

According to *NPS Management Policies 2006*, the National Park Service will collect, protect, preserve, provide access to, and use objects, specimens, and archival collections to aid understanding among park visitors, and to advance knowledge in the humanities and sciences. Further, collections management facilities need to accommodate the special needs of park collections for long-term preservation and protection by ensuring that they are stored in energy efficient buildings. Director's Order 24: *Park Collections Management Guideline* (September 2008) provides further guidance, standards, and requirements for preserving, protecting, documenting, and providing access to and use of NPS collections.

Golden Gate National Recreation Area's 2009 *Collection Management Report* documented 4,210,233 items in the park collections; these include items from the park's coastal defense fortifications and military installations. Additionally, the park collections include items from Alcatraz Island, such as original FBI evidence from the 1962 Alcatraz escape, as well as original uniforms, other accoutrements, and everyday objects from the island.

The park collections are currently stored in 15 different facilities throughout the park that function as visitor centers, interpretive exhibits, or dedicated storage areas. Of the four largest storage repositories, two are located in buildings owned by the Presidio Trust with no lease agreements in place. This places the park collections in a vulnerable position because of potential eviction and deteriorating structural conditions.

The no-action alternative would continue to make incremental improvements upon existing facilities. Improvements would include consolidating storage from other deficient structures and installing more compact shelving to increase the usable storage footprint threefold. The National Park Service would also formalize the use of Building 667 through an agreement with the Presidio Trust. Another option to be explored under the no action alternative is storing oversized collections in a larger joint storage facility that consolidates collections from all national park sites in the San Francisco Bay area. This proposal is outlined in the *Bay Area Museum Resource Center Plan* (2010).

These measures are intended to improve the long-term preservation of park museum collections; however, there are no formal agreements for long-term use of facilities located on the Presidio (Buildings 002 and 667). An unmet need under this alternative is public space for exhibits and programs that engage visitors in park collection stewardship and preservation activities.

Conclusion

The conditions for park collections would be improved to meet NPS standards for long-term preservation, protection, and use. Thus, continuation of current management of park collections would be expected to have short-term, minor, beneficial impacts on the park collection.

Because there would be no major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Golden Gate National Recreation Area; 2) key to the natural or cultural integrity of the park; or 3) identified as a goal in the park's general management plan or other relevant NPS planning documents, there would be no impairment of the park's collections.

Alternative 1: Connecting People with the Parks (NPS Preferred Alternative for Park Sites in Marin, San Francisco, and San Mateo Counties)

Analysis

In addition to the actions proposed for the park collection described under the "Actions Common to All Alternatives" section, in which the collections are consolidated into one or more facilities, alternative 1 would allow for the incorporation of artifacts into the visitor experience on a case-by-case basis at sites that are managed for historic immersion. This action would help visitors to better understand the historic context of a particular site and how park collections are inextricably linked to the park's historic resources. Use of these artifacts would still require respect for NPS standards for the preservation and protection of park collections. The public's awareness of the park collections would be increased and could result in increasing donations and support for "growing" and conserving the collections, thus resulting in overall long-term, beneficial impacts.

Conclusion

Incorporating the park collections in ways that enhance the visitor experience and help expose the values of the collection while still meeting NPS preservation standards would have a long-term, beneficial impact on the value of the collections.

No impairment of park collections would result from this alternative.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

In addition to the actions proposed for the park collections described under the "Actions Common to All Alternatives" section, in which the collections are consolidated into one or more facilities, the actions under alternative 2 would increase the ecosystem

management approach of the alternative by generating more specimens for the natural research collection. This action would contribute to the monitoring and studies associated with influence that climate change could have on the park's natural resources. The result of improving the natural resource portion of the park collections could result in improved understanding of park resources and to increased access for researchers and managers to a body of knowledge that is necessary for future management decisions. The actions under alternative 2 would have a long-term, beneficial impact to the park collections.

Conclusion

The increased emphasis of collecting and preserving natural resource specimens would have a long-term, negligible, and beneficial impact to the park collections.

No impairment of park collections would result from this alternative.

Alternative 3: Focusing on National Treasures (NPS Preferred Alternative for Alcatraz Island)

Analysis

In addition to the actions proposed for the park collection described under the “Actions Common to All Alternatives” section in which the collections are consolidated into one or more facilities, the actions under alternative 3 would include treatments of historic buildings and cultural landscape resources that range from upgrades to exhibits and furnishings to more complete restoration. The goal of these actions would be increasing access to and interpretation of some of the park's most significant resources. A larger number of artifacts and archival items would be prominently displayed for visitor education and interpretation under this alternative, thus enhancing the visitor experience, resulting in a beneficial impact. The public's awareness of the park collections would be increased and could result in increasing donations and support for “growing” and conserving the collections, thus resulting in overall long-term, beneficial effects.

Conclusion

Incorporating the park collections in ways that enhance the visitor experience and help expose the values of the collection while still meeting NPS preservation standards would have a long-term, beneficial impact on the value of the collections.

No impairment of park collections would result from this alternative.

VISITOR USE AND EXPERIENCE

No-action Alternative

Analysis

In the no-action alternative, visitors would continue to access a diversity of recreational opportunities in a wide range of settings throughout Golden Gate National Recreation Area. The park's extensive system of hiking, bicycling, and equestrian trails would be available for visitors and residents. Overnight camping and lodging opportunities would continue. Beach recreation, along with wildlife viewing and scenic touring, would also be

important components of the visitor experience. Continuing these visitor opportunities provide for a long-term, moderate, beneficial impact to the visitor experience.

During scoping and in recent visitor surveys, most respondents acknowledged their enjoyment of the park's visitor opportunities and suggested that the variety of activities should be maintained. Some people noted concerns about any further regulation or reduction of recreation opportunities, particularly for mountain bikers, equestrians, and dog owners. There was also interest in additional recreation opportunities, particularly more and different trail connections. There were some concerns expressed about conflicts between recreation activities that share facilities and areas. The park staff would continue to work to improve upon user conflict situations and conditions that currently contribute to long-term, minor, adverse impacts within the park. The park staff would also continue to complete trail improvements identified in the Trails Forever program, focusing on the California Coastal Trail and its connectors between Muir Beach and Mori Point.

A variety of educational and interpretive programs would continue to be offered by the National Park Service and its partners throughout the park. Continuing the current opportunities would have a long-term, minor, beneficial impact. Some of the public has expressed interest in having more interpretive and educational opportunities, including more onsite interpretive materials and programs. In addition, a need has been expressed for increasing outreach to diverse audiences. Access to the park collections and the integration of the collection into interpretive and educational programming and facilities have been identified as needs. This alternative would not provide these opportunities, resulting in a long-term, minor, adverse impact.

Visitor access to the various park sites would continue via multiple modes of auto, transit, bicycle, and pedestrian access. Some park sites are challenging to reach, given limited transit options and parking infrastructure, congested roadways, and conflicts between autos and bicyclists or pedestrians. There has been a significant amount of feedback from the public regarding a desire to explore the expansion and enhancements of alternative modes of access to and between park sites to provide easier access, reduced traffic congestion, and orientation opportunities. In addition, the need for more signs, maps, and orientation information to help visitors explore the park has been mentioned. Visitors have access to most of the sites within Golden Gate National Recreation Area. There are some areas that have restricted access to protect sensitive resources or visitor safety. In addition, some areas are restricted for certain types of activities. The San Mateo County park lands have minimal facilities and services to support visitation, but access is permitted. Overall, continuing the current conditions regarding access would result in long-term, minor to moderate, adverse impacts on the visitor experience.

Finally, there are locations within the park where visitor safety is an issue. Use conflicts between multiple modes of transportation are a concern in certain areas. Use conflicts between types of recreation activities can also occur and cause both real and perceived safety problems such as conflicts between bicyclists and equestrians. In addition, the park faces safety concerns that are typical of being in close proximity to a large urban area. The actions previously described would have a long-term, minor to moderate adverse impacts on the visitor experience.

On Alcatraz Island, the primary visitor activities of visiting the cellhouse and enjoying the sights and sounds of the island in the middle of the bay would continue in this alternative; a long-term, moderate, beneficial impact. The existing interpretive programs

would also continue to focus primarily on the military history and federal prison-era stories. In addition, visitors would have opportunities for self-guided exploration on only a small portion of the island.

During scoping for the plan, there were some mentions of additional recreation opportunities that were desired including more trail access around the island, more access to a larger number of structures, and overnight opportunities. Further, some visitors have expressed interest in more diverse interpretive programs. Visitors are provided limited opportunities to explore the historic military fortification and citadel that are located under the federal prison. The lack of some of these desired improvements would be a long-term, minor to moderate, adverse impact on those visitors seeking these opportunities.

Alcatraz continues to provide outstanding opportunities for understanding the stories and structures associated with the federal penitentiary period of the island. The audio tour is popular with visitors and gives them an excellent understanding of life on “the Rock.” The audio tour has also provided a means to better distribute the flow of visitors and reduce noise associated with large groups visiting the cellhouse. The National Park Service and its partners have also managed the levels of use visiting the island to help control issues associated with crowding and conflicts resulting in a long-term, moderate, beneficial impact. There are isolated occasions and certain locations where crowding and use conflicts do occur resulting in long-term, minor, adverse impacts. In particular, certain locations along the walk to the cellhouse can sometimes become crowded, and there are occasional conflicts between the visitor tram and pedestrians during high-use days.

Alcatraz Island also supports one of the largest concentrations of nesting waterbirds in San Francisco Bay. Visitors have some opportunities to learn about and observe the colonies as part of their visit to the island; a long-term, minor, beneficial impact for visitors interested in understanding the important role the island plays in the ecological system of the bay. However, many areas of the island are currently closed during breeding season to protect the colonies from human disturbance. This results in long-term, minor, adverse impacts to visitors who may want to explore these areas. In addition, the sights and smells associated with large numbers of birds during the nesting season has resulted in some minor, adverse impacts to the visitor experience.

Visitors have access to the island via the NPS concession-run ferry. The ferry ride to the island is one of the highlights of the visitor experience given the views of the island and the city, along with the orientation and interpretive information provided; a long-term, minor, beneficial impact. There are times when tickets are sold out to the island and some visitors are unable to take a trip to the island at their desired date and time resulting in a long-term, moderate, adverse impact on the visitor experience. During scoping for this plan, some members of the public expressed interest in having alternative access opportunities to the island by motorized and nonmotorized boats. This alternative would not explore additional access opportunities causing a long-term, minor, adverse, impact.

Visitor safety at Alcatraz Island is generally good in the no-action alternative, although there are some safety issues associated with the deteriorating condition of historic structures—a long-term, minor, adverse impact.

Conclusion

The no-action alternative for Golden Gate National Recreation Area would result in long-term, minor to moderate, beneficial impacts from continued opportunities to access high-quality resource-dependent visitor opportunities and experience the natural, historic, and scenic qualities of the park. Visitors would have extensive trail, beach, and educational opportunities, which are some of the most valued activities in the park. However, minor to moderate adverse impacts on the visitor experience from traffic congestion, use conflicts, limited facilities in San Mateo County, and restricted access to a few desired locations would continue.

The no-action alternative for Alcatraz Island would result in long-term, minor to moderate, beneficial impacts from continued opportunities to access the cellhouse and the immediate surrounding landscape. In addition, high-quality interpretive and educational programs and materials would continue to be provided. However, minor to moderate adverse impacts on the visitor experience from conflicts with birds, limited access to areas and structures on the island, and some visitor crowding would continue.

Alternative 1: Connecting People with the Parks (NPS Preferred Alternative for Park Sites in Marin, San Francisco, and San Mateo Counties)

Analysis

The emphasis of alternative 1 for Golden Gate National Recreation Area is connecting people with the parks. This alternative would increase the diversity of recreational opportunities offered throughout the park and encourage wider participation by the local and regional population, including those that are not traditional park visitors. The establishment of recreation “portals,” or locations from which multiple activities may be staged and initiated, is a primary component of this alternative. These portals would be located in Tennessee Valley, Marin Headlands, Upper Fort Mason, and Rancho Corral de Tierra. The portals would include trailheads and other visitor facilities to better support access to a diversity of recreation opportunities, and help connect visitors with the information and support services they need to plan and enjoy their visit to the park. These efforts to welcome and orient the park visitor would have a long-term, moderate, beneficial impact on the visitor use and experience at the park.

Rehabilitation, expansion, and upgrades to existing facilities, including trails, trailheads, campsites, picnic areas, and parking would better support visitor activities throughout the park, including community based park stewardship programs. In particular, enhancements to the park’s trails would be beneficial because the trails are one of the most important aspects of visitor opportunities, and these improvements were highly sought after by the public. New facilities are also proposed in key park locations in this alternative including warming huts; a variety of overnight accommodations, from camping to rustic cabins; stewardship centers; picnic facilities; and trails. Establishing these facilities would result in a long-term, moderate, beneficial effect on visitor opportunities and the facilitation of visitor activities throughout the park lands.

Under alternative 1, existing recreation activities would continue and be better supported through the facilities and access improvements already mentioned. Some activities would

be expanded in this alternative, including educational and stewardship opportunities, and public equestrian programs and trailhead facilities. Equestrian facilities would be retained and improved at Rancho Corral de Tierra to expand public access and related benefits. These activities would allow the park staff to engage a wider audience and better demonstrate the unique and interesting resources found throughout the park. Further, scenic viewing throughout the park would be enhanced at key points through the addition of overlooks, landscape and facility restoration, and improvements for non-automobile access to park sites. These actions would result in long-term, moderate, beneficial, impacts.

Stewardship and volunteer activities would be enhanced in this alternative, resulting in a long-term, moderate, beneficial impact. New stewardship and educational facilities are proposed at several park locations. Efforts for programming and educational materials by park staff and partners would be purposively aimed at engaging a wider audience, as well as enhancing individual understanding of park resources and values.

Public access to park sites, including parking improvements, public transportation connections, and multimodal access would be enhanced as a result of the alternative, resulting in long-term, moderate, beneficial impacts. Improved public transportation opportunities would help connect a larger audience to park sites, offer better connections between sites, and reduce use conflicts. Further, some of the improvements would allow for easier access to busy sites, reducing visitor frustration and improving the quality of park visits.

Visitor safety would benefit by several actions in this alternative resulting in long-term, moderate, beneficial impacts. Implementing roadside improvements to State Route 1 and Panoramic Highway would benefit visitors with better wayfinding, overlooks for safe scenic viewing, and more separation between auto and bicycle use. Other safety improvements could include enhancements to multimodal transportation options to ease use conflicts and road congestion during peak times. Finally, increased ranger presence throughout the park lands, particularly in San Mateo County, would improve response capabilities for park staff. However, the addition of new multiuse trails may cause a small amount of increased conflicts among visitors.

Restrictions on public access in Sensitive Resource zones would result in some long-term, minor, adverse impacts on visitor access and opportunities for recreation, but effective educational programming and information associated with these areas could also improve visitor understanding of these highly sensitive and exceptional resources.

On Alcatraz Island, alternative 1 would offer a wider variety of settings, experiences, and activities for visitors to enjoy. Stewardship activities would be a focus of this alternative to increase visitors' understanding and appreciation of the unique and diverse natural and cultural resources on the island. In addition to telling the stories of the infamous prison history, the National Park Service would offer visitors opportunities to understand other historic periods and the island's natural history, as well as to enjoy a diversity of scenic and recreational experiences on the island, including special events. Increased preservation, interpretation, and reuse of historic buildings would expand the range of activities for visitors and allow them to better understand the lives of people who lived and worked in those buildings, resulting in long-term, moderate, beneficial impacts.

Further, this alternative could increase visitor amenities at key locations including food service at Building 64. This alternative also includes additional strategies in core visitor use areas, such as removal of the rubble piles on the parade grounds to minimize the conflict between visitors and birds, thereby increasing access and improving the experience in these areas. This wider range of activities, settings, and services would likely appeal to a wider audience of participants and would also likely encourage an increase in repeat visitation. Further, this alternative would allow for a greater dispersion of visitors throughout the island, helping to minimize crowding at key sites like the cellhouse. These actions would have a long-term, moderate, beneficial impact on the visitor experience.

Visitor safety would benefit through the preservation of the buildings as well as through increased bird management, resulting in long-term, minor, beneficial impacts. While reduced crowding could increase safety in some areas, allowing visitors to explore more of the island's rugged and natural settings could bring about more incidents.

Conclusion

The actions proposed in alternative 1 for Golden Gate National Recreation Area would result in long-term, moderate, beneficial impacts to the visitor experience. The diversity of recreational opportunities provided, the new and enhanced visitor support facilities, and the purposeful effort to engage a more diverse audience would have a positive and important impact on the visitor experience to the park. Further, the emphasis on improved access, particularly transportation connections, would be a beneficial impact on the visitor experience by reducing traffic congestion and use conflicts.

Alternative 1 would result in long-term, moderate, beneficial impacts to the visitor experience on Alcatraz Island. The enhancements to the park setting through increased preservation of the structures; the increased access to the island's various layers of historic resources and natural settings; and the purposeful effort to increase programming options and connect with a more diverse audience would help create this long-term, moderate, beneficial impact. The number of visitors who could be accommodated on the island may also be slightly increased upon implementation of this alternative given the increased number of opportunities and the ability to better disperse visitors, resulting in a long-term, minor, beneficial impact.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

Alternative 2 proposes a visitor experience that is focused on forging individual connections with the park's natural and cultural resources through more natural and challenging visitor opportunities and enhanced stewardship activities. Visitors would still have a diversity of recreation activities available to them, but there would be an emphasis on encouraging more self-reliant and more natural and wild experiences throughout much of the park lands. For those visitors who enjoy solitude, natural quiet, and some challenge during their visit to the park, this alternative would generally result in long-term, minor, and beneficial impacts. In addition, those visitors who enjoy connecting to the park lands via stewardship and educational programs would also benefit from this alternative. However, for those visitors who prefer a wider range of activities and more support

services to facilitate their visit, this alternative would have some long-term, minor, adverse impacts.

Some visitor facility improvements are proposed in this alternative for key locations throughout all three counties. These facilities would improve access to select sites, better connect sites within the park, and facilitate stewardship and education opportunities, resulting in long-term, moderate, beneficial impacts. For example, upper Fort Mason would serve as the primary portal for stewardship and participatory science activities with access to programs throughout the park, allowing these opportunities to be better marketed, coordinated, and facilitated. Alternative 2 also proposes the removal of some facilities. Equestrian facilities at Rancho Corral de Tierra would be removed or relocated further from coastal streams to allow for enhancement or restoration of the stream areas. While removal of facilities could have an adverse impact on the experience for some visitors who have relied on those facilities, it could also be beneficial to others who want to immerse themselves in a more natural environment and participate in opportunities that are more challenging.

Most of the park's current visitor activities would be maintained; however, there may be more regulations and restrictions on access to better protect resources in this alternative. Further, visitor opportunities may be relocated or concentrated to reduce the "footprint" on park lands and create a more sustainable system of recreation facilities. Alternative 2 also recognizes several sensitive resource areas, and accordingly requires limitations on visitor access to those areas. These restrictions and regulations could have a long-term, minor to moderate, adverse impact on some visitors in terms of visitor opportunities, with the greatest effect on local visitors who frequent these areas on a regular basis. Some of the areas with more substantial changes in visitor access and regulations include Slide Ranch, Fort Funston, Rancho Corral de Tierra, and the southern portion of Ocean Beach.

Visitor activities associated with immersion in and exploration of natural and cultural landscapes would be enhanced in this alternative, with plentiful opportunities for those who seek solitude, quiet, and contemplation. Trail connectivity and related improvements would allow a more diverse visitor population to enjoy trail experiences with less conflict and more focus on enjoying the setting. Scenic viewing would be enhanced in this alternative through the removal of some facilities and the addition of new overlooks. Maintaining low levels of development, removing some facilities, and restoring landscapes would provide what many members of the public identified as one of the most highly desired functions of the park: to act as a green retreat from the urban environment of San Francisco. These actions would have a long-term, minor to moderate, beneficial impact for visitors seeking these types of settings and opportunities.

Park staff and park partners would work towards more diverse, frequent, and better coordinated natural and cultural resource stewardship and restoration activities in this alternative. Stewardship programs would allow local residents to better understand and appreciate the natural settings within the park, and deepen participants' commitment to long-term protection of its resources. Further, this alternative would include additional programming and interpretation regarding the park's natural and cultural resources and related stories. These learning opportunities would be enhanced through the extensive trail system that would further highlight the park's diverse ecosystems and rich cultural history, resulting in long-term, moderate, beneficial impacts.

Access to some areas would become more difficult by personal vehicle and may generally be more regulated; however, associated public transportation services and non-vehicular access options would be improved. Improved public transportation opportunities would help connect a larger audience to park sites, better connect visits between sites, and reduce use conflicts. Further, some of the improvements would allow for easier access to busy sites, reducing visitor frustration and improving the quality of park visits. These actions contribute to a long-term, moderate, beneficial impact. In alternative 2, if a slide impacts State Route 1 near Slide Ranch in Marin County, the National Park Service could encourage Caltrans to stabilize and abandon this section of road. This action could inconvenience local residents and park visitors traveling along this route and would result in a long-term, moderate, adverse impact.

Visitor safety would increase due to several actions in this alternative, resulting in long-term, moderate beneficial impacts. If successful in promoting access improvements to State Route 1 and Panoramic Highway, visitors would benefit from better wayfinding, safer overlooks for scenic viewing, and better separation between auto and bicycle use. Other safety improvements include enhancements to multimodal transportation options to ease use conflicts and road congestion during peak times. Finally, increased ranger presence throughout the park lands, particularly in San Mateo County, would improve response capabilities for park staff.

On Alcatraz Island, alternative 2 would highlight the concept of isolation on the island, which is a recurrent theme in the island's cultural and natural history. Visitors would have opportunities to experience first-hand the island's isolation, natural systems, and layers of history. Ecotourism, outdoor learning, and natural and cultural resource stewardship programs would be the focus of this alternative, deepening the visitor's understanding of these topics as they relate to the island. This would benefit those visitors with interest in these topics and would encourage all visitors to take away more than just the federal penitentiary story. The diversity of activities available on the island would be increased given the additional emphasis on increasing visitors' understanding of the natural resources on the island. This would include programming, stewardship, and related overnight opportunities that would be new options for visitors to the island. There would also be increased opportunities for wildlife and scenic viewing, and hiking around the perimeter of the island. Expanding the visitor opportunities could have a long-term, moderate, beneficial impact to the visitor experience.

It is likely these actions would appeal to a different audience than those who primarily visit the island for its historic resources. However, the emphasis on promoting the natural values of the island would also potentially increase the conflict between visitors and birds in core visitor use areas, resulting in a long-term, moderate, adverse impact on the visitor experience during the nesting season. Further, there has been public interest in accessing many of the closed buildings on the island; this alternative would increase visitor access to some while continuing to limit access to others. This would result in a long-term, minor, adverse impact.

This alternative proposes additional visitor access restrictions in the waters surrounding the island to protect coastal resources and seabird colonies. These regulations would have an adverse impact on some visitors who enjoy navigating the waters in this area (via private boats and harbor tours), and enjoy the views of the island from close-up, resulting in a long-term, minor, adverse impact to water-based recreation.

Preservation of the buildings and spaces where visitors would be allowed would result in greater levels of visitor safety. There may be additional conflicts associated with visitors and birds, but it is unlikely that these conflicts would result in any significant concerns related to visitors' health and safety.

Conclusion

The actions proposed in alternative 2 for Golden Gate National Recreation Area would result in long-term, minor to moderate, beneficial impacts to the visitor experience. The visitor experience would be improved regarding the depth and content of educational programming, interpretation, and resource stewardship; along with the preservation and promotion of visitor activities focused on immersion in the natural and cultural settings unique to the park. Visitors would gain a better understanding of park resources and values. However, the regulation and restrictions on some visitor activities and access to some areas might not encourage as much connection to the diverse local and regional population, and may have a long-term, moderate, adverse impact on repeat visitors who have a long-standing attachment to certain locations or activities that may be regulated or restricted.

On Alcatraz Island, alternative 2 would result in long-term, minor to moderate, beneficial impacts to the visitor experience given the actions that would increase understanding and appreciation of the island's important role in the marine ecosystem and related activities and programming. However, there would be long-term, moderate, adverse impacts to the visitor experience in this alternative due to the increased interaction and related conflicts between visitors and birds during the nesting season, and the restricted access to desired locations and structures on the island.

Alternative 3: Focusing on National Treasures (NPS Preferred Alternative for Alcatraz Island)

Alternative 3 proposes a visitor experience that is focused on the nationally significant sites and resources found throughout the park. Visitors would have a diversity of recreational and educational opportunities centered on the park's iconic sights, structures, and stories. There would be many opportunities for first-hand learning. Visitors would have the opportunity to immerse themselves in a historic setting, and participate in stewardship activities at key sites. The natural and cultural resources would be preserved to their highest level of quality, providing the best opportunity for visitors to understand and forge a connection with the resources and values of the park, as well as the larger national park system. Because the large expanse of undeveloped open space is one of the park's fundamental resources and values, the park would still provide many opportunities for those visitors who enjoy solitude, natural quiet, and some challenge during their visit.

Much of the visitor facility improvements in this alternative focus on rehabilitation of and upgrades to existing facilities that would support visitor understanding and access to key sites throughout the park. In Marin County, one of the most substantial differences in this alternative occurs in the area within and around Forts Barry and Cronkhite where the structures and landscapes would be restored to showcase the stories of military history and the transition from Army post to national park. To facilitate visitors' visits and understanding of this part of the park, a new visitor center would replace the housing

infrastructure at the Capehart housing area. In addition, trails and roads in the area would be managed to connect visitors to the important historic and natural resource stories.

In San Francisco County, facility improvements include dedication of more structures at Fort Mason to visitor services; the area would serve as the primary visitor entrance to the park with improved orientation and educational services. In San Mateo County, the National Park Service would work in cooperation with surrounding cities, the county, and Caltrans to encourage a more unifying character to the State Route 1 road corridor, along with a coordinated approach to visitor access and services. This would include transitioning the Sheldance Nursery facilities to visitor support facilities, with improved access to State Route 1, providing a convenient and accessible location for coordinated information services at the entrance to San Mateo County. Further, facility improvements would include the identification and development of recreation portals with trailheads and other visitor support services in Rancho Corral de Tierra, which would better support access to a diversity of recreation opportunities, and help connect visitors with the information and services they need for a visit to this area of the park. These actions would expand visitor opportunities and access to park resources and therefore contribute to a long-term, minor to moderate, beneficial impact to the park visitor.

Most of the existing recreation activities within the park would continue and be better supported through the facilities and access improvements already mentioned. Activities that would be expanded in this alternative include educational and stewardship opportunities at key park sites. These activities would allow the park staff to engage a wider audience and better demonstrate the park's fundamental resources and values, particularly its coastal military defense structures and stories. Connected and improved trails are also proposed in this alternative, along with more multiuse trails. The expansion and enhancement of the park's already extensive trail system would allow for greater opportunities to explore the park. Given the importance of trail opportunities to the public, these improvements would result in a long-term, moderate, beneficial impact. In addition, this alternative provides for an increase in the diversity of overnight opportunities, including primitive camping. These actions would increase the diversity of recreational opportunities and were supported by the public during scoping for this plan. Additional public equestrian programs and expanded equestrian trailhead facilities are proposed in San Mateo County, allowing equestrian uses to expand in the park, which was encouraged by some members of the public. These actions would result in long-term, moderate, beneficial impacts.

Alternative 3 designates a few sensitive resource areas, and accordingly requires limitations on visitor access to those areas. In addition, this alternative proposes changes in the access and regulations for some key visitor use sites including Slide Ranch, Fort Funston, and the southern portion of Ocean Beach. These restrictions and regulations could have long-term, moderate, adverse, impacts on some visitors in terms of visitor opportunities, with the greatest effect on visitors who frequent these areas on a regular basis.

As already noted, this alternative includes proposals for enhanced understanding and exposure to the park's most important resources and stories. In particular, the military history and coastal fortifications at several sites along the coast and bay would be highlighted using the latest technological and multimedia advances and associated programming, giving visitors a deeper understanding of these nationally significant

structures. Stewardship centers located in the park would enhance community pride and commitment in the park, and serve as places to teach the next generation of park stewards, resulting in long-term, moderate, beneficial impacts.

Access and orientation to the park would generally be improved, resulting in a long-term, moderate, beneficial impact. In particular, there would be an increased focus on linking key park sites via multiple modes of transportation, which would help connect a larger audience to park sites, better connect visits between sites, and reduce use conflicts. Trail improvements and connections would be a primary element of this alternative. Trail access improvements allow visitors more convenient and safe access to and between areas within the park as well as surrounding communities and other public lands. Further, this alternative proposes visitor hubs or portals, which would provide centralized orientation and services, improving visitors' ability to access sites throughout the park.

Visitor safety would be better due to several actions in this alternative. If successful in promoting access improvements to State Route 1 and Panoramic Highway, visitors would benefit from better wayfinding, safer overlooks for scenic viewing, and more separation between auto and bicycle use. Other safety improvements include enhancements to multimodal transportation options to ease use conflicts and road congestion during peak times. Finally, increased ranger presence throughout the park, particularly in San Mateo County, would improve response capabilities for park staff. However, the addition of new multiuse trails may cause a small amount of increased conflicts for some visitors. Overall, these safety changes, including access improvements, would provide a long-term, minor, beneficial impact.

Alternative 3 is the NPS preferred alternative for managing the resources and visitors on Alcatraz Island. This alternative would immerse visitors extensively in all of the island's historic periods, providing the best opportunity for visitors to understand and forge a connection with the resources and values of the island. The visitor's immersion in the history of Alcatraz Island could be extended to the historic embarkation site at Fort Mason's Pier 4. Visitors would have access to restored portions of historic structures that would better tell the story of the various aspects of life on "the Rock." Other special events, classes, and stewardship opportunities focused around the resources and stories of the island's period of significance would also increase the diversity of opportunities available to visitors. Visitors to Alcatraz Island already highly value the interpretive and educational programming of the island's historic resources, and this alternative would expand those opportunities to include more immersive experiences, a setting that is more reflective of the period of significance, and more direct access to the island's historic structures; this would result in a long-term, moderate, beneficial impact. This increase in options would likely appeal to a wider audience of participants and would also likely encourage an increase in repeat visitation.

This alternative proposes additional visitor access restrictions in the waters surrounding the island to replicate the historic no-trespass zone as well as to protect coastal resources and seabird colonies. These regulations would have an adverse impact on some visitors who enjoy navigating the waters in this area (via private boats and harbor tours), and enjoying the close-up views of the island from the water, resulting in long-term, minor, adverse impacts to water-based recreation.

Visitor understanding, education, and interpretation would be greatly enhanced in this alternative, given the higher level of preservation of the buildings, increased access to the

structures and surrounding landscapes, and more diverse programming options. In addition, stewardship activities would provide increased visitors understanding and appreciation of the island's natural and cultural resources. Visitor safety would benefit through the preservation of the buildings as well as through increased bird management.

Conclusion

The actions proposed in alternative 3 for Golden Gate National Recreation Area would result in long-term, moderate, beneficial impacts to the visitor experience. The most significant beneficial effect of this alternative would be the increased opportunities for visitors to understand, appreciate, and take part in the preservation of the park's most fundamental resources and values. In addition, this alternative would improve access and connectivity to and between key sites in the park, facilitate the visitor experience, and reduce use conflicts and visitor frustration. However, this alternative would change visitor opportunities at a few existing use areas, leading to long-term, minor to moderate, adverse impacts on visitors who currently frequent these locations for various recreation activities.

Alternative 3 is the NPS preferred alternative for managing Alcatraz Island and would result in long-term, moderate to major, beneficial impacts to the visitor experience. This is primarily due to the opportunities to immerse oneself in the historic periods of Alcatraz Island, have access to more of the island's settings and buildings in improved condition, and to participate in stewardship and education activities supported by expanded overnight programs and facilities. The island's history, particularly as related to the military and the federal penitentiary, is of primary interest to most visitors to the island. This alternative would bring the experience alive, illustrating more aspects of life on "the Rock" for a greater diversity of visitors. The number of visitors who could be accommodated on the island may also be slightly increased upon implementation of this alternative given the increased number of opportunities and the ability to better disperse visitors; this would result in long-term, minor to moderate, beneficial impacts on visitor use and experience.

SOCIAL AND ECONOMIC ENVIRONMENT

Introduction

The analysis of impacts to the social and economic environment of the gateway communities and overall Bay Area that surrounds Golden Gate National Recreation Area and Muir Woods National Monument is based on topic research and professional judgment of planners who have experience with similar plans. To help identify the impacts of the various alternatives, the social and economic environment is described by three primary contributing factors: quality of life, population demographics, and local economy. These three factors reflect the three main areas of discussion in the Social and Economic Affected Environment section. The impact analyses in this section primarily focus on the quality of life and local economy topics because the park management actions in the various alternatives may affect these attributes of the social and economic environment. Also, in terms of geographic scope, the impact analyses in this section primarily focus on the social and economic conditions of the local gateway communities

around the park and monument and the three adjacent counties of Marin, San Francisco, and San Mateo because this is where the majority of impacts would be noticeable.

In the discussion of impacts to the social and economic environment, an analysis section and conclusion section are included for each alternative for Golden Gate National Recreation Area, including Alcatraz Island. The impacts from actions associated with the Muir Woods National Monument are discussed later in this part.

No-action Alternative

Analysis

By continuing to provide and potentially expanding open space preservation, outdoor recreation opportunities, natural and cultural resource preservation, interpretation, education, and stewardship opportunities the park would continue to strengthen its contribution to the Bay Area's high quality of life. As detailed in the Social and Economic Affected Environment section, public access to parklands is integral in sustaining a high quality of life in a highly urbanized region such as the Bay Area. The Golden Gate National Recreation Area's location at an urban-wildland interface make it particularly important for physiological health (i.e., from exercise), psychological health, community-building, community identity, and landscape aesthetics (e.g., open space backdrop to a densely populated urban area). Under the no-action alternative, the National Park Service would continue working cooperatively with other neighboring local governments and land managers to further enhance the area's quality of life by preserving a vast network of open lands in the Bay Area. In addition, with a few exceptions, existing education and stewardship opportunities for the residents would be maintained at the park, and possibly improved as financial and staffing resources become available. As other private land continues to be developed and urbanized into the future, Golden Gate National Recreation Area will become exponentially more valuable to the community and the quality of life of the residents. Its preservation would result in an impact that is long-term, moderate, and beneficial in the context of the local gateway communities and three adjacent counties.

In a general sense, the park's overall intrinsic contribution to the local economy of the gateway counties and the Bay Area would be maintained and/or enhanced by the no-action alternative. By continuing to provide open space preservation, numerous recreation opportunities, facilities, and park settings for organized group activities, the park would continue to help make the Bay Area a place for companies and talented professionals to call home. In other words, the Bay Area's quality of life becomes a draw for business and economic growth with help from places like Golden Gate National Recreation Area. The no-action alternative will sustain and enhance this economic value to the Bay Area. The economic growth and success of Silicon Valley is a prime example of how economic growth relates to a quality business location and natural landscape backdrop. This results in an impact that would be long term, moderate, and beneficial in the context of the local gateway communities and three adjacent counties.

In terms of direct effects on the local economy, the no-action alternative would generally maintain the current levels of NPS jobs; concession operations; NPS operations spending and contract work; and park partner activities. There would be occasional site-specific or program-specific improvements. The value of these attributes to the local economy is

discussed in the “Social and Economic Environment” section of Part 8. The overall value of the park’s contribution to the local economy would continue to have significant positive effects on the local economy in the gateway communities and three adjacent counties. In addition, Alcatraz Island remains a major attraction that directly contributes to the tourism industry through increased length of stay in local accommodations, business opportunities related to the Alcatraz Island theme, bay tours, and other guided commercial opportunities. These commercial activities contribute to sustaining employment within the tourism industry. The continuation of the current management direction would have a long term, minor to moderate beneficial impact on the gateway communities and adjacent three counties.

Conclusion

The overall impact to the social and economic environment from the no-action alternative could be long term, minor to moderate, and beneficial for the local gateway communities and the three adjacent counties. The beneficial impacts would result from maintaining the park’s contribution to the local economy and quality of life, existing education and stewardship programs, as well as maintaining existing relationships with other local governments and land managers.

Alternative 1: Connecting People with the Parks (NPS Preferred Alternative for Park Sites in Marin, San Francisco, and San Mateo Counties)

Analysis

Alternative 1 would maintain the inherent quality of life and economic values of Golden Gate National Recreation Area, as noted in the analysis for the no-action alternative. It would continue to provide open space preservation, outdoor recreation opportunities, natural and cultural resource preservation, as well as education and stewardship opportunities. The park’s location at an urban-wildland interface make it particularly important for physiological health, psychological health, community-building, community identity, and landscape aesthetics, which all contribute to quality of life in a highly urbanized region. This value will only increase as more private land in the region develops in the future. As in the no-action alternative, its continued preservation would result in an impact to quality of life that is long term, moderate, and beneficial in the context of the local gateway communities and three adjacent counties. Also, alternative 1 would maintain the park’s overall intrinsic contribution to the local economy, as mentioned in the no-action alternative analysis. Given its significant contribution to quality of life at the urban-wildland interface of a large urban area, the park would continue to help attract businesses and talented professionals to the Bay Area. This results in an impact that would be long term, moderate, and beneficial in the context of the local gateway communities and three adjacent counties.

In addition to continuing these attributes of the no-action alternative, alternative 1 would guide park staff to make stronger efforts at reaching out to the diverse populations of the Bay Area and welcoming them to Golden Gate National Recreation Area. Actions would include community outreach programs, adding group facilities, new park programs, and establishing new welcome/orientation facilities in key locations in the park. These outreach and welcoming efforts would include collaborative community building and

would help foster a new relationship with Bay Area residents. A community that develops a strong relationship with its parks can contribute to quality of life of its residents. Under alternative 1, new and/or improved welcoming and orientation centers, some in collaboration with local communities, would be provided at multiple locations. New and varied interpretive, educational, and stewardship programs would evolve to better connect diverse communities with the park's resources. These facility and program enhancements under alternative 1 would provide new opportunities for many school groups and residents throughout the Bay Area. Under alternative 1, the National Park Service would also work closely with local communities to improve accessibility to the park sites by improving the public transit network and connecting the park and communities with numerous trails. Collectively, these actions would contribute to the quality of life for Bay Area residents. This could result in an impact that is long term, minor to moderate, and beneficial to the local gateway communities and three adjacent counties.

Alternative 1 would support the continuation of existing equestrian facilities in the park. Some minor expansions may also take place at the facility in Tennessee Valley, while the existing equestrian facilities at Picardo Ranch and Rancho Corral de Tierra in San Mateo County will be maintained and enhanced with more programming under alternative 1. These facilities are important recreational assets to many members of the surrounding communities and contribute to the quality of life of these residents. Sustaining and/or expanding these equestrian facilities could yield impacts that are long term, minor to moderate and beneficial for the local gateway communities and the three adjacent counties.

Alternative 1 includes a variety of actions that would help foster or improve relationships between the National Park Service and local communities, park partners, and other adjacent land management agencies. These actions would include community outreach and education programs that help introduce the community to the national park system. Alternative 1 places an emphasis on preserving and enhancing opportunities for local community residents to experience nature, learn local history, and enjoy open lands with other community residents. By providing opportunities and a venue for community interaction, this would enhance the quality of life for residents of the gateway counties. This alternative would also emphasize building community connections by collaborating with local governments, park partners, and other local land managers via multi-agency projects. Community-building efforts such as these could result in impacts that are long term, moderate, and beneficial for local gateway communities. Impacts to the three adjacent counties could be long term, minor to moderate, and beneficial.

A key component of alternative 1 is providing new and upgraded visitor facilities that would complement the park staff's efforts at welcoming and orienting people to the park. Given this priority, alternative 1 would include many new and expanded facilities throughout the park in all three gateway counties. The projects would include the construction, relocation, redevelopment, and/or restoration of visitor centers, historic structures, restrooms, showers, picnic areas, parking lots, warming huts, interpretive exhibits, roadway viewpoints, campsites, trailheads, and other modest overnight accommodations. Alcatraz Island would also have numerous historic structure restoration projects. Many of these projects would generate new work for local and regional companies in the Bay Area, including engineering consultants, construction contractors,

and environmental consultants. These projects would not only support these businesses and their employees directly, but the economic multiplier effect would circulate this contract money through the local economy. The collective result of these actions would be an economic contribution that is short term, minor to moderate, and beneficial for local gateway communities and three adjacent counties.

In addition to the economic contributions as described in the no-action alternative, Alternative 1 would also create new and expanded economic opportunities for some park partners and local organizations by providing expanded visitor programs, amenities, and facilities that could help grow these organizations and partners. This could empower or leverage partners to provide more educational, stewardship programming, and visitor service opportunities. These types of collaborations with park partners and other local agencies would result in an economic impact that is long term, minor to moderate, and beneficial for local gateway communities and the three adjacent counties.

Lastly, to meet the “Connecting People with the Parks” objective of alternative 1, several park facilities and amenities would be upgraded to provide more guest services to better-accommodate the visitors (e.g., visitor orientation, food services, meeting/program space, rustic cabins, hostels, camping, and special event or conference hosting). These new or expanded services could generate additional employment for park partners, concessions, and local businesses. In addition, the local economy would benefit from the various equestrian facilities being retained under alternative 1, as the equestrian facilities generate jobs and other local business. The visitor service improvements, and associated jobs, under alternative 1 would occur at several sites throughout all three gateway counties. The creation of jobs is important for economic growth, as it provides sustained direct and secondary spending (i.e., economic multiplier effect) in local spending in the community. Thus, these proposed visitor services in alternative 1 would have an impact that is long term, minor, and beneficial in the context of the local gateway communities and three adjacent counties.

Conclusion

The short-term and long-term beneficial impacts of alternative 1 on the social and economic environment of the local gateway communities and the three adjacent counties could range from minor to moderate. These beneficial impacts to quality of life and local economy could result from

- a significant increase in public outreach programs, visitor orientation, and educational or stewardship opportunities;
- significant improvements in public accessibility, transportation options, and community trail connections;
- sustaining and/or enhancing the existing equestrian facilities;
- incorporating several community-building components;
- economic growth via many new engineering and construction contract work for numerous facility improvement projects throughout the three gateway counties;
- several new opportunities for park partners to use park facilities and expand their operations; and
- a substantial amount of job creation from the proposed increase in visitor services throughout the park.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

Alternative 2 would maintain the inherent quality of life and economic values of Golden Gate National Recreation Area, as noted in the analysis for the no-action alternative. It would continue to provide open space preservation, outdoor recreation opportunities, natural and cultural resource preservation, as well as education and stewardship opportunities. The park's location at an urban-wildland interface make it particularly important for physiological health, psychological health, community-building, community identity, and landscape aesthetics, which all contribute to quality of life in a highly urbanized region. This value will only increase as more private land in the region develops in the future. As in the no-action alternative, its continued preservation would result in an impact to quality of life that is long term, moderate, and beneficial in the context of the local gateway communities and three adjacent counties. Also, alternative 2 would maintain the park's overall intrinsic contribution to the local economy, as mentioned in the no-action alternative analysis. Given its significant contribution to quality of life at the urban-wildland interface of a large urban area, the park would continue to help attract businesses and talented professionals to the Bay Area. This results in an impact that would be long term, moderate, and beneficial in the context of the local gateway communities and three adjacent counties.

In addition to continuing these attributes of the no-action alternative, alternative 2 would emphasize a new priority of "preserving and enjoying coastal ecosystems." The park's goals would focus on educating the public on the importance of the natural resources throughout the Bay Area coastal environment and the importance of being good stewards to these unique resources. Under alternative 2, the National Park Service would increase educational and stewardship opportunities for local residents and school groups in the three gateway counties by improving facilities and enhancing education and stewardship programs at several park sites throughout the region. Raising the level of community awareness of ecological issues and active stewardship can improve the quality of life for local residents by getting them more concerned and "invested" in the park and its unique resources, which could yield a stronger sense of community value and healthy living. In turn, the open lands and unique resources would stand a better chance at being preserved into the future if the community residents become more aware and active in stewardship. In other words, by helping to preserve the resources, the residents are, in effect, also helping to preserve the qualities that make living in the Bay Area wonderful (because much of the quality of life relies on open, preserved lands and resources). Alternative 2 would also enhance community connectivity by guiding the National Park Service to work with local communities and land managers to pursue improved trail accessibility and public transit to some park sites. Providing more access opportunities would allow local residents to access more park programs and amenities, as well as open areas for exercise and community gathering. Collectively, these actions would contribute to the quality of life for area residents, resulting in long-term, minor to moderate, and beneficial impacts for the local gateway communities and the three adjacent counties.

However, under alternative 2, converting Montara Lighthouse from a hostel to a facility dedicated to education and stewardship would have a long-term, minor, adverse impact to the hostel facility operation and its users. While the equestrian facilities in Marin County would be more or less maintained in their current state, the four equestrian facilities at

Rancho Corral de Tierra in San Mateo County could be removed and/or relocated in an effort to protect resources near the streams. Similarly, the environmental and farm education centers at Slide Ranch would be relocated to a more sustainable and geologically stable area. Although the education programs would be continued in the new location, the value of the facility to local residents and school children may be negatively affected due to the location change, especially if relocated away from the Pacific Ocean. These facilities are important assets to many members of the surrounding communities and contribute to their quality of life. Therefore, if these opportunities are removed, a long-term, minor to moderate, and adverse impact could result in the context of the local gateway communities and three adjacent counties.

Alternative 2 includes several actions that would help the National Park Service develop relationships with local communities and local land management agencies of the Bay Area. Many of these actions are focused on cooperating with other land managers to jointly solve and address long-term natural resource issues. Other actions are aimed at creating relationships with gateway county communities to establish a network of natural resource stewardship programs in the park. Thus, these actions are in line with dual emphasis in alternative 2 of protecting ecological resources and educating the community on these resources (and how to be good stewards). In addition, when a diverse population of residents and agencies work together toward a common goal, such as climate change awareness, coastal preservation, or land stewardship, an evolving sense of environmental ethic and community livability develops. This further contributes to the community's quality of life. Actions like these can result in impacts that are long term, moderate, and beneficial for local gateway communities. Impacts to the three adjacent counties could be long term, minor to moderate, and beneficial.

Under alternative 2, several natural resources restoration projects would contribute to the local economy in the three gateway counties, and possibly beyond. The projects would include restoration of habitats, stream corridors, marine ecosystems, and removal of invasive species over large areas of the park. In addition, alternative 2 would improve some park facilities and infrastructure in order to continue these visitor services while working to minimize impacts on the natural resources of the park. Many of these projects would generate new work for local and regional companies in the Bay Area, including engineering consultants, construction contractors, and environmental consultants. These projects would not only support these businesses and their employees directly, but the economic multiplier effect would circulate this contract money through the local economy. These actions could result in impacts that are short term, minor, and beneficial for local gateway communities and three adjacent counties.

Alternative 2 would have some beneficial impacts on the park partners and other community organizations in the area. The most notable new impacts on park partners under alternative 2 would be at Alcatraz Island and in the City and County of San Francisco. Such collaborations between the park and partners would increase opportunities for the partners to grow their programs and organizations. This would also strengthen working relationships with the communities and raise community awareness of climate change and coastal preservation. These actions could result in impacts that are long term, minor, and beneficial for local gateway communities and three adjacent counties.

However, the removal of the facilities at Slide Ranch would have negative economic effects on the park partner that currently manages Slide Ranch. Also, alternative 2 would include the removal of work force housing units at Capehart housing area in Marin County to allow for ecological restoration. This would affect park partners who utilize these facilities. These two impacts to the local economy would be long term, minor and adverse in the context of the local gateway communities. Impacts to the three adjacent counties would be negligible.

Alternative 2 includes a proposal that, in event of catastrophic coastal landslide on U.S. State Route 1 (south of Stinson Beach) in Marin County, the National Park Service would recommend to Caltrans that it abandon this segment of road. However, because the highway is not under the jurisdiction of the National Park Service, the decision and environmental analysis regarding any State Route 1 reroute or segment closure would be administered by Caltrans. If this would occur, the closure of this segment of State Route 1 would alter the transportation system for local communities (and regionally, for Caltrans), which would be inconvenient to local residents. This closure could have an impact that is long term, moderate, and adverse to the local gateway communities. Impacts to the three adjacent counties could be long term, minor, and adverse.

On Alcatraz Island, alternative 2 would include visitor orientation, some food services, office/classroom space, day use programming facilities, and hostel accommodations for visitors and volunteer stewards. These new and expanded services could generate additional jobs for NPS employees and/or private concessioners and result in long-term, minor, beneficial impacts to the local gateway communities and negligible impacts to the three adjacent counties.

Overall, this alternative does not appreciably add new levels of visitor services and facilities, and emphasizes a more primitive visitor experience. These actions would result in negligible increase in park-related employment opportunities. Therefore, alternative 2 could have a minimal added contribution to the local economy resulting in long-term, minor, beneficial impact to the gateway communities and negligible impacts to the three counties adjacent counties.

Conclusion

In summary, the short-term and long-term beneficial impacts of alternative 2 on the local gateway communities and the three adjacent counties would range from minor to moderate. Collectively, the beneficial impacts to quality of life and local economy could result from

- some site-specific increase in public outreach programs and visitor orientation,
- a significant increase in educational and stewardship opportunities,
- some additional community trail connections,
- National Park Service collaborations with several other community governments and land management agencies,
- some new engineering and construction contract work for several restoration projects throughout the three gateway counties,
- a limited number of new park partner opportunities, and

- a limited amount of job creation from the proposed increase in visitor services throughout the park.

The long-term adverse impacts to the social and economic conditions of the local gateway communities and three adjacent counties could range from minor to moderate. The adverse impacts from alternative 2 could result from 1) a possible reduction in NPS and concession jobs at certain park sites due to area closures and some facility removal, 2) a possible reduction in opportunities for a limited number of park partners, 3) the recommended closure of a segment of State Route 1 (though Caltrans has jurisdiction and decision authority), and 4) removing or relocating equestrian facilities (at Rancho Corral de Tierra) and an environmental and farm education facility (at Slide Ranch).

Alternative 3: Focusing on National Treasures (NPS Preferred Alternative for Alcatraz Island)

Analysis

Alternative 3 would maintain the inherent quality of life and economic values of Golden Gate National Recreation Area, as noted in the analysis for the no-action alternative. It would continue to provide open space preservation, outdoor recreation opportunities, natural and cultural resource preservation, as well as education and stewardship opportunities. The park's location at an urban-wildland interface make it particularly important for physiological health, psychological health, community-building, community identity, and landscape aesthetics, which all contribute to quality of life in a highly urbanized region. This value will only increase as more private land in the region develops in the future. As in the no-action alternative, its continued preservation would result in an impact to quality of life that is long term, moderate, and beneficial in the context of the local gateway communities and three adjacent counties. Also, alternative 3 would maintain the park's overall intrinsic contribution to the local economy, as mentioned in the no-action alternative analysis. Given its significant contribution to quality of life at the urban-wildland interface of a large urban area, the park would continue to help attract businesses and talented professionals to the Bay Area. This results in an impact that would be long term, moderate, and beneficial in the context of the local gateway communities and three adjacent counties.

In addition to continuing these attributes of the no-action alternative, alternative 3 would guide the expansion and/or enhancement of several park site facilities and services in a way that offers improved information and orientation to the National Park Service and to Golden Gate National Recreation Area. By providing improved orientation services, new visitor welcoming centers, and an understanding of park-related opportunities to the diverse populations via new facilities and programs, the National Park Service could improve the quality of life for many residents of the area. In addition, compared to the no-action alternative, alternative 3 includes a substantial increase in educational and stewardship opportunities for local residents and school groups at several park sites. This alternative focuses on education and stewardship of both ecological education and historic and cultural sites. By offering local residents education about the ecological and historic significance and national uniqueness of the many sites around them, the National Park Service could generate community interest in resource stewardship of these sites, as well as provide the residents with a comprehensive understanding of the Bay Area

history. Also, under alternative 3, the National Park Service would improve a park-wide expansion of trail connections to adjacent community parks and trail networks by collaborating with many local governments. These trail connections should provide community residents with several additional ways to access Golden Gate National Recreation Area park sites to benefit from park programs and amenities. Collectively, these facility enhancements and program improvements could improve the quality of life for local residents. This would result in an impact that is long term, minor to moderate, and beneficial in the context of the local gateway communities and three adjacent counties.

Also, all existing equestrian facilities in the park would be maintained and enhanced with additional programming. These equestrian facilities San Mateo and Marin counties would continue to be important assets to many residents of the surrounding communities by contributing to their quality of life. The maintenance or enhancement of the existing equestrian facilities could yield impacts that are long term, minor, and beneficial for the local gateway communities and the three adjacent counties.

Alternative 3 includes several actions that would help the National Park Service develop relationships with local communities and local land management agencies of the Bay Area. The aim of these cooperative efforts would be to educate the Bay Area community on the national significance and uniqueness of the significant park sites (both in the park and on other public lands in the area). This heightened public awareness of the history and national significance of the many park sites in all three gateway counties would likely generate a sense of community pride throughout the area. The cooperative efforts would also attempt to inform the local residents on how the “quilt” of undeveloped land has been preserved by the National Park Service, various land trusts, several local governments, and individuals. Understanding and awareness of a resource can lead to community appreciation, awareness, and pride. These community values can contribute to the quality of life in the area. These community-building actions could result in impacts that are long term, moderate, and beneficial for local gateway communities. Impacts to the three adjacent counties could be long term, minor to moderate, and beneficial.

In terms of impacts to the local economy, alternative 3 would include major construction and restoration projects at park sites in all three gateway counties. The projects under alternative 3 would include the construction, relocation, redevelopment, and/or restoration of visitor centers, a stewardship/education center, several historic structures, restrooms, showers, picnic areas, parking lots, warming huts, interpretive exhibits, roadway pull-offs, rustic overnight accommodations, and natural landscapes. Many of these projects would generate new contract work for private firms in the Bay Area, including engineering consultants, construction contractors, and environmental consultants. These projects would not only support these contracting businesses and their employees directly, but the economic multiplier effect would circulate this contract money through the local economy. This phenomenon is explained in the Social and Economic Affected Environment section. The collective result of these contracted projects would be impacts that are short term, minor to moderate, and beneficial for local gateway communities and three adjacent counties.

The proposed expansion of facilities and services at Alcatraz Island and other historic park sites provide examples of park partners benefitting from NPS programming.

Alternative 3 would provide expanded visitor programs, amenities, and facilities that could help grow these organizations and partners. This could empower or leverage partners to provide more educational, stewardship programming, and visitor service opportunities. This collaboration with park partners and other local organizations and agencies would result in impacts that are long term, minor to moderate, and beneficial for local gateway communities and the three adjacent counties.

Alternative 3 would include the removal of some work force housing units at Capehart housing area in Marin County. These units would be replaced with a new visitor center. This could affect park partners who benefit from this housing unless it is provided elsewhere. This could result in an impact that is long term, minor, and adverse in the context of local gateway communities. Impacts to the three adjacent counties would be negligible.

To fulfill the “Focusing on National Treasures” objective of alternative 3, park facilities and amenities would be restored and new park programs developed. These new or expanded services could generate additional jobs for NPS employees and/or private concessioners. These improved services would include: a new ferry service (Fort Mason to Alcatraz Island), improved visitor orientation and additional park programs, facilities and services and special event hosting. The creation of jobs is important for economic growth, as it provides sustained direct and secondary spending (i.e., multiplier effect) in local spending in the community. Thus, these proposed service expansion actions in alternative 3 would have an impact that is long term, minor, and beneficial in the context of the local gateway communities. The impact in the context of the three adjacent counties would be negligible.

However, a possible negative impact to tour boat operators may occur with alternative 3. Although the visitor ferry access will be accommodated along the eastern shoreline, the historic no trespass zone around the island will place limitations on tour boat operators that currently use the area, thus negatively affecting jobs and reducing economic multiplier effect of this tourism industry. This impact would be long term, minor, and adverse to the local gateway communities.

Conclusion

The short-term and long-term beneficial impacts of alternative 3 on the social and economic environment of the local gateway communities and three adjacent counties could range from minor to moderate. The beneficial impacts to quality of life and economy could result from

- an increase in public outreach programs, visitor orientation, educational/stewardship opportunities and additional park programs;
- improvements in public accessibility and community trail connections;
- sustaining and/or enhancing existing equestrian facilities;
- incorporating several community-building components;
- a moderate amount of new engineering and construction contract work for numerous facility improvement and restoration projects;
- limited new opportunities for park partners to use park facilities and expand their operations and

- a small amount of job creation from the proposed increase in visitor services at various park sites.

The adverse impacts could result from removal of work force housing units at Capehart housing area and possible restrictions on tour boat operators with implementing the historic no trespass zone around the Island. These impacts would be long term, minor, and adverse to the local gateway communities.

TRANSPORTATION

This section describes the potential impacts to transportation at Golden Gate National Recreation Area park sites, including Alcatraz Island. The impacts are described for the counties of Marin, San Francisco, and San Mateo, and for Alcatraz Island.

No-action Alternative

Analysis

Marin County

In general, park areas in Marin have good pedestrian access, with some transit access to the Marin Headlands from San Francisco, and transit to other park sites via the West Marin Stagecoach and the Muir Woods Shuttle. Traffic congestion is a current and worsening problem in specific areas as noted below. In many cases traffic congestion is related to the rural roadway system with limited options and limited capacity. In rural Marin County, roadway capacity is unlikely to increase substantially.

In the southeast coastal area (Rodeo Valley / McCullough and Conzelman Road), existing planned road, trail, and transit projects are likely to improve access for visitors from all parts of the Bay Area as well as for park partners and reduce congestion at scenic overlooks. This area is served by transit on Sundays by MUNI bus service from San Francisco, with plans to expand service to Saturdays when funding is available. Traffic congestion would continue to be problematic during peak periods on roads connecting the Golden Gate Bridge with the Marin Headlands.

Along the southwest coast, (Muir Beach to Point Bonita), small roads serving Tennessee Valley, Muir Beach, and Muir Woods National Monument experience traffic congestion ranging from moderate on warm weekends to severe during peak periods. Neither Tennessee Valley nor Muir Beach is served by transit.

For a recent report, *Transportation Planning to Address Access and Congestion Issues – Muir Woods National Monument*, HDR, Inc. collected detailed data on seven weekday and weekend days from August 7 through August 16, 2009, along State Route 1 between Highway 101 and Muir Woods. Intersections experiencing Levels of Service (LOS) E or F on weekends were: Muir Woods Road at Panoramic Highway, State Route 1 at Panoramic Highway, State Route 1 at Tennessee Valley Road, State Route 1 at Pohono Street, and State Route 1 at Flamingo Road (unsignalized). The last three of these intersections saw LOS of E or F on weekdays as well.

In the Stinson area, access to Stinson Beach along State Route 1 and the Panoramic Highway is congested on good weather weekends, approaching gridlock at times on summer weekends. Stinson Beach is served by the West Marin Stagecoach.

The absence of measures improve transportation access to park sites in Marin (beyond those already planned) would have a long-term, minor to moderate adverse impact. While projects described in the Cumulative Impacts section would help mitigate transportation shortcomings in the Marin Headlands, other areas such as Muir Beach, Muir Woods National Monument, and Stinson Beach would all continue to experience long-term, moderate, adverse impacts on accessibility to visitors during peak periods.

San Francisco

San Francisco park areas are well served by transit, and well-connected with bicycle and pedestrian paths. Exceptions to this are Lands End, Sutro Heights, and Fort Miley, which are not well served by transit. Aside from any actions taken by the park, transit to the Fort Mason area is likely to be improved with the development of the Van Ness Bus Rapid Transit system, and further enhanced with the proposed extension of the streetcar along the northern waterfront. Either of these measures would provide a long-term, moderate to major, beneficial impact in connectivity and availability of public transit to Fort Mason, Crissy Field, and the Presidio. In addition, the implementation of the *Northern Embarcadero Waterfront Plan*, which calls for bicycle lanes along Jefferson Street, will enhance transportation to Fort Mason. Independent of these external projects, the absence of further transportation measures would have a negligible impact on access to park lands in San Francisco.

San Mateo County

Under the no-action alternative, access to park lands in San Mateo County would continue to be less accessible by all modes of transportation because of unimproved trailheads, limited parking, minimal signage, and very limited transit access. Visitation would continue to increase without additional transportation improvements to direct and accommodate new visitors, or to promote or provide non-auto access options. Informal or “social” trails would continue to be a significant way to enter parklands from adjacent neighborhoods; such trails, created by visitors, can lead to deterioration of natural resources. Accessibility for people with disabilities would continue to be limited. Auto access would improve in 2011 when the Devil’s Slide tunnels are opened. The County of San Mateo is required to install bus stops at the north and south pullouts near the tunnels; thus transit options in this particular area will improve as well. Taking no further transportation improvement actions in San Mateo County would have a long-term, minor to moderate, adverse effect on access to these park sites, limiting access for many potential visitors.

Alcatraz Island

In the no-action alternative, transportation to and within Alcatraz Island is limited to concession-operated water transport only; visitors board the ferry at Pier 33 on San Francisco’s Embarcadero, and leave the ferry at the Alcatraz arrival area. Ferry access would remain limited to the concessioner from Pier 33. Private boats cannot land on the island, although tour boats can come within the 1,000-foot perimeter that defines the area managed by the National Park Service.

Conclusion

In Marin County, auto access to the most popular destinations is likely to continue to be difficult during peak periods, while bicycle and pedestrian access would improve, particularly in the Marin Headlands, because of projects outside of this planning process. Existing transit service would continue to enable access to park lands in Marin County for visitors without cars. The no-action alternative would have a long-term, minor to moderate to major, adverse impact on the access to most popular sites, and a long-term, minor, adverse effect on transportation in other areas, such as the Marin Headlands.

Park sites in San Francisco County in the north part of the city would see long-term, moderate, beneficial impact to access by land via improved transit implemented by the San Francisco Municipal Transportation Agency.

Park lands in San Mateo County would see a long-term minor improvement in access by land because of the Devil's Slide project and accompanying transit stops. Taking no other transportation improvement actions in San Mateo would have a long-term, minor to moderate, adverse effect on access to these park sites.

The no-action alternative would have negligible impacts on transportation to or within Alcatraz Island.

Alternative 1: Connecting People with the Parks (NPS Preferred Alternative for Park Sites in Marin, San Francisco, and San Mateo Counties)

Analysis

Alternative 1 proposes to improve and expand connectivity and access to the park and monument through new and improved transit (land or water), bicycle, and pedestrian access to and within the park.

Marin County

In addition to the actions common to all alternatives, transportation-related measures in alternative 1 would improve public transportation and multimodal access to all park sites in Marin County. Trails would be improved in all areas, increasing access and connectivity to sites.

In the southeast coastal area (Rodeo Valley / McCullough and Conzelman Road), safe pedestrian, bicycle, and motor vehicle access to overlooks and to interpretive and recreational opportunities would be provided. This would have a long-term, moderate, beneficial impact for visitors to this area. In the southwest coast area (Muir Beach to Point Bonita) a trailhead and transit stop would be added to the Golden Gate Dairy. The National Park Service would continue to work with Caltrans to improve the safety of State Route 1, including exploring regularly scheduled transit. Increased transit access would have a long-term, minor, beneficial impact for visitors in this area. Trails in the Lower Redwood Creek area would be improved to connect Muir Woods Road to the equestrian facilities at Santos Meadow. This may have a long-term, negligible effect on connections for visitors to this area.

The Diverse Opportunities zone in Rodeo Valley could include visitor amenities such as improved trailheads and accessible trails, as well as camping, picnicking, and orientation. These facilities would welcome visitors and give access to the adjacent natural areas.

Improved and accessible trails would provide a long-term, minor, beneficial effect on circulation in this area. Housing for staff, interns and volunteers would be provided within and adjacent to this management zone. A transit stop would be added at Fort Barry. Increased transit access would have a long-term, minor, beneficial impact for park and park partner's employees as well as visitors in this area.

The National Park Service would collaborate with other agencies to develop a community trailhead in Marin City. This would have a long-term, moderate, beneficial effect for hikers accessing the Marin Headlands from Marin City.

In Tennessee Valley, in collaboration with Marin County and the local community, park managers would explore transit to the trailheads on peak season weekends, extend a multiuse trail to connect with the Mill Valley Bike Path (and the San Francisco Bay Trail), and manage traffic congestion. This may enable more people to visit on peak weekends, because currently, some visitors are unable to find parking, and leave without visiting the valley. These measures would have a long-term, moderate, beneficial impact for Tennessee Valley, affecting most visitors by reducing traffic congestion on peak weekends and providing other ways to access this popular location besides driving.

Some additional parking would be added at the trailhead in Oakwood Valley. This would have a long-term, minor, beneficial impact in reducing crowded parking conditions on Tennessee Valley Road.

At Stinson Beach and along the State Route 1 / Panoramic park, the park staff would collaborate with Caltrans, Marin County, and other land management agencies to improve roadways and trail crossings for the safety and enjoyment of park visitors. New facilities could include overlooks and trailheads with parking, enhanced trail and transit connections, and a unified wayfinding system. A small trailhead parking area could be developed in the vicinity of the former White Gate Ranch. These transportation improvements would have a long-term, minor to moderate, beneficial impact on access by land, parking availability, and improved public safety. Improvements east of Panoramic Highway in the vicinity of Homestead Hill would enhance trail and transit access in this area. Improvements would fit with the rural character of the area. Increased trail and transit access would have a long-term, minor, beneficial impact in this area. Park management would continue to seek increased transit to the Beach on peak-season weekends. Increased transit access would have a long-term, moderate, beneficial impact for visitors in this area.

San Francisco

In addition to the actions common to all alternatives, alternative 1 provides greater connectivity to San Francisco parks through improved transit, trails, and signage. This alternative anticipates development of a water shuttle system connecting bay front parks.

The park would continue to improve trails and trailheads throughout its San Francisco park lands to make the park accessible to the broadest array of visitors. Sites would be connected to each other and to communities by the trail system and the city's transit and multimodal access systems. These projects would have a long-term, minor to moderate, beneficial effect on visitor connections.

Visitor circulation and wayfinding improvements would be implemented in response to new adjacent bus, streetcar and ferry connections. These projects would have a long-term, minor, beneficial effect on visitor connections.

The park would improve the California Coastal Trail and other trail connections linking Ocean Beach to Lands End, Fort Funston, city neighborhoods, and other park lands including Golden Gate Park and Lake Merced. This would have a long-term, minor to moderate, beneficial effect on connectivity between the park and neighborhoods for the southwest San Francisco park sites.

San Mateo County

In addition to the actions common to all alternatives, alternative 1 attempts to mitigate the remoteness and lack of access to the San Mateo park lands by focusing on providing more trail access to and between all park areas, as well as increasing parking and improving transit connections. A comprehensive trail plan would be prepared to create a sustainable regional trail network, providing greater opportunities to access park sites and connect with local communities. The California Coastal Trail is already built on Mori Point, allowing increased access north and south; it is partially built across the Pedro Point Headlands. Once the property is acquired and the trail is completed, it will significantly increase access to these areas.

Park managers would work with county transit providers to improve transit connections to local trailheads and east–west transit between bayside communities and State Route 1. In cooperation with Caltrans and at the request of the town of Pacifica, signs along State Route 1 would be improved to make the park and monument more visible. The significant increase in trail and transit access is likely to have a long-term, moderate, beneficial impact on all park lands in San Mateo County.

Connections to the regional trail network at the Sheldance Nursery and the surrounding public lands (SFPUC, San Pedro Valley County Park, McNee Ranch State Park, and Rancho Corral de Tierra) would be developed in coordination with other land managers. Additional connections to the Bay Area Ridge Trail and the Sawyer Camp Trail in the SFPUC watershed would be enhanced. These projects would have a long-term, minor to moderate, beneficial effect on connecting Golden Gate National Recreation Area sites in San Mateo County to other local and state park sites, regional trails, and surrounding communities. Limited vehicular access to the San Francisco Bay Discovery Site National Historical Landmark would be available by permit. Together, these actions would have a long-term, minor, beneficial impact for visitors accessing these park lands.

Access to Mori Point would be enhanced with an ADA-accessible trailhead and parking improvements, providing a long-term, moderate, beneficial impact.

Visitors would access the coastal areas through an enhanced and sustainable system of multiuse trails. The trail network would connect local communities to the park and link the ridges of Montara Mountain to the Pacific Ocean. Opportunities for a trail connection to Sweeney Ridge through the SFPUC watershed’s northwest corner would be explored. Unnecessary roads could be converted to trails or removed. These projects would have a long-term, moderate, beneficial impact on visitor access, connecting the coastal areas to each other and to surrounding communities.

Alcatraz Island

Alternative 1 includes the following transportation-related actions for Alcatraz. Some indoor and outdoor areas on Alcatraz Island that are currently inaccessible would be reopened, while sensitive wildlife areas would remain protected. Parts of the perimeter trail would be made accessible year-round. This action would have a long-term, minor,

beneficial impact on making currently inaccessible areas available to the public. The National Park Service would prohibit boat tours and small boat landing in the Sensitive Resources management zone (extending 100 feet from the island's western shore). This action would have a long-term, minor, adverse effect on water access to this side of the island. The Scenic Corridor zone (extending beyond the Sensitive Resources zone and along the island's eastern shore) would be managed to accommodate ferry service to the island. Boat tours around the island and some types of water-based recreation, such as fishing, could be permitted. These actions would have a long-term, minor, beneficial effect on access to the island.

The area adjacent to the entry dock would be managed to expand the capacity and range of uses that may occur. This would enable Alcatraz Island to be part of the San Francisco Bay Water Trail, welcoming nonmotorized boats via permits or reservations. This would have a long-term, minor, beneficial effect on access to the island for those arriving in private nonmotorized boats.

Conclusion

In alternative 1, access by land to park sites in Marin County—including improved trails, increased transit services, and wayfinding—would see a long-term, moderate, beneficial effect, particularly during peak and shoulder seasons, and on holiday weekends throughout the year. Increased transit service and stops would have a moderately beneficial impact on both the functionality of the land-based transportation system and on connectivity. It would not only provide more ways for people to get to the park sites, but would also relieve congestion on the roads for both transit and motorists.

In San Francisco County, alternative 1 would have a long-term, moderate, beneficial impact on both visitor connections and the functioning of the transportation system through increased land and water transit and improved trails.

In San Mateo County, enhanced trail systems would provide a long-term, moderate to major, beneficial effect on connections by land; there would be a long-term, moderate, beneficial effect on transportation functionality through more transit availability and a minor beneficial impact on parking.

At Alcatraz Island, the slight increase in boat and ferry traffic in the Scenic Corridor zone as well as the entry dock area could result in a long-term, minor, beneficial impact by increasing access by water to the island. Re-opening improved areas of the park and increasing currently limited trail access to year-round access would have a long-term, minor, beneficial impact on pedestrian access to park features and circulation on the island.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

Alternative 2 focuses on preserving the natural resources of the park and monument by carefully controlling access and removing deteriorated or unused human-made structures, and has the least impacts on transportation.

Marin County

In addition to the measures under “Actions Common to all Alternatives,” previously described, there are few actions in alternative 2 that would significantly improve or detract from visitor access and connectivity. Little-used roads would be converted to trails. The main Tennessee Valley trail, which is currently open to hikers and equestrians, would be converted to a multiuse trail, opening the trail to bicycles as well. These actions would provide a long-term, negligible to minor, beneficial impact in access and in modes of travel.

Alternative 2 recommends that the South parking lot at Stinson Beach be removed and the wetland restored. Because this lot comprises about 50% of the parking spaces at Stinson Beach, removing the south parking lot would have to be carefully coordinated with the town of Stinson Beach, the County of Marin, and Marin Transit in order to prevent major adverse effects on the local community. Data from the *Comprehensive Transportation Management Plan for Park lands in Southwest Marin, 2002*, shown in the table below, indicates that at present, the parking capacity at Stinson (approximately 840 cars) does not meet demand on peak weekends for 1,050 spaces (2002). The projected peak-season parking demand for 2023 is 1335 spaces, an increase of 285 spaces over the current capacity.

Parking overflow might only be a problem during peak weekends for the next few years, with longer term excess demand on peak and shoulder weekends. As shown in the table above, reducing the parking to approximately 420 spaces is likely not to be a problem during the off season (October through April). However, even during the off season, Stinson Beach does see increased visitors on sunny weekends, particularly those with holiday Mondays, so the off-season weekend estimates may be lower than actual demand.

Table 20: Parking Capacity at Stinson Beach, 2002 & 2023

Parking Demand at Stinson Beach – 2002					
Peak Season		Shoulder Season		Off Season	
Weekday	Weekend	Weekday	Weekend	Weekday	Weekend
365	1050	260	450	155	270

Estimated Parking Demand at Stinson Beach – 2023					
Peak Season		Shoulder Season		Off Season	
Weekday	Weekend	Weekday	Weekend	Weekday	Weekend
465	1335	315	540	180	310

NOTE: 2009 Parking Capacity: 839; with south lot removed: approximately 420

The effects of inadequate parking on the town include spillover parking in neighborhoods, and illegal parking. Enforcement of parking restrictions in Stinson Beach is under the jurisdiction of the Marin County Sheriff. Because all of West Marin is currently served by two law enforcement officers, consistent enforcement of parking

restrictions is unlikely to occur; enforcement and towing may have to be managed and could involve support from the National Park Service. Parking tickets alone are ineffective in controlling where people park in Stinson Beach; according to some residents, some visitors appear to consider the cost of a parking ticket simply the price one pays to go to the beach. In a community already experiencing severe levels of congestion on peak weekends, parking reduction could lead to even greater traffic congestion as well as increased air pollution as cars circle the parking lot and neighborhoods looking for parking spaces.

As demonstrated in community meetings held in May 2009, residents of Stinson Beach are extremely concerned about the effects of traffic and of parking overflow problems in neighborhoods adjacent to the beach. Any reduction in peak-season parking would have to include as part of the measure significant proven mitigations in order to get local support and to prevent the town from being inundated with vehicles. One such mitigation might be increased transit service and greatly expanded marketing of transit and alternative modes, including signs on Highway 101 warning of the lack of parking in Stinson Beach. Currently Stinson Beach is served by Marin Transit's Stagecoach service. Were parking to be reduced, the park staff may wish to partner with Marin Transit on increased service frequency, earlier and later hours, and joint marketing efforts to reduce the number of cars entering Stinson Beach. Closing the south parking lot may have long-term, major, adverse impacts, because it could substantially restrict access to Stinson Beach and lower the quality of the visitor experience because of increased traffic congestion. Alternatively, with substantially increased transit service, along with aggressive marketing and consistent parking enforcement, this may have a long-term, moderate, beneficial impact on the Stinson Beach area by reducing the number of cars on local roads.

Alternative 2 also includes a recommendation that, in the event of a catastrophic landslide on State Route 1 (Shoreline Highway), park managers would encourage abandonment of State Route 1 between Muir Beach and Stinson Beach in the affected segment. State Route 1 is ultimately controlled by Caltrans. If State Route 1 between Muir Beach and Stinson Beach were damaged and then abandoned at the affected segment, the coastal communities would sustain a long-term, moderate, adverse impact to connectivity. This would more than double the driving distance between Muir Beach and Stinson Beach from 5 miles to 13 miles, and lengthen the driving time from approximately 8 minutes to 30 minutes. This would have implications for residents of both communities and for emergency access to those areas.

San Francisco County

With its focus on preserving the natural environment, this alternative has no transportation-related measures affecting San Francisco other than those common to all alternatives.

San Mateo County

In addition to the measures described in the "Actions Common to all Alternatives" section cited previously, the following narrative describes the transportation measures for San Mateo County. At Sweeney Ridge, Sneath Lane could be converted to a trail and connect to the Bay Area Ridge Trail in the SFPUC watershed. Unnecessary fire roads could also be converted to trails or removed if not historic, and natural resources restored. If acquired, a trailhead would be located at Picardo Ranch with modest visitor support

facilities (restroom, picnic tables, parking). These measures are likely to result in a long-term, minor, beneficial impact at Sweeney Ridge. In the SFPUC watershed easement, park managers would promote access along the existing multiuse trail and the implementation of trail improvements proposed in the *San Francisco Watershed Management Plan* (2002), including completion of the north-south corridor through the watershed in areas of low sensitivity. Completion of these actions could have a long-term, minor to moderate, beneficial effect on access to these areas.

Alcatraz Island

In alternative 2, visitor access to now-closed sites would be opened. Visitor access to the north end of the island would be expanded to provide wildlife viewing and research while carefully managing impacts to prevent disruption of natural resources. This would result in a long-term, minor, beneficial impact on visitor circulation on Alcatraz Island.

The Scenic Corridor zone (extending beyond the Sensitive Resources zone and along the island's eastern shore) would be managed to accommodate ferry access to the island. Some other types of water-based recreation could also be permitted. This would result in a long-term, minor, beneficial impact on visitor access to Alcatraz Island via water.

Conclusion

For park lands in Marin County, impacts on access and connectivity for alternative 2 are negligible, with two exceptions. A 50% reduction in parking at Stinson Beach could have either a long-term, major, adverse impact on accessibility and user experience in Stinson Beach during peak periods and holiday weekends by exacerbating an already difficult traffic congestion situation, or a long-term, moderate, beneficial effect if combined effectively with other efforts such as provision of transit, marketing of transit, and enforcement of parking restrictions.

Closing a segment of State Route 1 between Muir Beach and Stinson Beach may have a moderate to major, adverse impact on connectivity between these two communities.

There are no transportation actions for San Francisco for alternative 2.

In San Mateo, the transportation actions in alternative 2 may result in a minor to moderate, beneficial effect on connections by land through enhanced trail systems.

The improved access on Alcatraz Island to previously closed areas could result in a long-term, minor, beneficial impact to connectivity by water transit, and access to sites on Alcatraz Island via enhanced trails.

Alternative 3: Focusing on National Treasures (NPS Preferred Alternative for Alcatraz Island)

Analysis

In addition to the impacts highlighted below, the transportation impacts that are described above in alternative 1 also apply to this alternative for park lands in Marin, San Francisco, and San Mateo counties.

At Fort Funston, alternative 3 proposes relocating both access and parking to the edge of Fort Funston, allowing restoration of dunes. This measure has long-term, minor, impacts that could be considered either beneficial (for the restoration of the dunes) or adverse

(because visitors would have a longer walk to reach the beach). This action does not appreciably limit or enhance visitors' ability to visit Fort Funston.

Alternative 3 envisions that visitors would be able to go to a larger number of locations on Alcatraz Island. Current barriers to visitor access and circulation include rubble that would be removed, buildings that would be stabilized, and trails that would be upgraded, including the perimeter trail. Pedestrian circulation would be improved for many visitors, with more sites accessible. This could have a long-term, moderate, beneficial impact on the visitor experience at Alcatraz Island, enhancing public safety by stabilizing structures.

This alternative also includes consideration of additional ferry service from San Francisco. Multiple ferry embarkation points could include the original Alcatraz dock (Pier 4) at Fort Mason, with primary embarkation still from the San Francisco Waterfront. This added embarkation would provide a historic program tour to Alcatraz Island that would leave from the restored Pier 4 west of Muni Pier. This would likely have a long-term, moderate, beneficial impact on visitor access to the island by providing more than one place to board the ferry in San Francisco.

Conclusion

In alternative 3, the relocation of parking and access to Fort Funston in San Francisco has a long-term, minor effect that is both slightly beneficial for preservation of the natural environment with a slightly adverse impact on visitor access.

For Alcatraz Island, this alternative could result in a long-term, moderate, beneficial increase in connectivity through additional ferry embarkation points; and a long-term, moderate, beneficial increase in access to additional historic features over an expanded area of the island because of trail expansion and improvement.

PARK MANAGEMENT, OPERATIONS, AND FACILITIES

No-action Alternative

Analysis

The no-action alternative would generally call for the continuation of current management, programs, operations, funded construction projects, and current levels of annual operating funds.

Staffing levels would continue at current levels. While some divisions are staffed adequately, others have the need for additional staff. For example, despite creative approaches in supplementing the work of park maintenance staff, the required workload needed to maintain and support the park assets exceeds available staff resources, resulting in a significant maintenance backlog. The aging infrastructure in the park requires increasing resources to maintain. A majority of the maintenance needs annually go unmet due to funding, which results in an expanding backlog of deferred maintenance.

The demand for educational and interpretive programs exceeds what the interpretive staff is able to provide. Other divisions, such as the Cultural Resources Division, are supplemented by volunteer staff. The Natural Resources Division's staffing levels prevent the park from completing the baseline studies and monitoring necessary to guide

the park's natural resources preservation efforts in the future. A lack of sufficient patrol units has resulted in adverse impacts to resources. Additionally, due to staff limitations, the management of volunteers is very limited; and therefore the volunteer program does not have the capacity to grow and provide additional benefit to the park and monument.

While staff at Golden Gate National Recreation Area and Muir Woods National Monument lead the field in many of the programs they spearhead—such as development of partnerships, community based stewardship, and increased sustainability in many areas of park operations—the continued impact of low staffing levels on park operations is long term, moderate, and adverse.

Facilities continue to deteriorate given minimal additional project funding and the current inadequate annual base funding for maintenance. Even given the direction of the park asset management plan for prioritizing funds, a large gap in maintenance funding would result in an increase in the deferred maintenance backlog. Inadequate project and operational funding would result in long-term, moderate, adverse impacts to park facilities.

Facilities at Alcatraz Island are in an advanced stage of deterioration. Infrastructure for utilities is another constraint on the island. For example, potable and wastewater must be transported to and from the island by ferry. Water storage constraints also place limits on the visitation and operations presence on the island. Fire system water storage and distribution is an issue on the island. Power utilization and energy demands are also an issue; power is generated by diesel engines, which pollute and also constrain operations on the island. Each of these systems requires improvement for continued use at current levels. A lack of future project funding would result in long-term, major, adverse impacts to mission critical facilities on the island.

Facility location, condition, and available use also impact park operations. Maintenance facilities do not meet the needs of the park; currently, long distances from storage and maintenance facilities to job sites, and inappropriate storage facilities for equipment affect the operations adversely and result in equipment deterioration. Park public safety is also impacted negatively by the current location of facilities; currently, law enforcement staff has limited facilities in the Headlands and no base of operations in San Mateo County. The operations would continue to have long-term, moderate, adverse impacts due to current maintenance and public safety facility locations, size, and lack of modern and secure features.

Park partners are vital to the continued operation of the park, as they provide generous funds, organize volunteers, and provide interpretive and educational programs. The park's continued efforts at developing and maintaining partnerships would continue to provide long-term, moderate, beneficial impacts to park operations.

The Volunteers-In-Parks Program is critical to the ongoing operation of Golden Gate National Recreation Area and Muir Woods National Monument. In a typical year, between 10,000 and 14,000 volunteers provide an excess of 300,000 volunteer hours to various programs and efforts within the park and monument. The continued management of volunteer programs at the park and monument contribute a continuing long-term, moderate, beneficial impact to park operations.

Conclusion

Inadequate staffing levels would result in continued long-term, moderate, and adverse impacts to operations. Continued partner and volunteer efforts would result in long-term, moderate, beneficial impacts to park operations, although these efforts would be limited by current staffing levels. Inadequate project and operational funding would result in long-term, major, adverse impacts to park facilities throughout Golden Gate National Recreation Area including Alcatraz Island. The inadequate maintenance and public safety facilities and their locations would result in continued long-term, moderate, and adverse impacts to operations.

Alternative 1: Connecting People with the Parks (NPS Preferred Alternative for Park Sites in Marin, San Francisco, and San Mateo Counties)

Analysis

While designed to contribute to the protection of resources and the enhancement of visitor opportunities, the proposals of alternative 1 will achieve these ends only if staffing and operating funds are increased in accordance with the cost estimates identified for this alternative. If funding and needed staffing levels are not made available when these actions are implemented, then the proposed actions would have long-term, moderate, adverse effects on park operations.

Additional staff needs projected under this alternative would supplement many of the divisions with the people needed to achieve the resource and visitor experience objectives of the alternative. Expanding operations into San Mateo County requires increasing employees and support facilities in order to manage the existing and newly acquired lands. In addition, some staff would be responsible for organizing and managing volunteer groups—thus leveraging park resources with the expertise and enthusiasm of willing community members and youth groups. While the park would be better able to meet resource protection goals as well as visitor experience and safety through the addition of these full-time equivalent employees, salaries for these employees would appreciably increase the operating budget and the need to develop additional partnerships. Increased staff would result in long-term, moderate, beneficial impacts to operations if appropriate funding is available, otherwise the actions of this alternative would continue the adverse impacts identified in the no-action alternative.

The proposed new or reconstructed facilities in this alternative would require additional capital investments. If funded, the improvements would result in a decrease in the park's deferred maintenance. Unless the cyclic maintenance budget is adjusted to maintain the park's facilities as identified in this alternative, the deferred maintenance will increase, even with an initial investment in that asset. Adjusting the operations and maintenance budget to realistically reflect the true costs of a facility will have a long-term, moderate, beneficial impact on park operations; otherwise, the impact would be adverse and result in an increase of deferred maintenance.

Fundraising through park partners to support specific programs to improve park facilities has often been successful, although maintenance funding is typically more difficult to come by. The investment in facilities would improve facility conditions, reduce the

deferred maintenance backlog, meet sustainability goals, and improve the ability of the park to meet its goals for natural and cultural resource protection and improve the visitor experience. Construction, rehabilitation, restoration, and demolition projects proposed in the alternative would result in long-term, major, beneficial impacts to park operations if funding could be obtained. Construction activities would impact park operations in the short term and would be minor and adverse, as some inefficiency would be caused by the closure of buildings during construction.

Enhancing park operations at Fort Funston would improve maintenance and public safety functions in that area. The proposed “portals” at Rancho Corral de Tierra, Upper Fort Mason, and Tennessee Valley would improve interpretation and public safety operations with opportunities for visitors to access park staff. These changes would result in long-term, moderate, beneficial impacts to park operations.

At Alcatraz Island, increases in staff would allow for increased levels of maintenance, public safety, resource protection, and visitor services. These increases in staff would result in long-term, moderate, beneficial impacts to operations, if the positions are adequately funded.

Alternative 1 proposes extensive restoration and rehabilitation of facilities on Alcatraz Island. These actions would result in long-term, moderate, beneficial impacts to the operations of Alcatraz Island. Construction activities would result in minor, short-term, adverse impacts due to the closure of facilities.

Conclusion

Increased number of park staff would result in long-term, moderate, beneficial impacts to operations if appropriate, annual base funding is available. Construction, rehabilitation, restoration, and demolition projects proposed in the alternative would result in long-term, moderate, beneficial impacts to park operations by addressing deferred maintenance. Construction activities would result in short-term, minor, adverse impacts on park operations, because of closures during the work. An expanded maintenance facility at Fort Funston and the addition of three “portals” would result in long-term, moderate, beneficial impacts to park operations.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

While designed to contribute to the protection of resources and the enhancement of visitor opportunities, the proposed actions of alternative 2 would achieve these ends only if staffing and operating funds are increased in accordance with the cost estimates identified for this alternative. If funding and needed staffing levels are not made available when these actions are implemented, then the proposed actions would have long-term, moderate, adverse effects on park operations.

This alternative would require significant increases in park staffing to manage the new park lands in San Mateo County; educate visitors about the coastal ecosystems of the area; gather baseline natural and cultural resource information, and use this information to guide the future of these programs; maintain facilities and landscapes; and provide for effective public safety in areas where visitors are concentrated as well as in more primitive areas. Increases in staffing levels would result in a long-term, moderate,

beneficial impact in the ability of the park to meet its operating and mission goals while leveraging the support of partners and volunteers. However, salaries for these FTEs would appreciably increase the operating budget and the need to develop additional partnerships. Increased staffing would result in long-term, moderate, beneficial impacts to operations if adequate funding accompanied the staffing increases.

The removal of noncritical facilities and the restoration of those landscapes would result in fewer maintenance needs and the removal of the deferred maintenance associated with those structures and the redistribution of park personnel and funds to remaining facilities.

Capital investment in facilities would improve facility conditions, help to reduce the deferred maintenance backlog, and help to meet sustainability goals. If adequately funded, construction, rehabilitation, restoration, and demolition projects proposed in the alternative would result in long-term, moderate, beneficial impacts to park operations. Construction and landscape restoration activities would result in short-term, minor, adverse impacts, caused by the closure of buildings and lands during construction or restoration.

On Alcatraz Island, increases in staff would allow for improved maintenance as well as increased resource protection and public safety, especially if visitor use extends into the late evenings. Such increases in staff and work would result in long-term, moderate, beneficial impacts to operations if positions are adequately funded. The increased difficulty for public safety to reach the more primitive areas of the island that would become open in this alternative would result in long-term, negligible to minor, adverse impacts to operations.

On Alcatraz Island, alternative 2 proposes wilding of many areas on the island and stabilizing some structures. In addition, alternative 2 provides for various treatments for each historic structure (e.g., stabilization, restoration, or rehabilitation). Actions in this alternative will address structures that are in poor condition and pose threat of injury to visitors and staff. The improved facility conditions would result in long-term, moderate, beneficial impacts to the operations of Alcatraz Island and would address the deferred maintenance issues. Construction activities would result in minor, short-term, adverse impacts due to the closure of facilities. Increases in law enforcement staff would allow for overnight experiences on the island.

Conclusion

Increased staff would result in long-term, moderate, beneficial impacts to operations if accompanying funding is appropriate. Construction, stabilization, rehabilitation, restoration, and demolition projects proposed in the alternative would result in long-term, moderate, beneficial impacts to park operations and address deferred maintenance issues. Construction and landscape restoration activities would result in minor, adverse impact in the short term, as some inefficiency would be caused by closure of buildings and lands during construction or restoration. The increased difficulty for public safety personnel to reach the more primitive areas would result in long-term, minor, adverse impacts to operations.

Alternative 3: Focusing on National Treasures (NPS Preferred Alternative for Alcatraz Island)

Analysis

While designed to contribute to the protection of resources and the enhancement of visitor opportunities, the proposals of alternative 3 will achieve these ends only if staffing and operating funds are increased in accordance with the cost estimates identified for this alternative. If funding and needed staffing levels are not made available when these actions are implemented, then the proposed actions would have long-term, moderate, adverse effects on park operations.

In addition to the impacts outlined in alternative 1, alternative 3 would require additional park staff and park partners to support visitor programs and services throughout the park, significant new interpretive and educational programs at Alcatraz Island, expanded natural and cultural stewardship centers, and visitor programs associated with the park collections. These additional park staff would enable the park to provide interpretive and educational programs that are especially tied to cultural and natural resources associated with the Historic Immersion management zone. Additionally, maintenance and public safety staff would require expanded hours at Alcatraz Island and for management of the park lands in San Mateo County. Increased staff would result in long-term, moderate, beneficial impacts to operations if appropriate funding is available; otherwise, the actions of this alternative would continue the adverse impacts identified in the no-action alternative.

Increased restoration of nationally significant resources would benefit operations by reducing deferred maintenance, improving facility conditions, and helping the park to reach its sustainability goals. The construction, stabilization, rehabilitation, restoration, and demolition projects proposed in the alternative would result in long-term, moderate, beneficial impacts to park operations if funding could be obtained. Some construction and landscape restoration activities would result in minor, adverse impacts on park operations in the short term, because of the closure of buildings and lands during construction or restoration. Costs to implement this alternative would be somewhat greater than historic capital project fund amounts. The ability of the park and partners to raise needed funds would dramatically affect the ability to achieve the goals of alternative 3.

Changes in facility use and location would result in moderate, long-term, beneficial impacts to park operations. The establishment of a visitor center at Capehart, a hub at Rancho Corral de Tierra, and additional visitor services at Fort Mason would make it easier for park staff to provide educational and interpretive information to visitors throughout the park. An operations area at Fort Miley would improve efficiencies in public safety and maintenance in that area.

At Alcatraz Island, increases in staff would allow for improved maintenance as well as for increased levels of public safety and resource protection. As this alternative proposes a high level of restoration to nationally significant resources, these areas would need to be staffed and managed accordingly. If adequately funded, these increases in staff would result in long-term, moderate, beneficial impacts to park operations.

Also at Alcatraz Island, national treasure facilities would be stabilized, restored, or rehabilitated. Currently, many of the facilities are in poor condition and pose the threat of injury to visitors and staff. The improved facility conditions would result in long-term, moderate, beneficial impacts to park operations at Alcatraz Island and help to address the deferred maintenance issues. Construction activities would result in minor, short-term, adverse impacts due to the closure of facilities. The funding needed to complete the projects in this alternative is significant.

Conclusion

Increased staff would result in long-term, moderate, beneficial impacts to operations if adequate funding accompanies the increase in park staffing. Construction, stabilization, rehabilitation, restoration, and demolition projects proposed in the alternative would result in long-term, moderate, beneficial impacts to park operations, but would also result in short-term, minor, adverse impacts while the activities are underway. Facility use and location changes would result in long-term, moderate, and beneficial impacts to park operations.

MUIR WOODS NATIONAL MONUMENT

NATURAL RESOURCES – PHYSICAL RESOURCES

Carbon Footprint and Air Quality

No-action Alternative

Analysis

The continuation of current conditions and management would continue to result in adverse impacts to air quality/carbon footprint. Baseline GHG emissions (2008) for Muir Woods National Monument are estimated at 2,257 MTCE.

Mobile combustion associated with visitor travel in personal automobiles and the pilot shuttle would continue to be the largest contributor of GHG emissions (2,179 MTCE), representing about 96% of gross emissions at the monument.

Greenhouse gas emissions from visitors and NPS operations do contribute to elevated ozone and other air quality concerns. The National Park Service would continue to reduce greenhouse gas emissions by reducing energy consumption and replacing high-emitting apparatus with green technology—resulting in a beneficial impact.

Overall, when compared to background levels of air pollution and GHG emissions in the region or the nation (estimated at 6 billion in 2007), impacts to air quality from the no-action alternative would be long term, adverse, and negligible.

Conclusion

Total gross emissions for Muir Woods National Monument would be estimated at 2,257 MTCE, resulting in long-term, minor, adverse impacts to the monument's carbon footprint. Overall, when compared to background levels of air pollution and GHG emissions in the region or the nation (estimated at 6 billion in 2007), impacts to air quality from the no-action alternative would be long term, adverse, and negligible.

No impairment of air resources would result from this alternative.

Alternative 1: Connecting People with the Parks (NPS Preferred Alternative for Park Sites in Marin, San Francisco, and San Mateo Counties)

Analysis

Under alternative 1 visitor travel to the monument would be altered so that dependency on personal automobiles would be reduced. About 25% of parking would be removed and the Muir Woods shuttle would be expanded and could run on compressed natural gas, a lower emissions fuel. As a result, mobile combustion is estimated to be reduced by 20% to 1,740 MTCE. When compared to the no-action alternative, impacts to air quality/carbon footprint would be reduced—resulting in a beneficial impact.

Emissions from stationary combustion and purchased electricity would be slightly reduced when compared to the no-action alternative as result of facility removal and corresponding reductions in energy usage. Emissions associated with wastewater treatment and solid waste would be the same as under the no-action alternative.

Short-term adverse impacts to air quality would occur as a result of the construction activities needed to remove facilities (buildings and parking areas) and reclaim the disturbed sites.

Long-term, adverse impacts on air quality/carbon footprint would also be expected due to increases in energy consumption and related emissions attributed to the new welcome center/shuttle parking located on Highway 101.

The combined effect of the actions included in alternative 1 is estimated to decrease the gross emissions of Muir Woods National Monument by 20% to 1,812 MTCE. This would result in long-term, minor, beneficial impacts on the Park Service's carbon footprint. As in the no-action alternative, impacts to air quality (when compared to background levels of air pollution in the region and nation) would be negligible.

Conclusion

The combined effect of the actions included in alternative 1 is estimated to decrease the gross emissions of Muir Woods National Monument by 20% to 1,812 MTCE. This would result in long-term, minor, beneficial impacts on the Park Service's carbon footprint. As in the no-action alternative, impacts to air quality (when compared to background levels of air pollution in the region and nation) would be negligible.

No impairment of air resources would result from this alternative.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

Under alternative 2 visitor travel to the monument would be altered so that dependency on personal automobiles would be significantly reduced. Most of the parking at the monument would be removed and the Muir Woods shuttle would be expanded to a year-round operation and could run on compressed natural gas, a lower emissions fuel. As a result, mobile combustion is estimated to be reduced by 85% to 333 MTCE. When compared to the no-action alternative, impacts to air quality/carbon footprint would be reduced—resulting in a beneficial impact.

Emissions from stationary combustion and purchased electricity would be slightly reduced when compared to the no-action alternative as result of facility removal and corresponding reductions in energy usage. Emissions associated with wastewater treatment and solid waste would be the same as under the no-action alternative.

Short-term adverse impacts to air quality would occur as a result of the construction activities needed to remove facilities (buildings and parking areas) and reclaim the disturbed sites as well as from the restoration of Redwood Creek.

Long-term, adverse impacts on air quality/carbon footprint would also be expected due to increases in energy consumption and related emissions attributed to the new welcome center/shuttle parking located on Highway 101.

The combined effect of the actions included in alternative 2 is estimated to decrease the gross emissions of Muir Woods National Monument by 82% to 401 MTCE. This would result in long-term, major, beneficial impacts on the Park Service's carbon footprint. As in the no-action alternative, impacts to air quality (when compared to background levels of air pollution in the region and nation) would be negligible.

Conclusion

The combined effect of the actions included in alternative 2 is estimated to decrease the gross emissions of Muir Woods National Monument by 82% to 401 MTCE. This would result in long-term, major, beneficial impacts on the Park Service's carbon footprint. As in the no-action alternative, impacts to air quality (when compared to background levels of air pollution in the region and nation) would be negligible.

No impairment of air resources would result from this alternative.

Alternative 3: Focusing on National Treasures (NPS Preferred Alternative for Muir Woods National Monument)

Analysis

Under alternative 3 visitor travel to the monument would be altered so that dependency on personal automobiles would be reduced. About 25% of parking would be removed and the Muir Woods shuttle would be expanded and could run on compressed natural gas, a lower emissions fuel. As a result, mobile combustion is estimated to be reduced by 20% to 1,740 MTCE. When compared to the no-action alternative, impacts to air quality/carbon footprint would be reduced—resulting in a beneficial impact.

Emissions from stationary combustion and purchased electricity would be slightly reduced when compared to the no-action alternative as result of facility removal and corresponding reductions in energy usage. Emissions associated with wastewater treatment and solid waste would be the same as under the no-action alternative.

Short-term adverse impacts to air quality would occur as a result of the construction activities needed to remove facilities (buildings and parking areas) and reclaim the disturbed sites as well as from targeted restoration of Redwood Creek.

Long-term, adverse impacts on air quality/carbon footprint would also be expected due to increases in energy consumption and related emissions attributed to the new welcome center/shuttle parking located on Highway 101.

The combined effect of the actions included in alternative 3 is estimated to decrease the gross emissions of Muir Woods National Monument by 20% to 1,813 MTCE. This would result in long-term, minor, beneficial impacts on the Park Service's carbon footprint. As in the no-action alternative, impacts to air quality (when compared to background levels of air pollution in the region and nation) would be negligible.

Conclusion

The combined effect of the actions included in alternative 3 is estimated to decrease the gross emissions of Muir Woods National Monument by 20% to 1,813 MTCE. This would result in long-term, minor, beneficial impacts on the Park Service's carbon footprint. As in the no-action alternative, impacts to air quality (when compared to background levels of air pollution in the region and nation) would be negligible.

No impairment of air resources would result from this alternative.

Soils and Geologic Resources and Processes

No-action Alternative

Analysis

Under the no-action alternative, the presence and maintenance of existing facilities (including structures, parking lots, roads, and trails) would continue to cause parkwide impacts to soils and geologic resources due to the permanent loss and function of these resources and from erosion associated with unsustainable trails and roads. The impact of these activities would be long term, minor to moderate, adverse, and localized, but would occur throughout Muir Woods National Monument.

Projects to improve natural habitat values and ecosystem function, such as the modification of trails and roads, would have beneficial effects on soils and geologic resources and processes because they would improve or restore the functionality of natural processes—the impact would be long term, minor, beneficial, and localized.

Recreational use would continue to cause compaction and erosion of soils, resulting in long-term, minor, adverse, localized impacts throughout the monument.

Park Service efforts to provide educational and participatory stewardship programs would continue to have a beneficial effect on geologic resources and soils due to increased public understanding and support for resource protection and management—the impact would be long term, minor, beneficial, and monumentwide.

Conclusion

Overall, the impact to geologic resources and soils from the no-action alternative would be long term, range from minor to moderate adverse to minor beneficial, and be localized and monumentwide. Adverse impacts would occur from the presence and maintenance of existing facilities and visitor use. Beneficial impacts would occur from restoration and education and stewardship activities.

No impairment of geologic resources would result from this alternative.

Alternative 1: Connecting People with the Parks (NPS Preferred Alternative for Park Sites in Marin, San Francisco, and San Mateo Counties)

Analysis

Under alternative 1, a variety of management zones would be used that would assist in the protection of soils and geologic resources and processes. Approximately 91% of the monument would be zoned using the Natural and Sensitive Resources zones.

The removal of facilities/structures and the reclamation of disturbed building sites in the Camino del Canyon and Druid Heights area and the current entrance to Muir Woods National Monument, as well as the removal of the upper parking lot, would improve soil function and integrity and restore natural geologic processes. The impact of these activities would be long term, minor, beneficial, and localized. Short-term, minor, adverse impacts (such as increased erosion or compaction in adjacent areas) would occur during construction activities.

Visitor access and use would be expanded under alternative 1, resulting in increased soil compaction and erosion; however, compared to use patterns under the no-action alternative, only slight adverse impacts would be expected. Most impacts would be contained within defined visitor use areas and on trails. The impact, especially in areas off-trail, would be long term, minor, adverse, and localized. This impact would occur in areas throughout the monument.

New recreational development (new facilities at Bridge 4 and welcome center / shuttle parking at Highway 101) would have long-term, adverse, localized impacts on soils and geologic resources due to the permanent loss of soil function and integrity resulting from new development and increased erosion from facility construction and maintenance. The intensity of the impact would range from negligible to minor because in some cases the impact would be confined to previously developed or disturbed sites.

Impacts from an expanded NPS educational and stewardship programs would enhance the beneficial effect on soils and geologic processes due to increased public understanding and support for resource protection and management—the impact would be long term, minor, beneficial, and monumentwide.

Conclusion

Overall, the impact to soils and geologic resources and processes from alternative 1 would be short and long term, range from negligible adverse to minor beneficial, and be localized. Adverse impacts would occur from new recreational development and expanded visitor use. Beneficial impacts would occur from trail relocation, the restoration of disturbed sites, and improved resource understanding and public support.

No impairment of geologic resources would result from this alternative.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

Under alternative 2, a variety of management zones would be used to assist in the protection of soils and geologic resources and processes. Approximately 99% of the park would be zoned using the Natural and Sensitive Resources zones —the most of all the alternatives.

Nearly all of the built environment would be removed from Muir Woods National Monument. These include facilities and structures in the Camino del Canyon and Druid Heights area as well as at the current entrance and within the primeval redwood forest of the monument, the upper and lower parking areas, unneeded management roads, and several miles of trails. In addition, Redwood Creek would be restored. Restoration of these areas would reduce soil erosion, improve soil function and integrity, and restore natural geologic processes. The impact of these activities would be long term, moderate, beneficial, and localized. Short-term, minor, adverse impacts (such as increased erosion or compaction in adjacent areas) would occur during demolition and restoration activities.

Impacts from visitor access and use would be less than those described in the no-action alternative because it would be limited and highly controlled, resulting in long-term, minor, beneficial, localized impacts.

Impacts from expanded NPS educational and stewardship programs would enhance the beneficial effect on soil and geologic resources due to increased public understanding and support for resource protection and management—the impact would be long term, minor, beneficial, and monumentwide.

Conclusion

Overall, the impact to soils and geologic resources and processes from alternative 2 would be short and long term, range from minor adverse to moderate beneficial, and localized. Adverse impacts would occur from visitor use and construction. Beneficial impacts would occur from the removal of facilities and structures and restoration of disturbed sites.

No impairment of geologic resources would result from this alternative.

Alternative 3: Focusing on National Treasures (NPS Preferred Alternative for Muir Woods National Monument)

Analysis

Under alternative 3, a variety of management zones would be used that would assist in the protection of soils and geologic resources and processes. Approximately 85% of the monument would be zoned using the Natural and Sensitive Resources zones.

The impacts to geologic resources and soils from the continued maintenance of existing facilities and structures under alternative 3 would be the less than the no-action alternative. New recreational development (including a new welcome center/shuttle parking at State Route 1, new recreational amenities near Bridge 4, new trails in the monument, and picnicking facilities) would have long-term, minor, adverse, localized impacts on geologic resources and soils due to the permanent loss of soil function and integrity resulting from new development and increased erosion from facility construction and maintenance.

Beneficial effects on geologic resources and soils would occur from the removal of facilities and structures and the restoration of disturbed sites throughout the monument (such as the removal of the upper parking area; a number of structures in the Camino del Canyon and Druid Heights; and targeted removal of rip rap along Redwood Creek)—a total of about 28 acres of built environment would be removed and restored to natural conditions. The impact of these activities would be long term, moderate, beneficial, and localized. Short-term, minor, adverse impacts (such as increased erosion or compaction in adjacent areas) would occur during construction activities.

Visitor access and use would continue to cause adverse impacts to geologic resources and soils due to the effects compaction and erosion. However, the impact would be less than under the no-action alternative because primary use areas and trails would be moved away from the creek (where soils may be more prone to compaction and erosion) and new boardwalks would be developed that reduce these impacts—resulting in a beneficial impact. The impacts to geologic resources and soils from visitor use under alternative 3 would be negligible.

Impacts from NPS educational and stewardship programs would generally be the same as those described in the no-action alternative.

The expanded NPS interpretive, educational and stewardship programs would engage many more visitors and could have a long-term, moderate, beneficial effect on soils and geologic resources and processes due to increased public understanding and support for resource protection and management—the impact would be long term, moderate, beneficial, and monumentwide.

Conclusion

Overall, the impact to soils and geologic resources and processes from alternative 3 would be short and long term, range from negligible adverse to moderate beneficial, and be localized. Adverse impacts would occur from new recreational development and visitor use. Beneficial impacts would occur from the removal of facilities and structures and restoration of the upper parking lot and disturbed sites, as well as creek restoration activities.

No impairment of geologic resources would result from this alternative.

Water Resources and Hydrologic Processes

No-action Alternative

Analysis

Under the no-action alternative, the presence and maintenance (or lack of maintenance in some cases) of existing facilities (including structures, roads, and trails) would continue to cause localized impacts to water quality due to pollution from urban runoff and turbidity from soil erosion. The impact of these activities would be long term, minor to moderate, adverse, and localized, but would occur throughout the monument.

Structures would remain in the 100-year floodplain of Redwood Creek resulting in adverse impacts. Trails, bridges, administrative/concession buildings, the gift shop, restrooms are located in the floodplain. Retention of these facilities would continue to affect floodplain function. The structures themselves could affect the flow of water during floods and paved surfaces such as the parking area and portions of the trail system could affect the capacity of the floodplain to store floodwaters. Furthermore, the existing rock revetment that lines portions of Redwood Creek would continue to adversely affect natural hydrologic processes and floodplain function. Riparian wetland expansion would continue to be adversely affected by the presence of the parking area. The impact of these activities would be long term, moderate, adverse, and localized.

Recreational use would continue to cause erosion of soils resulting in turbidity. Vehicle use at parking areas and on roadways in the vicinity of the monument would continue to affect water quality from runoff that contains chemical contaminants. These activities would result in long-term, minor, adverse, localized impacts to water quality.

Park Service efforts to provide educational and participatory stewardship programs would continue to have a beneficial effect on water resources and hydrologic processes due to increased public understanding and support for resource protection and management—the impact would be long term, minor, beneficial, and monumentwide.

Conclusion

Overall, the impact to water resources and hydrologic processes from the no-action alternative would be long term, range from minor adverse to minor beneficial, and be localized and monumentwide. Adverse impacts would occur from the presence and

maintenance of existing facilities (including rock revetment), visitor use. Beneficial impacts would occur from education and stewardship activities.

No impairment of water resources would result from this alternative.

Alternative 1: Connecting People with the Parks (NPS Preferred Alternative for Park Sites in Marin, San Francisco, and San Mateo Counties)

Analysis

Under alternative 1, a variety of management zones would be used that would assist in the protection of water resources and hydrologic processes. Approximately 91% of the park would be zoned using the Natural and Sensitive Resources zones.

The removal of some facilities and structures and the reclamation of disturbed building sites and roads in the Camino del Canyon and Druid Heights area and the main part of Muir Woods National Monument, including removal of the upper parking lot, would improve natural hydrologic processes. The impact would be long term, minor, beneficial, and localized. Short-term, minor, adverse impacts to water quality could occur from sedimentation and runoff during construction and restoration activities.

Impacts to floodplains would be the same as described under the no-action alternative, except for those associated with the removal of the upper parking area and restoration of the site to a natural area. The removal of the upper parking area would eliminate the impervious surface at the site, restoring floodwater capacity and natural floodplain function—resulting in a long-term, minor, beneficial impact.

Visitor access and use would be expanded under alternative 1, potentially resulting in some increase in erosion along trails and at primary visitor use areas that could have impacts on water quality—the impact would be long term, negligible to minor, adverse, and localized.

New recreational development (new facilities at Bridge 4 and welcome center/shuttle parking at Highway 101) could have short-term, negligible to minor, adverse, localized impacts on water quality from increased erosion and sedimentation, and the potential for chemical contamination resulting from inadvertent chemical spills from heavy equipment at construction sites. Similar impacts to water quality could occur over the long term due to the increased potential for fecal coliform contamination and urban pollutants. These activities would result in long-term, minor, adverse, localized impacts to water quality. However, the new restroom facility may reduce the presence of human waste in Muir Woods National Monument and the associated water quality impacts.

Impacts from expanded NPS educational and stewardship programs would enhance the beneficial effect on water resources and hydrologic processes due to increased public understanding and support for resource protection and management—the impact would be long term, minor, beneficial, and monumentwide.

Conclusion

Overall, the impact to water-related resources from alternative 1 would be short and long term, range from negligible adverse to minor beneficial, and be localized and parkwide. Adverse impacts would occur from the presence and maintenance of existing facilities

(including rock revetment), new recreational development, and expanded visitor use. Beneficial impacts would occur from trail and road maintenance and the restoration of disturbed sites and removal of the upper parking area.

No impairment of water resources would result from this alternative.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

Under alternative 2, a variety of management zones would be used that would assist in the protection of water resources and hydrologic processes. Approximately 99% of the park would be zoned using the Natural and Sensitive Resources zones.

Alternative 2 would reduce impacts to water quality by eliminating erosion from unsustainable trails and unneeded management roads, resulting in long-term, minor to moderate, beneficial, localized impacts. Short-term, minor, adverse impacts to water quality could occur from sedimentation and runoff during construction and restoration activities.

The substantial removal of facilities and structures and the reclamation of disturbed building sites and road in the Camino del Canyon and Druid Heights area and the main part of Muir Woods National Monument, as well as the removal of the upper and lower parking areas, would improve the natural hydrologic processes. The impact would be long term, moderate, beneficial, and localized. Short-term, minor, adverse impacts to water quality could occur from sedimentation and runoff during construction and restoration activities.

Impacts to floodplains would include the removal of the upper and lower asphalt parking areas and the restoration of about 6,700 linear feet of Redwood Creek (including rock revetment) and its floodplain. This would restore floodwater capacity and natural floodplain function and improve riparian wetlands and hydrologic processes. Water flow and floodplain function would also be restored by removing or redesigning bridges. These activities would result in long-term, moderate to major, beneficial impacts on floodplains and related water resources.

Impacts from expanded NPS educational and stewardship programs would enhance the beneficial effect on water resources and hydrologic processes due to increased public understanding and support for resource protection and management—the impact would be long term, minor, beneficial, and monumentwide.

Conclusion

Overall, the impact to water-related resources from alternative 2 would be short and long term, range from minor adverse to moderate-major beneficial, and be localized. Adverse impacts would occur from expanded visitor use and restoration activities. Beneficial impacts would occur from the restoration of disturbed sites, removal of structures, facilities, roads, and asphalt parking areas and substantial creek and floodplain restoration.

No impairment of water resources would result from this alternative.

Alternative 3: Focusing on National Treasures (NPS Preferred Alternative for Muir Woods National Monument)

Analysis

Under alternative 3, a variety of management zones would be used that would assist in the protection of water resources and hydrologic processes. Approximately 85% of the park would be zoned using the Natural and Sensitive Resources zones.

Alternative 3 would reduce impacts to water quality by reducing erosion from unsustainable trails and roads, resulting in long-term, minor, beneficial, localized impacts. Short-term, minor, adverse impacts to water quality could occur from sedimentation and runoff during construction and restoration activities.

The removal of facilities, structures, roads, and the reclamation of disturbed building sites in the Camino del Canyon and Druid Heights area and the main part of Muir Woods National Monument, as well as the removal of the upper parking area, would improve natural hydrologic processes. The impact would be long term, minor, beneficial, and localized. Short-term, minor, adverse impacts to water quality could occur from sedimentation and runoff during construction activities.

Impacts to floodplains would include the removal of the upper parking area and conversion of the remaining asphalt surface to a more pervious surface, as well as targeted restoration of Redwood Creek (including rock revetment) and its floodplain. This would restore flood water capacity and natural floodplain function and improve riparian wetlands and hydrologic processes. Water flow and floodplain function would also be restored by removing or redesigning bridges. These activities would result in long-term, moderate, beneficial impacts on floodplains and related water resources.

Visitor access and use would be expanded under alternative 3, potentially resulting in some increase in erosion along trails and at primary visitor use areas that could have impacts on water quality – the impact would be long term, negligible to minor, adverse, and localized.

The expanded NPS interpretive, educational and stewardship programs would engage many more visitors and could have a long-term, moderate, beneficial effect on water resources and hydrologic processes due to increased public understanding and support for resource protection and management—the impact would be long term, moderate, beneficial, and monumentwide.

Conclusion

Overall, the impacts to water-related resources from alternative 3 would be short and long term, range from negligible adverse to moderate beneficial, and be localized. Adverse impacts would occur from the presence and maintenance of existing facilities (including rock revetment), new recreational development, expanded visitor use, and construction and restoration activities. Beneficial impacts would occur from the restoration of disturbed sites, removal of the upper parking area, improvements to Redwood Creek, and restoration of the Camino del Canyon and Druid Heights area.

No impairment of water resources would result from this alternative

NATURAL RESOURCES – BIOLOGICAL RESOURCES

Habitat (Vegetation and Wildlife)

No-action Alternative

Analysis

Under the no-action alternative, the presence and maintenance (or lack of maintenance in some cases) of existing facilities (including structures, parking lots, roads, and trails) would continue to cause localized impacts to vegetation and wildlife habitat by fragmenting natural areas and increasing the potential for exotic plant species to displace native species and affect native habitat. The rock revetment that lines Redwood Creek, and the trails in the floodplain, are affecting vegetation and wildlife habitat by limiting natural hydrologic process that support natural conditions. Furthermore, the developed and hardened trails (such as boardwalks) themselves act as barriers to wildlife movement on the ground and in the forest canopy. The impact of these activities would be long term, moderate, adverse, and localized, but would occur throughout the monument.

Rehabilitating disturbed sites would continue to improve the integrity and diversity of habitats available to aquatic and terrestrial organisms. Ongoing vegetation management, including the use of prescribed fire, and monitoring of plants and wildlife allows the National Park Service to improve native habitat conditions. The impact of these activities would be long term, minor, beneficial, and localized.

Recreational use would continue to reduce habitat integrity by trampling plants, introducing and increasing the spread of exotic species, causing disturbance (flushing and displacement) to animals, and increasing the potential for human-wildlife conflict resulting from habituation due to the presence of humans and the introduction of unnatural food sources. Recreational use also generates noise and unnatural light sources that affect wildlife. These activities would result in long-term, minor to moderate, adverse, localized impacts throughout the monument.

Park Service efforts to provide educational and participatory stewardship programs would continue to have a beneficial effect on water resources and hydrologic processes due to increased public understanding and support for resource protection and management—the impact would be long term, minor, beneficial, and monumentwide.

Conclusion

Overall, the impact to vegetation and wildlife habitat from the no-action alternative would be long term, range from minor-moderate adverse to minor beneficial, and be localized and monumentwide. Adverse impacts would occur from the presence and maintenance of existing facilities and visitor use. Beneficial impacts would occur from restoration and ongoing management and monitoring activities.

No impairment of vegetation or wildlife resources would result from this alternative.

Alternative 1: Connecting People with the Parks (NPS Preferred Alternative for Park Sites in Marin, San Francisco, and San Mateo Counties)

Analysis

Under alternative 1, a variety of management zones would be used that would assist in the protection of vegetation and wildlife habitat. Approximately 91% of the park would be zoned using the Natural and Sensitive Resources zones.

The removal of facilities/structures and the reclamation of disturbed building sites in the Muir Woods Addition area and the main part of Muir Woods, as well as the removal of the upper parking lot, would improve vegetation and wildlife habitat by improving habitat structure and the diversity of habitats available to support various species' needs. Human-wildlife conflicts would be reduced because the food concession in the monument would be eliminated, resulting in less wildlife habituation—resulting in a beneficial impact. These kinds of activities would reduce environmental stressors and increase the resiliency of species and systems to the effects of climate change. The impact would be long term, minor to moderate, beneficial, and localized. Short-term, minor, adverse impacts to habitat could occur during construction activities.

Visitor access and use would be expanded under alternative 1, potentially resulting in additional impacts to vegetation (trampling) and wildlife (disturbance) along trails and at primary visitor use areas—the impact would be long term, minor, adverse, and localized.

New recreational development (new facilities at Bridge 4 and welcome center at Highway 101) would have long-term, negligible, adverse, localized impacts on vegetation and wildlife due to the permanent loss of plants and wildlife habitat within the construction footprint. Short-term, minor, adverse impacts to vegetation would also occur from injury or loss of plants during construction activities; however, the area would be replanted with native plants and the natural habitat would be reclaimed. Similarly, short-term adverse impacts to wildlife, such as disturbance, would occur during construction.

Impacts from expanded NPS educational and stewardship programs would enhance the beneficial effect on impacts to habitats due to increased public understanding and support for resource protection and management—the impact would be long term, minor, beneficial, and monumentwide.

Conclusion

Overall, the impact to vegetation and wildlife habitat from alternative 1 would be short and long term. They would range from negligible adverse to minor or moderate beneficial and would be localized as well as monumentwide. Adverse impacts would occur from new recreational development and expanded visitor use. Beneficial impacts would occur from the restoration of disturbed sites.

No impairment of vegetation or wildlife resources would result from this alternative.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

Under alternative 2, a variety of management zones would be used that would assist in the protection of vegetation and wildlife habitat. Approximately 99% of the park would be zoned using the Natural and Sensitive Resources zones.

Nearly all of the built environment would be removed from Muir Woods—facilities/structures in the Muir Woods Addition area as well as in the main part of Muir Woods, the upper and lower parking areas, unneeded management roads, and several miles of trails. Restoration of about 6,700 linear feet of Redwood Creek would improve habitat structure and the diversity of habitats available to support various species' needs—an enhancement for aquatic and terrestrial organisms. Restoring the creek and its floodplain function would result in increased soil deposition that would assist in the recruitment of redwood trees. Human-wildlife conflicts would be reduced because the food concession in the monument would be eliminated, resulting in less wildlife habituation—a beneficial impact. These kinds of activities would reduce environmental stressors and increase the resiliency of species and systems to the effects of climate change. The impact would be long term, moderate to major, beneficial, and localized.

Short-term, minor, adverse impacts to vegetation would also occur from injury or loss of plants during construction activities; however, the area would be replanted with native plants and the natural habitat would be reclaimed. Similarly, short-term adverse impacts to wildlife, such as disturbance, would occur during construction.

Impacts from visitor access and use would be less than those described in the no-action alternative because it would be limited and highly controlled, resulting in long-term, minor, beneficial, localized impacts. Some impacts to vegetation (trampling) and wildlife (disturbance) along trails and at primary visitor use areas would still occur.

Impacts from an expanded NPS educational and stewardship programs would enhance the beneficial effect on habitats due to increased public understanding and support for resource protection and management. In addition, partnering with other agencies to manage visitor access and promote restoration and habitat management as part of the UNESCO Biosphere Reserve would elevate this issue and could result in benefits to vegetation and wildlife habitat. These actions would result in long-term, minor, beneficial, and monumentwide impacts.

Conclusion

Overall, the impact to vegetation and wildlife habitat from alternative 2 would be short and long term. They would range from minor adverse to moderate or major beneficial and would be localized and monumentwide. Adverse impacts would occur from visitor use and construction activities. Beneficial impacts would occur from the restoration of disturbed sites and creeks.

No impairment of vegetation or wildlife resources would result from this alternative.

Alternative 3: Focusing on National Treasures (NPS Preferred Alternative For Muir Woods National Monument)

Analysis

Under alternative 3, a variety of management zones would be used that would assist in the protection of vegetation and wildlife habitat. Approximately 85% of the park would be zoned using the Natural and Sensitive Resources zones.

The removal of facilities/structures and the reclamation of disturbed building sites in the Muir Woods Addition area and the main part of Muir Woods, as well as the removal of the upper parking lot, would improve vegetation and wildlife habitat by improving habitat structure and the diversity of habitats available to support various species' needs. Targeted restoration of Redwood Creek and its floodplain would improve habitat structure and the diversity of habitats available to support various species' needs—an enhancement for aquatic and terrestrial organisms. Human-wildlife conflicts would be reduced because the food concession in the monument would be eliminated, resulting in less wildlife habituation—a beneficial impact. These kinds of activities would reduce environmental stressors and increase the resiliency of species and systems to the effects of climate change. The impact would be long term, moderate, beneficial, and localized.

Short-term, minor, adverse impacts to vegetation would also occur from injury or loss of plants during construction activities; however, the area would be replanted with native plants and the natural habitat would be reclaimed. Similarly, short-term adverse impacts to wildlife, such as disturbance, would occur during construction.

New recreational development (new trails and additional visitor amenities) would cause increased habitat fragmentation and loss, resulting in long-term, minor to moderate, adverse, localized impacts.

Visitor access and use would be expanded under alternative 3, potentially resulting in additional impacts to vegetation (trampling) and wildlife (disturbance) along trails and at primary visitor use areas—the impact would be long term, minor, adverse, and localized.

The expanded NPS interpretive, educational, and stewardship programs would engage many more visitors and could have a long-term, moderate, beneficial effect on habitats due to increased public understanding and support for resource protection and management—the impact would be long term, moderate, beneficial, and monumentwide.

Conclusion

Overall, the impacts to vegetation and wildlife habitat from alternative 3 would be short and long term, range from minor adverse to moderate beneficial, and be localized and monumentwide. Adverse impacts would occur from visitor use and construction activities. Beneficial impacts would occur from the restoration of disturbed sites and creeks.

No impairment of vegetation or wildlife resources would result from this alternative.

Special Status Species (Federal and State Threatened and Endangered Species)

No-action Alternative

Introduction

In general, many of the impacts to vegetation and wildlife described in the habitat section of this part would apply to special status species. For example, visitor use and new development would result in changes that would be adverse impacts to listed species and their habitats. Likewise, vegetation management and creek restoration would result in beneficial impacts to listed species and their habitats. Keeping this in mind, the analysis provided below generalizes about the effects of land management priorities and, where possible, focuses on the impacts that specific actions included in the alternatives may have on listed species and their habitats.

Federal Threatened and Endangered

Coho salmon, Central California Coast (*Oncorhynchus kisutch*) and steelhead trout, Central California Coast (*O. mykiss*). These two listed salmonid species are analyzed together because of the similarities in their life characteristics, habitat requirements, and the effects of impacts on the two species.

Within the vicinity of Muir Woods National Monument, coho salmon are restricted to Redwood Creek and Eastkoot Creek in Marin County. Steelhead trout are restricted to Redwood Creek and the drainages to Bolinas Lagoon and Rodeo Lagoon in Marin County. Therefore, impacts would be restricted to these locations.

National Park Service activities, such as vegetation management, creek restoration, and efforts to improve water quantity and quality within the Redwood Creek watershed, would have beneficial impacts on maintaining habitat characteristics that support anadromous fish. Projects at Muir Woods National Monument (vegetation management and creek restoration) would have beneficial impacts on habitat parameters required by the two species. These projects would improve riparian vegetation and in-stream habitat complexity—resulting in improvements to spawning, rearing, and migratory habitats. Critical habitat would be affected by restoration activities. Within the immediate project area, short-term, minor, adverse, localized impacts to nearly all essential features of critical habitat (substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions) would be expected. However, these short-term impacts would be outweighed by the beneficial impacts expected to occur over the long term. The National Park Service would continue to monitor coho and steelhead populations and habitat and inventory potential habitat.

Controlling and managing visitor use would reduce impacts to coho and steelhead, such as habitat alteration and direct impacts from recreational use and development; however, some adverse impacts would continue. The upper and lower parking areas, as well as the rock revetment that lines sections of Redwood Creek, would continue to adversely affect the integrity of fish habitat by impacting natural floodplain function and therefore habitat integrity—resulting in an adverse impact.

The primary threats to coho and steelhead would continue to be loss and modification of habitat, water diversions, habitat channelization, sedimentation, and degraded water

quality—adverse impacts associated with increased urbanization of the region. Collectively, impacts to coho salmon and steelhead trout resulting from NPS actions that are part of the no-action alternative (the continuation of current management and trends) would be long term, beneficial, minor, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, likely to adversely affect*” for project specific actions in the short term, and “*may affect, not likely to adversely affect*” for land use and monument management over the long term. Consultation for specific projects would occur as necessary.

Northern spotted owl (*Strix occidentalis caurina*). Suitable habitat for northern spotted owls include all evergreen forested habitat north of State Route 1 in Marin County. Within the planning area, known spotted owl populations are currently limited to Muir Woods National Monument, Homestead Valley, and the Stinson Gulch area. Therefore, impacts would be restricted to these locations.

Vegetation management actions designed to protect and enhance coniferous forest, including old-growth, second growth and remnant stands, would provide potential roosting, feeding, and nesting habitat for the owl—a beneficial impact. The National Park Service would continue to monitor owl populations and survey potential habitat. Visitor use in the area would continue to disturb owls. Barred owls would also likely continue to invade preferred spotted owl habitats—an adverse impact. Ongoing actions to reduce human-created noise and light at Muir Woods National Monument would result in improvements to habitat conditions. Current actions to reduce barred owl use and nesting would help reduce adverse impacts to spotted owls. The primary threat to the northern spotted owl in the region would continue to be the loss of habitat—an adverse impact associated with increased urbanization of the region. Other threats include expansion in the range of the barred owl, West Nile virus, changes in habitat due to Sudden Oak Death, and recreational pressure. Locally, in Muir Woods National Monument, the primary threat is from barred owls. Collectively, impacts to the northern spotted owl resulting from NPS actions that are part of the no-action alternative (the continuation of current management and trends) would be long term, minor, beneficial and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect*.”

Marbled murrelet (*Brachyramphus marmoratus marmoratus*). Marbled murrelet surveys of Muir Woods National Monument have been completed but no murrelets have been observed. Vegetation management actions designed to protect and enhance old-growth redwood forest at the monument would continue to provide suitable nesting locations for the murrelet—a beneficial impact. The primary threat to the marbled murrelet would continue to be the loss of nesting habitat and increased nest predation due to high corvid (i.e., crows and jays) densities—this would result in an adverse impact associated with increased urbanization of the region. Collectively, impacts to the marbled murrelet resulting from NPS actions that are part of the no-action alternative (the continuation of current management and trends) would be long term, minor, beneficial and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect*.”

Conclusion

Table 21: Potential Impacts to Special Status Species of Muir Woods National Monument, No-action Alternative

Species	Status	ESA Determination
Coho salmon, Central California Coast ESU (<i>Oncorhynchus kisutch</i>)	Federal threatened; State endangered	“may affect, likely to adversely affect” for project specific actions in the short term, and “may affect, not likely to adversely affect” for land use and monument management over the long term
Steelhead trout, Central California Coast ESU (<i>Oncorhynchus mykiss</i>)	Federal threatened	“may affect, likely to adversely affect” for project specific actions in the short term, and “may affect, not likely to adversely affect” for land use and monument management over the long term
Northern spotted owl (<i>Strix occidentalis caurina</i>)	Federal threatened	“may affect, not likely to adversely affect”
Marbled murrelet (<i>Brachyramphus marmoratus marmoratus</i>)	Federal threatened; State endangered	“may affect, not likely to adversely affect”

No impairment of listed species would result from this alternative.

Alternative 1: Connecting People with the Parks (NPS Preferred Alternative for Park Sites in Marin, San Francisco, and San Mateo Counties)

Introduction

Under alternative 1, a variety of management zones would be used that would assist in the protection of special status species. Approximately 91% of the monument would be zoned using the Natural and Sensitive Resources zones.

Federal Threatened and Endangered

Coho salmon, Central California Coast (*Oncorhynchus kisutch*) and steelhead trout, Central California Coast (*O. mykiss*). In addition to the impacts described under the no-action alternative, restoration activities (removal of some buildings and reclamation of native habitat in the Camino del Canyon and Druid Heights area, removal of the upper asphalt parking lot at the entrance, and relocation of trails) under alternative 1 would improve water quality and habitat conditions – a beneficial impact. The construction of new facilities at Bridge 4 would affect water quality and instream habitat causing short-term, minor, adverse, localized impacts to salmonids due to construction and restoration activities. Collectively, impacts to coho salmon and steelhead trout resulting from

alternative 1 would be long term, beneficial, minor, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, likely to adversely affect*” for project specific actions in the short term, and “*may affect, not likely to adversely affect*” for land use and monument management over the long term. Consultation for specific projects would occur as necessary.

Northern spotted owl (*Strix occidentalis caurina*). In addition to the impacts described under the no-action alternative, restoration activities (removal of some buildings and reclamation of native habitat in the Camino del Canyon and Druid Heights area and removal of the upper parking lot at the entrance) under alternative 1 would improve resource conditions and integrity, which could result in an increase of suitable nesting habitat for spotted owls at Muir Woods National Monument. Impacts to the northern spotted owl would be long term, minor, beneficial, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

Marbled murrelet (*Brachyramphus marmoratus marmoratus*). In addition to the impacts described under the no-action alternative, restoration activities (removal of some buildings and reclamation of native habitat in the Camino del Canyon and Druid Heights area and removal of the upper parking lot at the entrance) under alternative 1 would improve resource conditions and integrity, which could result in an increase of suitable nesting habitat for the marbled murrelet at Muir Woods National Monument. Impacts to the marbled murrelet would be long term, minor, beneficial, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

Conclusion

Table 22: Potential Impacts to Special Status Species of Muir Woods National Monument, Alternative 1

Species	Status	ESA Determination
Coho salmon, Central California Coast ESU (<i>Oncorhynchus kisutch</i>)	Federal threatened; State endangered	“ <i>may affect, likely to adversely affect</i> ” for project specific actions in the short term, and “ <i>may affect, not likely to adversely affect</i> ” for land use and monument management over the long term
Steelhead trout, Central California Coast ESU (<i>Oncorhynchus mykiss</i>)	Federal threatened	“ <i>may affect, likely to adversely affect</i> ” for project specific actions in the short term, and “ <i>may affect, not likely to adversely affect</i> ” for land use and monument management over the long term
Northern spotted owl (<i>Strix occidentalis caurina</i>)	Federal threatened	“ <i>may affect, not likely to adversely affect</i> ”

Species	Status	ESA Determination
Marbled murrelet (<i>Brachyramphus marmoratus marmoratus</i>)	Federal threatened	"may affect, not likely to adversely affect"

No impairment of listed species would result from this alternative.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Introduction

Under alternative 2, a variety of management zones would be used that would assist in the protection of special status species. Approximately 99% of the monument would be zoned using the Natural and Sensitive Resources zones.

Federal Threatened and Endangered

Coho salmon, Central California Coast (*Oncorhynchus kisutch*) and steelhead trout, Central California Coast (*O. mykiss*). In addition to the impacts described under the no-action alternative, restoration activities (removal of buildings and reclamation of native habitat throughout the monument, removal of the upper and most of the lower asphalt parking area, and the restoration of about 6,700 linear feet of Redwood Creek, including removal of the rock rip rap, and its floodplain) under alternative 2 would improve water quality and habitat conditions. Water flow and floodplain function would be improved by removing or redesigning bridges that constrain floodplain function. Woody debris in the creek would increase as a result of restoring natural processes and would improve habitat structure and available nutrients to coho and steelhead. All of these activities would result in improvements to spawning and rearing habitat—resulting in a beneficial impact. There would be short-term adverse impacts from construction that would be outweighed by long-term habitat improvements. Collectively, impacts to coho salmon and steelhead trout resulting from alternative 2 would be long term, beneficial, moderate, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “may affect, likely to adversely affect” for project specific actions in the short term, and “may affect, not likely to adversely affect” for land use and monument management over the long term. Consultation for specific projects would occur as necessary.

Northern spotted owl (*Strix occidentalis caurina*). In addition to the impacts described under the no-action alternative, restoration activities (removal of buildings and reclamation of native habitat throughout the monument, removal of the upper and most of the lower parking lot at the entrance, and the restoration of the Redwood Creek and its floodplain) under alternative 2 would improve resource conditions and integrity, which could result in an increase of suitable nesting habitat for spotted owls at Muir Woods National Monument. Forage opportunities would likely improve as a result of these activities. The scale of beneficial impacts under alternative 2 is greater than under the no-action alternative. Impacts to the northern spotted owl under alternative 2 would be long term, minor to moderate, beneficial, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “may affect, not likely to adversely affect.”

Marbled murrelet (*Brachyramphus marmoratus marmoratus*). In addition to the impacts described under the no-action alternative, restoration activities (removal of buildings and reclamation of native habitat throughout the monument, removal of the upper and most of the lower parking lot at the entrance, and the restoration of the Redwood Creek and its floodplain) under alternative 2 would improve resource conditions and integrity, which could result in an increase of suitable nesting habitat for the marbled murrelet at Muir Woods National Monument. Forage opportunities would likely improve as a result of these activities. The scale of beneficial impacts under alternative 2 is greater than under the no-action alternative. Impacts to the marbled murrelet under alternative 2 would be long term, minor to moderate, beneficial, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

Conclusion

Table 23: Potential Impacts to Special Status Species of Muir Woods National Monument, Alternative 2

Species	Status	ESA Determination
Coho salmon, Central California Coast ESU (<i>Oncorhynchus kisutch</i>)	Federal threatened; State endangered	“ <i>may affect, likely to adversely affect</i> ” for project specific actions in the short term, and “ <i>may affect, not likely to adversely affect</i> ” for land use and monument management over the long term
Steelhead trout, Central California Coast ESU (<i>Oncorhynchus mykiss</i>)	Federal threatened	“ <i>may affect, likely to adversely affect</i> ” for project specific actions in the short term, and “ <i>may affect, not likely to adversely affect</i> ” for land use and monument management over the long term
Northern spotted owl (<i>Strix occidentalis caurina</i>)	Federal threatened	“ <i>may affect, not likely to adversely affect</i> ”
Marbled murrelet (<i>Brachyramphus marmoratus marmoratus</i>)	Federal threatened; State endangered	“ <i>may affect, not likely to adversely affect</i> ”

No impairment of listed species would result from this alternative.

Alternative 3: Focusing on National Treasures (NPS Preferred Alternative for Muir Woods National Monument)

Introduction

Under alternative 3, a variety of management zones would be used that would assist in the protection of special status species. Approximately 85% of the monument would be zoned using the Natural and Sensitive Resources zones.

Federal Threatened and Endangered

Coho salmon, Central California Coast (*Oncorhynchus kisutch*) and steelhead trout, Central California Coast (*O. mykiss*). In addition to the impacts described under the no-action alternative, restoration activities (removal of buildings and reclamation of native habitat in the Camino del Canyon and Druid Heights area, removal of the upper asphalt parking lot at the entrance, and relocation of trails) under alternative 3 would improve water quality and habitat conditions—a beneficial impact. Targeted, but limited, restoration of Redwood Creek would improve resource conditions and integrity, resulting in improvements to spawning and rearing habitat. Water flow and floodplain function would be improved by removing or redesigning bridges that constrain floodplain function. There would be short-term adverse impacts from construction and restoration that would be outweighed by long-term habitat improvements. Collectively, impacts to coho salmon and steelhead trout resulting from alternative 3 would be long term, beneficial, minor to moderate, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, likely to adversely affect*” for project specific actions in the short term, and “*may affect, not likely to adversely affect*” for land use and monument management over the long term. Consultation for specific projects would occur as necessary.

Northern spotted owl (*Strix occidentalis caurina*). In addition to the impacts described under the no-action alternative, restoration activities (removal of buildings and reclamation of native habitat in the Camino del Canyon and Druid Heights area and removal of the upper parking lot at the entrance) under alternative 3 would improve resource conditions and integrity, which could result in an increase of suitable nesting habitat for spotted owls. Realignment of the Old Muir Woods Road would reclaim some of the owl’s mapped foraging habitat. Targeted, but limited, restoration of Redwood Creek would improve resource conditions and integrity, resulting in potential improvements to nesting and foraging habitats. Visitor use would affect more areas of the monument under alternative 3, potentially increasing disturbance to individuals and potential owl nesting habitat—resulting in a long-term, minor, adverse, localized impact. Collectively, impacts to the northern spotted owl from alternative 3 would be long term, minor, beneficial, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

Marbled murrelet (*Brachyramphus marmoratus marmoratus*). In addition to the impacts described under the no-action alternative, restoration activities (removal of buildings and reclamation of native habitat in the Camino del Canyon and Druid Heights area and removal of the upper parking lot at the entrance) under alternative 3 would improve resource conditions and integrity, which could result in an increase of suitable nesting habitat for the marbled murrelet at Muir Woods National Monument. Targeted, but limited, restoration of Redwood Creek would improve resource conditions and integrity, resulting in potential improvements to nesting and foraging habitats. Impacts to

the marbled murrelet would be long term, minor, beneficial, and localized. The determination of effect under Section 7 of the Endangered Species Act would be “*may affect, not likely to adversely affect.*”

Conclusion

Table 24: Potential Impacts to Special Status Species of Muir Woods National Monument, Alternative 3

Species	Status	ESA Determination
Coho salmon, Central California Coast ESU (<i>Oncorhynchus kisutch</i>)	Federal threatened; State endangered	“ <i>may affect, likely to adversely affect</i> ” for project specific actions in the short term, and “ <i>may affect, not likely to adversely affect</i> ” for land use and monument management over the long term
Steelhead trout, Central California Coast ESU (<i>Oncorhynchus mykiss</i>)	Federal threatened	“ <i>may affect, likely to adversely affect</i> ” for project specific actions in the short term, and “ <i>may affect, not likely to adversely affect</i> ” for land use and monument management over the long term
Northern spotted owl (<i>Strix occidentalis caurina</i>)	Federal threatened	“ <i>may affect, not likely to adversely affect</i> ”
Marbled murrelet (<i>Brachyramphus marmoratus marmoratus</i>)	Federal threatened; State endangered	“ <i>may affect, not likely to adversely affect</i> ”

No impairment of listed species would result from this alternative.

CULTURAL RESOURCES – HISTORIC STRUCTURES, HISTORIC DISTRICTS, AND CULTURAL LANDSCAPES

No-action Alternative

Analysis

Under this alternative, the park would continue to manage Muir Woods National Monument as outlined in the 1980 general management plan. The no-action alternative would result in few changes to contributing features of historic structures, districts and cultural landscapes within the project area. The park would continue to stabilize, preserve, and rehabilitate the contributing historic structures and landscape features of this district in accordance with the *Secretary of the Interior’s Standards for the Treatment of Historic Properties*, though much of this work would be subject to funding availability.

Historic structures would continue to be preserved, rehabilitated, and maintained for use by park operations and visitor services. The primary arrival and entrance area would remain in the general location and condition as currently exists, with some improvements made for visitor services, access and circulation including shuttle drop-off and loading, pedestrian connections, and parking. Historic trails and roads, and other contributing landscape features, would be preserved and maintained. Efforts would be made to stabilize those landscape features that contribute to the historic district and whose condition is deteriorating. Overall, these ongoing preservation measures would result in a long-term, negligible to minor, beneficial impact and long-term, minor, adverse impact on contributing structures and landscapes of this historic district.

Dipsea Trail – The trail would be maintained and improvements would address erosion and natural resource issues resulting in long-term, minor, beneficial and adverse impacts.

Druid Heights – Historic buildings and landscape features would be stabilized to arrest any further loss of historic fabric, and preserved over time. This would result in a long-term, minor, beneficial and adverse impact. The national register eligibility of this property must be determined.

Hillwood Camp – Historic buildings and landscape features would be stabilized to arrest any further loss of historic fabric, and preserved over time and continue to be adaptively reused. This would result in a long-term, minor, beneficial and adverse impact.

Conclusion

When combined with the effects of the actions common to all alternatives, the impact to historic structures and landscape resources in Muir Woods National Monument under the no action alternative would be long-term, minor, beneficial and adverse. Under this alternative, the Section 106 determination of effect on historic structures, districts, and cultural landscapes for Muir Woods National Monument, would be *no adverse effect*.

Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Muir Woods National Monument; 2) key to the natural or cultural integrity of the monument; or 3) identified as a goal in the monument's general management plan or other relevant NPS planning documents, there would be no impairment of the monument's historic structures or districts or cultural landscapes.

Alternative 1: Connecting People with the Parks

Analysis

Under this alternative, the park would enhance programs, facilities, and trails that access the redwood forest and connect communities to the park and surrounding open space. Significant historic structures and landscape features would be preserved and rehabilitated, with the introduction of some new compatible elements to accommodate these programs and enhance the visitor experience. Changes would be made to the arrival and entrance area to the park; an offsite welcome center for the shuttle system, with parking and visitor services, would be an important feature under this alternative. The monument's existing entrance area would be redesigned to enhance the visitor's arrival experience, protect resources, and improve safety. A compatibly designed, modest arrival facility would be provided and could include a shuttle stop, passenger drop-off/pick-up

area, a sheltered waiting area, park orientation, restrooms, food service, and bookstore. Realignment of portions of Muir Woods Road would also be considered to improve its operational safety and visitor access. These changes to the arrival sequence and entrance area would result in long-term, minor, adverse impacts.

The park would continue to stabilize, preserve, and rehabilitate the contributing historic structures and landscape features of this district in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*. The Administrative-Concession Building would be rehabilitated for interpretive, educational, and stewardship programs with the Superintendent's Residence, Garage, and Equipment Shed rehabilitated for park operations and administration. Nonhistoric structures would be removed. These actions would result in long-term, minor, beneficial and adverse effects. The future use of the Old Inn would be determined through more detailed site planning that would include an evaluation of its historic significance and integrity, and consider its reuse for visitor services or operational needs, or potential removal.

The park would maintain much of the present system of trails through the forest while some existing facilities and use areas, such as the entrance area and parking lots, would be modified or relocated. Historic trails and roads, and other contributing landscape features, would be stabilized, preserved and maintained, which would result in long term, minor, beneficial and adverse impacts on these landscape features. New elements would be introduced to the cultural landscape, such as compatibly designed, new restrooms and drinking water facilities near Bridge 4, resulting in long-term, minor, adverse impacts.

Dipsea Trail – The trail would be maintained and improvements would address erosion and natural resource issues resulting in long-term, minor, beneficial and adverse impacts.

Druid Heights – the majority of the Camino del Canyon and Druid Heights area would be managed to preserve and restore the natural setting. All nonhistoric structures would be removed and the main access drive converted to a trail. Due to the emphasis on natural resource management, it is anticipated that impacts to historic resources will be long-term, moderate, and adverse. The national register eligibility of this property must be determined.

Hillwood Camp – Camp Hillwood and its immediate surroundings would be rehabilitated and adaptively reused for day use and/or overnight educational programs. These uses would be compatible with the historic setting and their preservation would result in a long-term, moderate, beneficial, and long-term, minor, adverse impact.

Conclusion

When combined with the effects of the actions common to all alternatives, the impact to historic structures and landscape resources in Muir Woods National Monument under alternative 1 would be long-term, negligible to minor, beneficial, and long-term, minor to moderate, adverse. Under this alternative, the Section 106 determination of effect on historic structures, districts, and cultural landscapes for Muir Woods National Monument, would be *adverse effect*.

Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Muir Woods National Monument; 2) key to the natural or cultural integrity of the monument; or 3) identified as a goal in the monument's general

management plan or other relevant NPS planning documents, there would be no impairment of the monument's historic structures or districts or cultural landscapes.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

Under this alternative, the visitor experience would be more primitive than exists today, as the majority of the built environment would be removed. All visitors would arrive by shuttle, bicycle or on foot. Similar to Alternative 1, an off-site welcome center for visitors would be developed and shuttle service would run year round to take visitors to the national monument. The park entrance would be relocated to the current “annex” parking lot and designed to accommodate the shuttle operations. The existing arrival area, including the upper parking area and some of the lower parking lot, restrooms, and visitor center, would be removed to restore the natural setting.

To more fully restore the primeval character and natural conditions of the old growth redwood forest, several historic buildings within the Muir Woods National Monument Historic District, such as the former Superintendent's Residence and its associated buildings and the Administration-Concession Building, as well as associated site features, would be removed. The Old Inn, which may be a contributing building to the historic district, would be retained for use by park administrative and limited maintenance operations. Where not in conflict with natural resource goals, historic trails and structures could be retained and adaptively reused. The historic trail system throughout the monument would be redesigned to a more pristine setting that emphasized natural resource preservation of the historic redwood groves (including the Redwood Forest, Bohemian Grove, and Cathedral Grove). However, many historic trails and bridges could be removed, relocated, or redesigned to enhance the natural resource conditions. Historic landscape features, such as the stone revetment erosion-control structures in Redwood Creek constructed by the Civilian Conservation Corps, would be removed for natural resource and floodplain system restoration.

In accordance with the proposed mitigation measures, prior to the removal of any national register-contributing or national register-eligible structure, appropriate recordation of the building would be prepared in accordance with Section 110 (b) of the National Historic Preservation Act and the documentation submitted to the Historic American Buildings Survey / Historic American Engineering Record / Historic American Landscapes Survey (HABS/HAER/HALS) program. Taken together, actions under this alternative that include the removal of historic buildings and landscape features that contribute to the District's national register status would result in a long term, major, adverse impact.

Dipsea Trail – Under this alternative, a portion of the trail would be rerouted at the Redwood Creek crossing to reduce current impacts on adjacent natural resources. The balance of the trail would be maintained along its historic alignment. This would result in a long term, minor, adverse impact.

Druid Heights – all structures and landscape features associated with this site would be removed and the area's natural habitat and drainage systems restored. In accordance with mitigation measures stipulated in this document, the site would be documented and

recorded in accordance with appropriate HABS/HAER/HALS standards. This would result in a long term, major, adverse effect.

Hillwood Camp – All structures and landscape features associated with this site would be removed and the area’s native habitat and natural drainage systems restored. In accordance with mitigation measures stipulated in Part 8 of this document, the site would be documented and recorded in accordance with appropriate HABS/HAER/HALS standards. This would result in a long term, major, adverse effect.

Conclusion

When the actions of alternative 2 are combined with the effects of the actions common to all alternatives, the impact to historic structures and landscape resources in Muir Woods National Monument, as well as Druid Heights and Hillwood Camp, would be long-term, major, and adverse. Under this alternative, the Section 106 determination of effect on cultural landscape resources in Muir Woods National Monument would be *adverse effect*.

This alternative would result in impairment with the removal of the historic buildings and landscape features of the Muir Woods National Monument National Register Historic District, Druid Heights, and Hillwood Camp.

Alternative 3: Focusing on National Treasures

(NPS Preferred Alternative for Muir Woods National Monument)

Analysis

Under this alternative, the park would present the monument as a contemplative outdoor museum for visitors to discover and learn about the primeval forest ecosystem (including the preserved redwood forest, and Bohemian and Cathedral Grove) and the monument’s place in the history of the American conservation movement. Accordingly, the majority of historic structures and landscape features associated with those themes would be rehabilitated and adaptively used to support visitor programming and services.

Similar to Alternative 1, an offsite welcome center for the shuttle system, with parking and visitor services, would be an important feature under this alternative. The monument’s existing entrance area would be redesigned to enhance the visitor’s arrival experience, protect resources, and improve safety. A compatibly designed, modest arrival facility would be provided and could include a shuttle stop, passenger drop-off/pick-up area, a sheltered waiting area, park orientation, restrooms, food service, and bookstore. Realignment of portions of Muir Woods Road and restrictions on shoulder parking would also be considered to improve its operational safety and visitor access and. These changes to the arrival sequence and entrance area would result in long-term, minor, adverse impacts.

Under Alternative 3, historically significant buildings in the Muir Woods National Monument Historic District such as the Administration-Concession Building and Superintendent’s Residence and associated buildings, would be rehabilitated and adaptively used to support visitor programming and services. Nonhistoric additions would be removed. These actions would result in long-term, minor, beneficial and adverse impacts. The future use of the Old Inn would be determined through more detailed site planning that would include an evaluation of its historic significance and

integrity, and consider its reuse for visitor services or operational needs, or potential removal.

Historic trails and roads, and other contributing landscape features, would be preserved and maintained; some new trails may be constructed to enhance the visitor experience, but would be designed to be compatible with the historic setting. Relocation or redesign of some historic trails or segments of trails, and the removal of selected portions of the erosion-control stone revetments in Redwood Creek constructed by the Civilian Conservation Corps would result in long-term, minor, adverse impacts because of the loss of historic features.

Dipsea Trail – The Dipsea Trail would be preserved and maintained and would be highlighted by park staff as an interpretive trail for visitors to understand the area's history. This would have a long term, minor, beneficial and adverse impact.

Druid Heights – Under Alternative 3, some historic structures and landscape features associated with the bohemian community at Druid Heights would be preserved. Camino del Canyon would be converted to a trail with access by foot or light service vehicle. These modifications would result in long term, minor, adverse and beneficial impacts, depending upon the extent of historic structure and landscape preservation work performed. The national register eligibility of this property must be determined.

Hillwood Camp – The historic structures and landscape features would be preserved and rehabilitated for educational and interpretive programs, when not in conflict with natural resource conservation goals, and would have a beneficial effect. However, some buildings at Camp Hillwood could be removed, resulting in long-term, adverse impacts of minor intensity. A segment of Conlon Avenue would be downgraded from its current road status and realigned to improve drainage and natural processes for this tributary of Redwood Creek. Overall these changes would result in a long term, minor, beneficial and adverse impacts due to the potential removal of some historic structures.

Conclusion

When combined with the effects of the actions common to all alternatives, the impact to historic structures and landscape resources in Muir Woods National Monument under Alternative 3 would be long-term, minor, beneficial and adverse. Under this alternative, the Section 106 determination of effect on historic structures, districts, and cultural landscapes for Muir Woods National Monument, would be *no adverse effect*.

Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Muir Woods National Monument; 2) key to the natural or cultural integrity of the monument; or 3) identified as a goal in the monument's general management plan or other relevant NPS planning documents, there would be no impairment of the monument's historic structures or districts or cultural landscapes.

CULTURAL RESOURCES – ARCHEOLOGICAL RESOURCES

No-action Alternative

Analysis

Currently, there is little information available concerning prehistoric and historic archeological resources at Muir Woods National Monument. Comprehensive archeological surveys and consultation with American Indian tribes regarding archeological sites with ethnographic significance are needed. However, those known archeological resources, which include eight archeological sites associated with the Muir Woods National Monument Historic District as well as two isolated sites, are protected and preserved. Any additional sites identified through future inventories would also be protected. Without a comprehensive approach to archeological surveys and preservation, however, archeological resources may be subject to potential deterioration, lack of adequate protection in some cases, and possible loss of integrity from natural processes and/or inadvertent visitor activity. Actions under this alternative could have long-term to permanent, minor to moderate, adverse impacts on archeological resources.

Conclusion

Little information is available concerning prehistoric and historic archeological resources at Muir Woods National Monument. A comprehensive archeological survey and consultation with American Indian tribes are needed. Known archeological resources are protected and preserved as they become identified. Until a comprehensive survey is implemented, there is a potential for deterioration and lack of protection as a result of natural process and/or inadvertent visitor activity. Actions under this alternative could have long-term to permanent, minor to moderate, adverse impacts on archeological resources.

Under this alternative, the Section 106 determination of effect on archeological resources would be *adverse effect*.

Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Muir Woods National Monument; 2) key to the natural or cultural integrity of the national monument; or 3) identified as a goal in the monument's general management plan or other relevant NPS planning documents, there would be no impairment of the national monument's archeological resources or values.

Alternative 1: Connecting People with the Parks (NPS Preferred Alternative for Park Sites in Marin, San Francisco, and San Mateo Counties)

Analysis

Under this alternative, identified archeological resources, such as the eight archeological sites associated with the Muir Woods National Monument Historic District and two isolated sites, would be protected from unauthorized removal or other destructive activities. Modification or relocation of trails and existing facilities could affect the integrity of some archeological resources, but every effort would be undertaken to avoid

known or discovered archeological sites. If such sites could not be avoided, mitigation procedures would be undertaken in consultation with the California state historic preservation office.

This alternative would result in more opportunities to identify, evaluate, and provide stabilization, security, or other protection to archeological resources commensurate with their significance and sensitivity because the majority of the monument would be in the Natural zone. In the Diverse Opportunities and Scenic Corridor management zones archeological resources would be stabilized and/or rehabilitated and incorporated into visitor opportunities, thus enhancing their protection through increased awareness and understanding.

Although some archeological resources in the national monument could be lost (resulting in permanent adverse impacts of minor intensity), these actions would generally result in long-term, beneficial impacts on archeological resources.

Conclusion

Identified archeological resources would continue to be protected and preserved under this alternative. Generally, this alternative would result in more opportunities to identify, evaluate, and provide stabilization, security, or other protection to archeological resources because the majority of the monument would be in the Natural zone.

Archeological resources in the Scenic Corridor and Diverse Opportunities zones would be stabilized or rehabilitated and incorporated into visitor opportunities. Although some archeological resources could be lost (resulting in permanent adverse impacts of minor intensity), these actions would generally result in long-term, beneficial impacts on archeological resources.

Under this alternative, the Section 106 determination of effect on archeological resources in Muir Woods National Monument would be *no adverse effect*.

No impairment of archeological resources would result from this alternative.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

Identified archeological resources, such as the eight archeological sites associated with the Muir Woods National Monument Historic District and two isolated sites, would be protected from unauthorized removal or other destructive activities. Removal of much of the built environment, redesign of the monument's trail system, and restoration of natural processes could affect the integrity of some archeological resources, but every effort would be undertaken to avoid known or discovered archeological sites. If such sites could not be avoided, mitigation procedures would be undertaken in consultation with the California state historic preservation office.

Because much of the monument would be in the Sensitive Resources zone under this alternative, archeological resources would be identified, evaluated, and provided stabilization, security, or other protection commensurate with their significance and sensitivity.

Although some archeological resources could be lost (resulting in permanent adverse impacts of minor intensity), these actions would generally result in long-term, beneficial impacts on archeological resources.

Conclusion

Identified archeological resources would continue to be protected and preserved under this alternative. Removal of much of the built environment, redesign of the monument's trail system, and restoration of natural processes could affect the integrity of some archeological resources. Because much of the monument would be in the Sensitive Resources zone under this alternative, archeological resources would be identified, evaluated, and provided stabilization, security, or other protection commensurate with their significance and sensitivity.

Although some archeological resources could be lost (resulting permanent adverse impacts of minor intensity), these actions would generally result in long-term, beneficial impacts on archeological resources.

Under this alternative, the Section 106 determination of effect on archeological resources in Muir Woods National Monument would be *no adverse effect*.

No impairment of archeological resources would result from this alternative.

Alternative 3: Focusing on National Treasures (NPS Preferred Alternative for Muir Woods National Monument)

Analysis

Identified archeological resources, such as the eight archeological sites associated with the Muir Woods National Monument Historic District and the two isolated sites, would be protected from unauthorized removal or other destructive activities. Construction of new trails and relocation/redesign of others and restoration of some natural processes could affect the integrity of some archeological resources, but every effort would be undertaken to avoid known or discovered archeological sites. If such sites could not be avoided, mitigation procedures would be undertaken in consultation with the California state historic preservation office.

In the Interpretive Corridor management zone, which embraces the redwood groves and Redwood Creek area in this alternative, archeological resources might be incorporated into interpretive opportunities for visitors. Archeological resources in much of the rest of the monument (managed under the Sensitive Resources management none) would be identified, evaluated, and provided stabilization, security, or other protection commensurate with their significance and sensitivity.

Although some archeological resources could be lost in the national monument (resulting in permanent adverse impacts of minor intensity), these actions would generally result in long-term, beneficial impacts on archeological resources.

Conclusion

Identified archeological resources would be protected and preserved. In the Interpretive Corridor zone, which embraces the redwood groves and Redwood Creek area, archeological resources might be incorporated into interpretive opportunities for visitors.

Archeological resources in much of the rest of the monument (within the Sensitive Resources zone) would be identified, evaluated, and provided stabilization, security, or other protection commensurate with their significance and sensitivity.

Although some archeological resources could be lost in the national monument (resulting in permanent adverse impacts of minor intensity), these actions would generally result in long-term, beneficial impacts on archeological resources.

Under this alternative, the Section 106 determination of effect on archeological resources in Muir Woods National Monument would be *no adverse effect*.

No impairment of archeological resources would result from this alternative.

CULTURAL RESOURCES – ETHNOGRAPHIC RESOURCES / TRADITIONAL CULTURAL PROPERTIES

No-action Alternative

Analysis

The National Park Service has not identified any ethnographic resources or traditional cultural properties within the national monument. However, an ethnographic survey and assessment needs to be conducted.

Conclusion

There are no identified ethnographic resources or traditional cultural properties in Muir Woods National Monument.

Under this alternative, the Section 106 determination of effect on ethnographic resources or traditional cultural properties would be *no resources or properties affected*.

No impairment of ethnographic resources or traditional cultural properties would result from this alternative.

Alternative 1: Connecting People with the Parks (NPS Preferred Alternative for Park Sites in Marin, San Francisco, and San Mateo Counties)

Analysis

The National Park Service has not identified any ethnographic resources or traditional cultural properties within the national monument. However, an ethnographic survey and assessment needs to be conducted.

Conclusion

There are no identified ethnographic resources or traditional cultural properties in Muir Woods National Monument.

Under this alternative, the Section 106 determination of effect on ethnographic resources or traditional cultural properties would be *no resources or properties affected*.

No impairment of ethnographic resources or traditional cultural properties would result from this alternative.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

The National Park Service has not identified any ethnographic resources or traditional cultural properties within the national monument. However, an ethnographic survey and assessment needs to be conducted.

Conclusion

There are no identified ethnographic resources or traditional cultural properties in Muir Woods National Monument.

Under this alternative, the Section 106 determination of effect on ethnographic resources or traditional cultural properties would be *no resources or properties affected*.

No impairment of ethnographic resources or traditional cultural properties would result from this alternative.

Alternative 3: Focusing on National Treasures

Analysis

The National Park Service has not identified any ethnographic resources or traditional cultural properties within the national monument. However, an ethnographic survey and assessment needs to be conducted.

Conclusion

There are no identified ethnographic resources or traditional cultural properties in Muir Woods National Monument.

Under this alternative, the Section 106 determination of effect on ethnographic resources / traditional cultural properties would be *no resources or properties affected*.

No impairment of ethnographic resources or traditional cultural properties would result from this alternative.

CULTURAL RESOURCES – PARK COLLECTIONS

The alternatives for Muir Woods National Monument’s park collections are covered under the environmental consequences in the “Actions Common to All Actions Alternatives” section and by each alternative for Golden Gate National Recreation Area.

VISITOR USE AND EXPERIENCE

No-action Alternative

Analysis

The primary visitor activities of hiking through the redwood forest and enjoying the sights and sounds of Muir Woods National Monument would continue in this alternative. The existing interpretive programs would also continue. In addition, visitors would still have some opportunities for self-guided exploration, which is a valued characteristic of visiting the monument. During scoping for the plan, there were some mentions of additional recreation opportunities that were desired including more trail access to the Camino del Canyon area and with connections to the surrounding state park lands. In this alternative, the Camino del Canyon area would remain largely inaccessible to most visitors and no additional trail connections would be established with adjacent public lands. Visitors have also expressed interest in more diverse interpretive programs and this alternative would not include additional programming or educational facilities to support programming. The lack of some of these desired improvements would be a long-term, moderate, adverse impact on those visitors seeking these opportunities.

The monument continues to provide some opportunities for solitude, quiet and connection with the primeval forest. These characteristics of the park's visitor opportunities are highly valued by the public. This alternative would continue to promote these values, including encouraging modification of visitor behavior through strategies such as quiet zones and quiet days to minimize impacts on the natural soundscape. However, a large number of visitors have expressed concerns about the amount of noise and crowding that still occurs during peak times, especially when groups are present in the woods.

Visitors would continue to have access to the monument via private automobile as well as the park shuttle during the peak season. The shuttle has improved access options to the monument and eased some of the congestion on surrounding access roads, a long-term, moderate, beneficial impact. However, there is still concern about the amount of informal parking that is occurring at the monument, and the amount of congestion from vehicles, buses, and pedestrians competing for the same space at the monument entrance. These issues result in a long-term, moderate, adverse impact on the visitor experience.

Visitor safety at the monument is considered to be good in the no-action alternative, except for the safety concerns associated with informal parking along the entrance road during peak visitation. The real and perceived safety problems associated with informal parking will continue in this alternative resulting in a long-term, minor, adverse impact.

Conclusion

The no-action alternative would result in long-term, minor to moderate, beneficial impacts from continued opportunities to experience the unique and highly valued characteristics of the primeval forest via hiking trails and educational programs. These activities and experiences are highly valued by visitors. However, minor to moderate adverse impacts on the visitor experience from visitor crowding, noise, and informal parking during peak times would continue.

Alternative 1: Connecting People with the Parks (NPS Preferred Alternative for Park Sites in Marin, San Francisco, and San Mateo Counties)

Analysis

Alternative 1 would provide for self-guided exploration in a natural park setting while making connections to a wider array of opportunities on adjacent public lands. Some additional programming and enhanced facilities would give visitors new means to understand the conservation history and primeval forest ecosystem. Additional trail and overnight opportunities in the Camino del Canyon area would also allow for new visitor opportunities. All of these actions would expand the range of activities for visitors and allow them to better understand the important stories of the monument. These actions would provide visitors with a long-term, minor to moderate, beneficial impact on their use and experience.

The monument would continue to welcome a diversity of visitors and support a range of recreation activities. New recreation activities would largely be focused on new interpretive, educational and stewardship activities that would be staged at the Administration-Concession Building and in the Camino del Canyon area. Also, visitors would be introduced to ways of accessing adjacent landscapes and recreational opportunities of surrounding public lands, creating a more seamless connection to the diversity of day and overnight recreation opportunities in the surrounding area.

Visitors would be provided a variety of programs and opportunities in exploring the natural and conservation themes throughout the monument, appealing to many learning styles and increasing the breadth of stories being told. Interpretation on the shuttle bus would orient visitors and allow them to better plan their visit. Expanded structured educational opportunities by park staff and partners would also add to the learning opportunities available to visitors. This would include new overnight educational opportunities in the Camp Hillwood area. Improved learning opportunities were highly desired by some members of the public. These added interpretive and educational programs would have a long-term, minor to moderate, beneficial effect to the visitor experience.

Alternative 1 would allow visitors improved access to the monument during peak times by providing increased shuttle service and more convenient shuttle stops. The increased shuttle access to the woods would reduce traffic congestion at the park entry, minimizing visitor frustration and conflicts on arrival. However, some visitors may experience adverse effects if they are not able to board the shuttle in a timely manner. Visitors who would prefer to park at the monument to maintain flexibility in their schedule would also be adversely affected by the proposed reduction in parking at the monument. Within the monument, visitor access would be improved and congestion reduced through greater dispersion of visitors, new facilities, and accessible trails. This would include upgrades to trails for purposes of accessibility and resource protection, along with water and restroom facilities at Bridge 4. These actions would result in long-term, moderate, beneficial impacts.

The monument's natural setting and its primary natural resource would be enhanced by reconfiguring parking away from the entrance to the primeval redwood forest and restricting parking along the road to the monument. Pulling vehicle circulation away from

the monument would also improve the natural soundscape. Implementation of a quiet zone would allow visitors to understand the value that is placed on the natural quiet of the forest and encourage visitors to help provide a quiet and contemplative experience for all. These actions would have a long-term, moderate, beneficial impact on the visitor experience at Muir Woods National Monument.

Because of the efforts made to improve the safety of the circulation system and parking at the monument, visitor safety would be improved. The potential for pedestrian and vehicular conflicts would be reduced as well as conflicts between vehicles.

Conclusion

Under alternative 1, impacts to the visitor experience would be long term, minor to moderate, and beneficial. The improvements to the arrival experience to the park, along with enhanced educational and interpretive opportunities, directly address the primary interests and concerns of most visitors to the monument. It is likely that a similar number of visitors could be accommodated in this alternative while still meeting desired conditions given the ability to better disperse and manage visitation on the park shuttle and trails, a long-term minor beneficial impact. \

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

Alternative 2 would restore the primeval character of the old-growth forest and the visitor experience would be more primitive than it is today. The majority of the built environment would be removed and only light-on-the-land trails would reach into the heart of the forest. While the range of activities would be limited, the experience of the primeval forest would be heightened, benefiting visitors who are interested most in the natural ecological processes of the forest and creek.

Visitors would still have opportunities to enjoy the primary recreation activity of the monument, hiking through the forest. The experience along the trail setting would be improved with fewer encounters with others and more emphasis on connection with the surrounding natural environment. Visitors would also have opportunities for educational and stewardship programs focused on exploring the redwood forest ecology and the conservation of Muir Woods National Monument. Participatory programs would encourage a deeper and more meaningful understanding of the forest. Interpretation on the shuttle bus would orient visitors and allow them to better plan their visit. This alternative provides a different visitor experience than the no-action alternative. If managed well, alternative 2 could result in a long-term, moderate, beneficial impact to visitor experience, with visitors enjoying a more hands-on interaction with the primeval redwood forest.

The full-time shuttle access to Muir Woods National Monument will reduce traffic congestion at the park entry, minimizing visitor frustration and conflicts on arrival; a long-term, moderate, beneficial impact. However, there would be long-term, moderate, adverse effects for those that cannot get on the shuttle in a timely manner. Some visitors who would prefer to park at the monument would also be adversely affected by the substantial reduction in parking. Additionally, the restriction on tour bus access would make access for tour groups less convenient.

The park setting would be restored to a more naturalistic setting, with few indications of built structures. All structures would be moved out of the woods, giving visitors more natural viewscales and soundscapes. The removal of all parking except for a small accessible lot would increase the naturalness of the arrival area to Muir Woods National Monument. It also would reduce the noise and pollution caused by personal vehicles and tour buses.

Because of the efforts made to improve the safety of the circulation system and parking at the monument, visitor safety would be improved. The potential for pedestrian and vehicular conflicts would be reduced as well as conflicts between vehicles. The increased rustic nature of the trail system may slightly increase the potential for safety incidences, a potential adverse impact.

Conclusion

Alternative 2 would result in long-term, minor to moderate, beneficial impacts to the visitor experience, primarily due to enhancements to the monument's natural setting and the promotion of a more authentic and connected visitor experience with the primeval forest. However, long-term, minor to moderate, adverse impacts to the visitor experience would also occur, because some visitors would likely find it challenging to visit given the lack of parking and support facilities, and the increased regulation of visitor access. Also, it is likely that alternative 2 would not further encourage use of the monument by diverse groups given more limited visitor opportunities and services. It is likely that a smaller number of visitors could be accommodated in this alternative given more limited facilities and the emphasis on fewer visitor encounters in the woods, a long-term minor adverse impact.

Alternative 3: Focusing on National Treasures (NPS Preferred Alternative for Muir Woods National Monument)

Analysis

Alternative 3 is the NPS preferred alternative and would present Muir Woods National Monument as a contemplative outdoor museum where visitors would explore and understand the primeval forest and the monument's place in American conservation history. Visitors would have greater diversity of recreational opportunities, along with multiple types of educational and stewardship opportunities provided to reach a more diverse audience with various learning styles.

Existing recreation activities would largely continue, along with the addition of thematic trails within the heart of the woods. There would also be new trail opportunities in Camino del Canyon. Other new opportunities would involve increased stewardship and educational programs that allow visitors first-hand experience in the "living museum" of the monument. The use of the Administration-Concession Building in the woods for expanded programs and research would allow for a wider range of recreation and learning opportunities. The park staff would be focused on facilitating improved understanding of park values to a broad audience. New and diverse learning opportunities were highly desired by some members of the public. Investment in new and comprehensive onsite interpretive and educational programs would expand the visitor

opportunities and understanding of the monument's resources and thereby effect long-term, moderate, beneficial impacts on the visitor experience.

The preferred alternative would allow visitors improved access to the monument during peak times by providing increased shuttle service and more convenient shuttle stops. The increased shuttle access to Muir Woods National Monument would reduce traffic congestion at the park entry, minimizing visitor frustration and conflicts on arrival—a long-term, moderate, beneficial impact. However, there would be long-term, moderate, adverse effects for those that cannot get on the shuttle in a timely manner. Some visitors who would prefer to park at the monument would also be adversely affected by the partial reduction in parking.

Within the monument, visitor access would be improved and congestion reduced through greater dispersion of visitors on thematic trails and within the newly opened Camino del Canyon area. However, some areas that would be zoned for sensitive resources would have reduced or more controlled visitor access. Camp Hillwood would be used for walk-in day use programs and thereby restrict access for existing overnight group opportunities.

Viewsheds and soundscapes at the monument would be improved in the preferred alternative. Visitors would experience a more natural setting upon arrival at the monument as a result of the reconfiguration of the parking lots. Dispersal of visitors among thematic trails and within the Camino del Canyon area would improve both the soundscapes and viewsheds, as fewer people would be in any one place at any one time. Soundscape management practices would also improve the soundscape. Overall, these actions would have a long-term, moderate, beneficial impact to the visitor experience.

Because of the efforts made to improve the safety of the circulation system and parking at the monument, visitor safety would be improved. The potential for pedestrian and vehicular conflicts would be reduced, as would the potential for conflicts between vehicles.

Conclusion

Actions proposed in the NPS preferred alternative would result in long-term, minor to moderate, beneficial impacts to the visitor experience. This alternative contributes to the purpose of the monument by providing high-quality recreation and education opportunities that welcome a wide audience to experience and understand the most important resources and stories of Muir Woods National Monument. It is likely that a reasonably large number of visitors could be accommodated in this alternative while still meeting desired conditions, given the ability to better disperse and manage visitation on the park shuttle and trails, a long-term, minor, beneficial impact.

SOCIAL AND ECONOMIC ENVIRONMENT

No-action Alternative

Analysis

As detailed in the “Social and Economic Environment” section of Part 8, park lands such as Muir Woods National Monument are integral in sustaining a high quality of life in a highly urbanized community such as the Bay Area. The no-action alternative for the national monument would continue to provide open space, a wildland experience, and public access, while maintaining a nationally significant natural resource. As other Bay Area private land continues to develop and urbanize into the future, Muir Woods National Monument will become exponentially more valuable to the community and its quality of life. The education and stewardship opportunities for the residents would be maintained, and possibly improved as resources become available, which would continue to enhance the quality of life for local residents by fostering a conservation ethic among them. Under the no-action alternative, the National Park Service would also continue to collaborate with other local land managers to maintain its “watershed approach” to land management. This would maintain a communitywide—and perhaps regionwide—effort for wildland protection, which ultimately would benefit the quality of life for local residents. This collaboration would also continue to improve community awareness and engagement in park and regional issues. Collectively, these effects to quality of life result in an impact that is long term, moderate, and beneficial in the context of the gateway communities in Marin County, and long term, minor, and beneficial for the three adjacent counties.

In terms of effects on the local economy, the no-action alternative for Muir Woods National Monument would maintain the current level of employment for the National Park Service and concessioners and NPS spending for park operations and contracts. The value of these attributes to the local economy is discussed in the Social and Economic Affected Environment section. The no-action alternative would result in a negligible change from current conditions in impact to the local economy in the future. However, as with all other alternatives, the no-action alternative would maintain Muir Woods National Monument’s overall intrinsic contribution to the local economy in the Bay Area. By continuing to provide open space preservation, recreation opportunities, and an aesthetic natural backdrop, the national monument would continue to help make the Bay Area a place for companies and talented professionals to call home. In other words, the Bay Area’s quality of life becomes a draw for business and economic growth with the help from places like Muir Woods National Monument. The no-action alternative will sustain and enhance this economic value to the Bay Area. This results in an impact that is long term, moderate, and beneficial in the context of the local gateway communities in Marin County. The impact would be long term, minor to moderate, and beneficial for the adjacent three counties.

Conclusion

In the context of the local gateway communities and the three adjacent counties, the beneficial impacts to the social and economic environment from the no-action alternative would be long term and minor to moderate. The beneficial impacts could result from maintaining the park’s contribution to the local economy and quality of life, existing

education and stewardship programs, as well as maintaining collaborative efforts with several local governments and land managers to maintain and expand open land protection in the region.

Alternative 1: Connecting People with the Parks (NPS Preferred Alternative for Park Sites in Marin, San Francisco, and San Mateo Counties)

Analysis

Alternative 1 would maintain the quality of life and economic benefits that the national monument provides to the local communities and counties, as described in the analysis of the no-action alternative. By providing open lands adjacent to a large urban center and continuing education and stewardship programs for local residents, the monument would continue to improve the quality of life for those in nearby communities. This alternative would also sustain the monument's intrinsic contribution to the local economy in the Bay Area (once again, as noted in the no-action alternative analysis). By continuing to provide open space preservation, recreation opportunities, and an aesthetic natural backdrop, the national monument would continue to help make the Bay Area a place for companies and talented professionals to call home. These contributions to the local economy and quality of life would result in an impact that is long term, moderate, and beneficial in the context of the local gateway communities in Marin County. The impact would be long term, minor to moderate, and beneficial for the adjacent three counties.

In addition to continuing these attributes of the no-action alternative, the public outreach, welcoming, and orientation focus of alternative 1 would contribute more to the quality of life of many residents in the area. Improved orientation, outreach, and support facilities that would be aimed at reaching the diverse populations of the Bay Area could connect with local residents and promote more awareness of the monument. Also, this alternative includes an improvement in park accessibility via an expanded shuttle bus service that would contribute to an improved quality of life in the community by allowing more local residents to access the park (e.g., those without personal vehicles), and by reducing traffic congestion on local and regional roads. All of these efforts would improve the quality of life of more residents by exposing them to the health, education, and recreation benefits of visiting Muir Woods National Monument and other park sites. This could result in an impact that is long term, minor to moderate, and beneficial in the context of the local gateway communities and three adjacent counties.

In addition, alternative 1 includes a variety of construction projects that would support the local economy by offering new contract work for local and regional firms. Most of these park projects would be associated with the improved visitor welcoming facilities that would complement the NPS effort at welcoming and orienting people at Muir Woods National Monument. These projects would generate new contract work for private firms in the Bay Area, including engineering consultants, construction contractors, and environmental consultants. These projects would not only support these contracting businesses and their employees directly, but the economic multiplier effect would circulate this contract money through the local economy. This phenomenon is explained in the Social and Economic Affected Environment section. The collective result of these

actions would be impacts that are short term, minor, and beneficial for local gateway communities and possibly the three adjacent counties.

The need for some new NPS or concession staffing may also be generated at the new welcome centers to provide new visitor services. The expanded shuttle bus services could also generate additional concession jobs. These new jobs may result in an impact that is long term, minor, and beneficial to the local gateway communities in Marin County. Impacts to the three adjacent counties would be negligible.

Lastly, alternative 1 includes an action that expands the shuttle bus service to the park and connects the shuttle with local and regional transportation systems. With the possibility of fewer park visitors accessing the park via personal vehicles because of this service, the potential exists for a reduction in local business activity in the Marin County communities (because those in personal vehicles can more readily access local sites and business while en route to the park). Therefore, the shuttle bus program could have a negative effect on the local economy. This loss in business would also have secondary negative effects on the local economy due to the reduction of the multiplier effect of the business revenues that would no longer be circulating further through the local economy. This action may result in an impact that is long term, minor, and adverse to the local gateway communities in Marin County. Impacts to the adjacent three counties would likely be negligible.

Conclusion

The overall beneficial impact to the quality of life and local economy from alternative 1 would be short term to long term, and range from minor to moderate for the local gateway communities and the three adjacent counties. The beneficial impacts would primarily result from

- a significant increase in public outreach programs, visitor orientation, and new welcoming facilities at the park,
- improved connections to local and regional transportation systems and less traffic congestion in the community,
- various new engineering and construction contracts for facility improvement projects, and
- job creation from the proposed increase in visitor services in the park and the shuttle service expansion.

The adverse impacts of alternative 1 could be long term and minor in the context of the local gateway communities. The adverse impacts could result from the possible reduction in local business activity from park visitors who opt for public transit and the park shuttle.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

Alternative 2 would maintain many of the quality of life and economic benefits that the national monument provides to the local communities and counties, as described in the analysis of the no-action alternative. By providing open lands adjacent to a large urban

center and continuing education and stewardship programs for local residents, the monument would continue to improve the quality of life for those in nearby communities. This alternative would also sustain the monument's intrinsic contribution to the local economy in the Bay Area (once again, as noted in the no-action alternative analysis). By continuing to provide open space preservation, recreation opportunities, and an aesthetic natural backdrop, the national monument would continue to help make the Bay Area a place for companies and talented professionals to call home. These contributions to the local economy and quality of life would result in an impact that is long term, moderate, and beneficial in the context of the local gateway communities in Marin County. The impact would be long term, minor to moderate, and beneficial for the adjacent three counties.

Because alternative 2 places a priority on ecological restoration, recreational opportunities in the park may be somewhat reduced for local residents. This may slightly reduce the amount of exercising, learning, and/or recreating in the local communities. However, given the availability of other park sites in the immediate proximity of Marin County, this adverse impact to quality of life would likely be negligible and very localized.

Alternative 2 includes a significant change in park accessibility. The proposed shuttle bus program will contribute to an improved quality of life by allowing more local residents to access the park (e.g., those without personal vehicles), and by reducing traffic congestion on local and regional roads in Marin County. This transportation change may result in an impact that is long term, minor, and beneficial for the local gateway communities in Marin County. The impact to the overall three adjacent counties would likely be negligible.

The focus on restoration of habitat connections may increase opportunities and reasons for local government land managers to preserve land in vicinity of the national monument (to establish public land connections and reduce further habitat fragmentation). If the adjacent local land managers pursue additional open space around Muir Woods in Marin County, the local residents of the area may have additional park sites to visit in the future. This would enhance the quality of life for residents of the area. The impact would be long term, minor, and beneficial for the local gateway communities. Impact to the adjacent three counties would be negligible.

As for impacts to the local economy, because alternative 2 focuses on preserving ecological resources, several actions in this alternative aim at restoring and reclaiming natural features in and around Muir Woods National Monument. These reclamation efforts would necessitate various types of construction and restoration projects that would support the local economy by offering new contract work for local and regional firms (including engineering consultants, construction contractors, and environmental consultants). These projects would not only support these contracting businesses and their employees directly, but the economic multiplier effect would circulate this contract money through the local economy. This phenomenon is explained in Part 3, in the Social and Economic Affected Environment section. The collective result of these actions would be impacts that are short term, minor, and beneficial for local gateway communities and possibly the three adjacent counties.

Some new NPS or concession staffing may be generated by the significant expansion to the shuttle service to the park. These new jobs may result in an impact that is long term, minor, and beneficial to the local gateway communities in Marin County.

Lastly, alternative 2 would require that all national monument visitors access the park via their own power (e.g., bike, walk) or via an expanded shuttle bus service that connects with local and regional transportation systems. Thus, this action would reduce the number of people traveling through Marin County via their personal vehicles. In terms of local economic impact, this transportation mode shift would result in less business activity for local business in Marin County because bus passengers cannot easily access local sites and businesses while en route to the park (unlike those in personal vehicles). This loss in business would also have secondary negative effects on the local economy due to the reduction of the multiplier effect of the business revenues that would no longer be circulating further through the local economy. This action may result in an impact that is long term, minor to moderate, and adverse to the local gateway communities in Marin County. Impacts to the adjacent three counties would likely be negligible, or possibly long term, minor, and adverse.

Conclusion

The beneficial impacts to the quality of life and local economy from alternative 2 would be short term to long term and minor for the local gateway communities and the three adjacent counties. The beneficial impacts could result from

- increased cooperation with other local governments and land managers to pursue the preservation of additional publicly accessible lands in the area,
- contract work created by various reclamation projects,
- possible new jobs created by the significant expansion in the shuttle service that serves the park, and
- the expanded shuttle service that would allow more local residents to access the park and reduce traffic congestion.

The adverse impacts from alternative 2 could be long term, ranging from minor to moderate for the local gateway communities, the three adjacent counties, as well as the Bay Area. The adverse impacts could result from the possible reduction in local business activity from park visitors who would need to take public transit to the park.

Alternative 3: Focusing on National Treasures (NPS Preferred Alternative for Muir Woods National Monument)

Analysis

Alternative 3 would maintain the quality of life and economic benefits that the national monument provides to the local communities and counties, as described in the analysis of the no-action alternative. By providing open lands adjacent to a large urban center and continuing education and stewardship programs for local residents, the monument would continue to improve the quality of life for those in nearby communities. This alternative would also sustain the monument's intrinsic contribution to the local economy in the Bay Area (once again, as noted in the no-action alternative analysis). By continuing to provide

open space preservation, recreation opportunities, and an aesthetic natural backdrop, the national monument would continue to help make the Bay Area a place for companies and talented professionals to call home. These contributions to the local economy and quality of life would result in an impact that is long term, moderate, and beneficial in the context of the local gateway communities in Marin County. The impact would be long term, minor to moderate, and beneficial for the adjacent three counties.

Alternative 3 for Muir Wood National Monument includes actions that provide some new visitor information and orientation, as well as interpretation programs that would be aimed at attracting the diverse populations of the Bay Area to the park. The attempts to connect with local residents would be complemented with improved visitor welcoming center facilities at Muir Woods National Monument access points. In addition, alternative 3 includes an improvement in park accessibility via an expanded schedule of shuttle bus connections with local and regional transportation systems. The shuttle bus program could contribute to an improved quality of life by allowing more local residents to access the park (e.g., those without personal vehicles), and by reducing traffic congestion on roads in Marin County. Collectively, these efforts could improve the quality of life of more Bay Area residents by exposing them to the health, education, and recreation benefits of visiting Muir Woods National Monument and other park sites. This could result in an impact that is long term, minor to moderate, and beneficial in the context of the local gateway communities and three adjacent counties.

Alternative 3 places a strong emphasis on the national significance of Muir Woods National Monument (natural and historical) and educating the public on this significance. As the residents of Marin County and the Bay Area as a whole become more aware of the uniqueness and importance of Muir Woods National Monument, they may develop a stronger sense of pride or identity in the community in which they live. These personal appreciation values and sense of community belonging can contribute to one's quality of life. This identification with the unique resources of the community may yield an impact that is long term, minor, and beneficial in the context of the local gateway communities and three adjacent counties.

The new welcome centers proposed as part of alternative 3 could generate a need for new NPS or concession staffing to provide new or expanded visitor services at the national monument. New concession jobs could also be created by the expanded shuttle bus services. This potential increase in jobs may result in an impact that is long term, minor, and beneficial in the context of the local gateway communities. Impacts to the three adjacent counties would be negligible.

Lastly, alternative 3 would expand the shuttle bus service to the park. Because this shuttle connects with local and regional transportation systems, many park visitors may choose to leave their car at home and access the park via public transportation. If this happens, local businesses in Marin County communities would experience a reduction in customers and business activity because bus passengers cannot easily access local sites and businesses while en route to the park (unlike those in personal vehicles). Therefore, the shuttle bus program could have a negative effect on the local economy. This loss in business would also have secondary negative effects on the local economy due to the reduction of the multiplier effect of the business revenues that would no longer be circulating further through the local economy. As a result, the impacts to the local

gateway communities in Marin County could be long term, minor, and adverse. Impacts to the adjacent three counties would likely be negligible.

Conclusion

The beneficial impacts of alternative 3 on the quality of life and local economy could be long term, ranging from minor to moderate for local gateway communities and the three adjacent counties. Overall, the beneficial impacts of alternative 3 could result from

- a moderate increase in public outreach, visitor orientation, and new welcoming facilities at the park,
- improved connections to local and regional transportation systems and less traffic congestion in the community,
- a modest number of possible jobs created by expanded visitor welcoming services and expanded shuttle service, and
- the community's improved awareness, pride, and appreciation of the national significance of Muir Woods National Monument.

The adverse impacts of alternative 3 could be long term and minor for the gateway communities. The adverse impacts to the social and economic environment could result from a reduction in local business activity due to a park visitors shifting from using personal vehicles to using public transportation

TRANSPORTATION

The analysis of transportation impacts in this section is based in part on several earlier studies, including

- four years of studies of the Muir Woods Shuttle pilot program conducted for the County of Marin (Nelson\Nygaard, 2005–2008);
- the “Muir Woods Shuttle Alternatives,” a memo to park managers (Nelson\Nygaard 2008);
- the Comprehensive Transportation Management Plan (NPS and Marin County 2002);
- and the Transportation Planning to Address Access and Congestion Issues – Muir Woods National Monument.

See these documents for more details on the Muir Wood Shuttle operations, performance and cost, analysis of parking changes at Muir Woods National Monument, and traffic congestion analysis for the Muir Woods National Monument area.

No-Action Alternative

Analysis

Currently, about 760,000 visitors per year travel to Muir Woods National Monument. Visitation peaks during the summer months, particularly on weekends. Managing these

crowds and balancing the impact of the large number of visitors with the preservation of the park resources has been an ever-increasing challenge for park managers.

Muir Woods is reached by narrow two-lane county and state roads that wind through canyons and over Mount Tamalpais. There is little opportunity for passing, thus the roads are heavily congested on busy summer weekends, particularly on State Route 1 between Highway 101 and Panoramic Highway. Marin County is committed to keeping roads in West Marin at two lanes to preserve the rural character of the area, so reducing congestion through increased capacity is not a realistic option.

Most visitors arrive at Muir Woods National Monument by automobile. The monument provides 179 parking spaces in three parking lots, supplemented by approximately 175 legal spaces along Muir Woods Road. Estimated demand for parking spaces on peak season weekends in 2002 was 450 spaces (NPS and Marin County 2002), a figure that exceeds the formal and informal parking capacity. Parking on the roadway often has extended to areas where parking is prohibited, and there is minimal enforcement. Marin County has recently restricted some of the shoulder area with fences and signs, slightly reducing the number of available spaces. On busy weekends, cars can be found parked along the road up to a mile from the monument. This can create safety issues because people walk in the road to get to the monument, and the parked cars make the navigable roadway narrower while also obscuring the view of pedestrians and oncoming traffic.

A shuttle system connecting offsite parking lots with Muir Woods National Monument was introduced in the summer of 2005. This was originally a three-year pilot program; now the National Park Service has entered into a three-year partnership with the County of Marin to jointly fund the service from 2009 through 2011 with the objective of continuing the service into the future indefinitely. The shuttle runs on weekends and holidays from May through September, and has gradually increased hours of service each year. Passengers board the shuttle in Sausalito, in Marin City, or from two Park-and-Ride lots in Mill Valley. These satellite parking lots are more than adequate to accommodate cars of shuttle riders on the weekends. More than half of shuttle riders choose to take the shuttle because of changeable message signs on Highway 101 informing them that the lot at Muir Woods is full, and directing them to a shuttle stop.

Data gathered during the 2008 season shows that 14% of visitors to Muir Woods National Monument took the shuttle on days when the shuttle was available (Nelson/Nygaard 2009).

Ridership has grown substantially each year of service, increasing farebox revenue and sometimes requiring additional vehicles for the mid-day rush peak use period, and at the end of the day. Even with this large number of riders, roads continue to be heavily congested with visitors arriving by auto, such that the shuttle is thrown off schedule during peak periods as it waits in traffic.

In addition to the Muir Woods Shuttle, park staff estimates that 20% of visitors arrive by tour bus (personal communication with Mia Monroe, Site Supervisor - Interpretation, Marin Headlands and Muir Woods).

Conclusion

With no further action taken, visitor connections to Muir Woods National Monument and the functionality of the transportation system to the monument could experience a long-

term, minor to moderate, adverse impact. Access roads and intersections on State Route 1 between Highway 101 and Muir Woods National Monument would continue to be congested, slowing shuttle service, and making it difficult at peak times for emergency vehicles to travel in the area. The existing parking lots at the monument are likely to continue to fill early in the day from May to September, particularly on the weekends, and the unsafe roadside parking situation could also continue. On a positive note, shuttle service can be expected to see continued increases in ridership, helping reduce road congestion.

All of the Action Alternatives

Analysis

Recognizing the difficulty of accommodating the large number of visitor vehicles, all alternatives move toward reducing the number of cars coming to the monument, and increasing the proportion of visitors coming by transit. This latter objective is accomplished by both increasing transit service and by intercepting travelers earlier in their trip so that more, if not all, of the trip is on transit rather than by car. The following transportation-related measures are incorporated in alternatives 1 through 3 for Muir Woods National Monument. Although described independently, they should be considered parts of a whole strategy, to be implemented in conjunction with each other.

A new offsite welcome center would be created in the vicinity of State Route 1 and Highway 101 where visitors would board the shuttle. The center would provide parking, shelter, restrooms, park information, and snacks, and would be a transfer point between regional and local transit and national park destinations. The creation of the welcome center would have a long-term, major, beneficial impact on transit facility capacity, amenities, conditions, and on unsafe road shoulder parking on Muir Woods Road near the monument.

Express transit service from downtown San Francisco and improved connections with the regional ferry services would be pursued. This action is likely to result in a long-term, moderate, beneficial impact to connectivity to Muir Woods, including number and capacity of connections, and available modes of travel.

In alternatives 1 and 3, shuttle service would be provided during shoulder periods (May and September) and peak periods (Memorial Day through Labor Day weekends), as well as on holiday weekends throughout the year. This would have a long-term, moderate, beneficial effect by making transit service available on holidays during the nonpeak period. In alternative 2, service would run 365 days a year, which is likely to have a long-term, major, beneficial impact on transit availability and an increase in modes of travel to Muir Woods National Monument.

Parking at the monument would be reduced in alternatives 1 and 3 and eliminated (except for space needed for those with special accessibility needs) in alternative 2. Impacts of this are multidimensional and are discussed below.

In all action alternatives, a main feature would be a reduction in or elimination of parking capacity at the monument (including unsafe road shoulder parking), offset by parking at one or more satellite lots (possibly including Kent Canyon), and increased shuttle service. Parking at the offsite welcome center would accommodate autos, while other lots in the

vicinity may also be available to accommodate visitors' cars. Some of the satellite parking lots are also used by commuters during the week, so these may not be available for shuttle passengers during that time unless other changes increase capacity. By shifting the majority of visitors to the shuttle and the San Francisco Express service, automobile congestion on local roads would be expected to be reduced.

Taking the place of driving to the Muir Woods National Monument would be increased shuttle and transit service. The transit service would be the logical primary mode of access for monument visitors, because potential for increased access by bicycle, on foot, or by tour bus is limited. Continued reasonably convenient access is essential to maintain (and if possible, enhance) a high-quality visitor experience.

The overall impacts of these measures would likely be long term, moderate to major, beneficial on the functionality and safety of the transportation system, with a moderate to major increase in transit access from San Francisco, the Sausalito Ferry, and other points in southern Marin County. There would be an increase in access by land- and water-based regional transit, increased number and capacity of connections, and an increase in the available modes of travel. These measures could result in a long-term, major, beneficial impact on connections, transit service availability, and transportation facility capacity and amenities.

There would be a major, adverse impact on parking availability at the monument, offset to a large degree by parking availability at offsite lots and increased transit. Visitors are still likely to arrive by car from points west of the monument, which means that they would have no opportunity to park and take transit. These visitors would be most affected by the lack of parking, and their ability to visit the monument would be adversely affected.

Conclusion

There would be a major, adverse impact on parking availability at the monument, offset to a large degree by parking availability at offsite lots and increased shuttle and transit service. Visitors are still likely to arrive by car from points west of the monument, which means that they would have no opportunity to park and take transit. These visitors would be most affected by the lack of parking, and their ability to visit the monument would be adversely affected.

Establishing a visitor's welcome center with an offsite parking area and increasing transit from both the Sausalito Ferry and San Francisco to Muir Woods National Monument would have a long-term, moderate to major, beneficial impact on the transit system serving the monument. Reducing parking at the monument is also likely to have a long-term, moderate to major, adverse impact on parking availability for visitors.

Alternative 1: Connecting People with the Parks (NPS Preferred Alternative for Park Sites in Marin, San Francisco, and San Mateo Counties)

Analysis

In addition to the actions common to all alternatives, alternative 1 includes the following transportation-related actions for Muir Woods National Monument. It should be noted that the transportation measures in alternative 3 are identical to those in alternative 1.

In addition to the offsite welcome center previously described, the monument's existing entry area would be redesigned. Pedestrian access would be improved by separating pedestrians from roads and parking. A modest facility would be provided to receive visitors arriving by different modes of transportation including the shuttle. The entry area might include such services as restrooms, orientation and information, food service, and sheltered areas for passengers waiting for buses. This measure may have a long-term, moderate, beneficial impact on transit facility capacity, amenities, and conditions, encouraging and supporting use of the shuttle.

In order to improve pedestrian safety and protect Redwood Creek, the monument would collaborate with Marin County to restrict shoulder parking along Muir Woods Road in non-trailhead areas when sufficient transit is available to meet visitation demand.

Parking in the monument lots and on the road shoulders would be reconfigured or relocated using sustainable design practices to reduce impacts to the creek and other sensitive resources. Parking would be decreased by an estimated 33% (primarily from a reduction in road shoulder parking); capacity would meet demand during the off season. This is likely to have a long-term, minor, adverse impact on parking availability during those times when the shuttle is not running, and a long-term, minor, beneficial impact on pedestrian access.

Data from the *Comprehensive Transportation Management Plan* for park lands in Southwestern Marin indicates that off seasons and shoulder season typical weekday parking demand at the monument ranges between 115 and 155 spaces. By 2023 this is projected to increase to 135 to 190 spaces. A 33% reduction in parking supply, or removing 117 spaces, would leave 265 spaces; this would be more than adequate to meet parking demand during those times when the shuttle would not be operating (weekdays during the shoulder and off season months). This assumes that the current supply includes 179 spaces in the lots, and an estimated 175 spaces on the shoulders of the road, totaling 354 spaces.

The following table shows estimated parking demand for 2002 and 2023 using data from the *Comprehensive Transportation Management Plan*.

With removal of some parking and an increase in shuttle service, parking demand would be shifted to offsite lots in the vicinity of State Route 1 and Highway 101. The welcome center, in all alternatives, would provide parking, shelter, restrooms, park information, snacks, etc. for shuttle riders. In addition, the Manzanita and Pohono Street Park-and-Ride lots, currently used as shuttle parking, are the potential future location of the welcome center, and could accommodate cars of shuttle riders. These lots, normally used by weekday commuters, would not be able to accommodate large numbers of monument visitors during the work week without some reconfiguration. Turnover in these lots

would be slower than turnover in the current monument lots, because the parking duration would include both the time visiting the monument and the travel time to and from the monument. Detailed analysis of this and other potential locations would be the subject of a separate planning effort.

Table 25: Parking Demand at Muir Woods National Monument, 2002 & 2023

Existing Parking Demand (2002)

Peak Season (Memorial Day through Labor Day weekends)		Shoulder Season (May and September)		Off Season (October 1 to May 1)	
Weekday	Weekend	Weekday	Weekend	Weekday	Weekend
380	450	155*	300	115*	250

Projected Parking Demand (2023)

Peak Season (Memorial Day through Labor Day weekends)		Shoulder Season (May and September)		Off Season (October 1 to May 1)	
Weekday	Weekend	Weekday	Weekend	Weekday	Weekend
485	575	190*	360	135*	285

* Periods when shuttle would not run

Depending on the level of available funding, shuttle service would be increased from its current weekends-only schedule to 7 days a week during the peak period, and on weekends and holidays during the rest of the year. Service could run on approximately 15-minute headways during the peak and shoulder seasons and on holidays, with 30-minute headways during other times (nonpeak weekends). This is in addition to the downtown San Francisco Express Service proposed in all alternatives.

Operating costs for the increase in shuttle service required to carry a greater number of visitors to the monument are difficult to predict because of the variable costs of administration and marketing, as well as the effect the reduction in parking would have on the demand for transit. An analysis of the cost of shuttles was performed in the “Muir Woods Shuttle Alternatives” memo (Nelson\Nygaard 2008). In that analysis, based on the hourly cost of shuttle service, requirements for layovers and other factors, two cost estimates were developed for a 75% parking scenario (a 25% reduction); they are presented below.

Scenarios involving a 25% removal of parking result in substantial shuttle operational costs, if the intent is to fully compensate for removed parking. Note that these estimates do not include the cost of the vehicles or bus stop amenities necessary to support increased service, which would also be substantial.

Conclusion

The transportation measures included in this alternative are likely to have a long-term, major, beneficial impact on connections between both ferry and regional bus transit and

Muir Woods National Monument and the Muir Woods Shuttle. The shuttle would become the primary mode of access to the monument during peak demand periods. A much larger proportion of visitors could be expected to park remotely and take the shuttle or express service from San Francisco.

Table 26: Estimated Annual Cost of Shuttle, 75% Parking at Muir Woods National Monument

Scenario	Peak offsite parking demand	Peak buses per hour	Fleet require- ment	Annual Cost*	
				\$75/hr.	\$180/hr.
Alternatives 1 and 3 Scenario A: 75% onsite parking	170	9	9	\$500,000	\$1,200,000
Alternatives 1 and 3 Scenario B: 75% onsite parking, S.F. shuttles	130	8	10	\$600,000	\$1,400,000

* Based on low and high hourly rates for transit service providers.

The reduction in the number of cars on the roads approaching Muir Woods National Monument would have a long-term, moderate, beneficial impact on the functionality of the transportation system by reducing congestion. The reduction in visitor-related congestion would allow the shuttles to stay on schedule, and would allow emergency vehicles improved access to the area. This alternative could have a long-term, minor to moderate, beneficial impact on pedestrian and bicycle access by making the access roads safer for these visitors due to reduced traffic and congestion and reduction of road shoulder parking, and by redesigning the walkways from the entry area to the monument so they are separated from auto traffic. Even with a 33% reduction in parking, and a projected increase in demand, there would still be adequate parking during the off season (October through April) when the shuttle is not running. During the peak season, the reduction in parking would be offset by an increase in transit service. The reduction in parking could have a long-term, moderate, adverse impact on parking availability on those days when the shuttle is not running.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

In alternative 2, the majority of the built environment—buildings, parking lots, and paved trails—would be removed, and all visitors would arrive by shuttle, bicycle, or on foot. Only a small parking area would be available for special needs. The monument entrance as well as all visitor services would be relocated to the current lower parking lot and the area would be designed to accommodate a transit stop for the shuttle. Tour buses would no longer be accommodated.

In addition to changes in modes of access to the monument, the trail system would be redesigned to accommodate fewer visitors. The existing main trail would be relocated out of the flood plain, paved surfaces would be removed, and other trails and bridges could be removed or relocated to promote natural processes. These measures could have a long-term, moderate, adverse impact on visitor's ability to access areas of the mature redwood forest now available to them.

Trails in the monument would be designed to connect to other regional trails; the Dipsea Trail would be realigned where it crosses Redwood Creek. This is likely to have a long-term, minor, beneficial impact for those visitors connecting to the monument by trail.

Most auto access would be eliminated, with all parking, both in parking lots and on the road side, removed. Only essential parking for park operations and to meet the needs of visitors with disabilities would be retained. The upper lot and most of the lower lot in the monument would be restored to their natural condition. This action would have a long-term, major, adverse impact on parking availability at the monument. However, the lack of parking would be offset by greatly increased transit service and offsite parking, described below.

As discussed, a welcome center would be created in the vicinity of Highway 101 and State Route 1, which would include parking for visitors and connections to transit, including the Muir Woods Shuttle. Some additional parking may also be provided in other lots in the area that are currently used for weekend shuttle service. Park-and-Ride lots, normally used by commuters, would not be able to accommodate monument visitors during the work week without some reconfiguration. Recent parking counts on weekdays show the Manzanita Park-and-Ride lot is filled to slightly over 100% capacity from 8:00 AM to 3:30 PM, and the Pohono parking lot is at 90% of its maximum use by noon. Turnover in these lots would be slower than those currently in the monument, because the parking duration would include both the time visiting the monument and the travel time to and from the monument. Detailed analysis of lot configuration would take place in future planning efforts.

A lack of access to the monument entrance by auto may affect visitation. There remains the potential for a large number of would-be visitors to not make the trip to Muir Woods National Monument if they could not drive their cars. This group includes people who are continuing on to other destinations after their visit at the monument—for example, Stinson Beach or Mount Tamalpais State Park. Another segment of visitors are travelling in large groups, have small children, or have members in their party with special needs requiring them to use a car. Thus it could be assumed that elimination of all parking at the monument (except for special needs) might depress visitation, although an exact percentage cannot be modeled.

In addition, there will inevitably be those who drive to Muir Woods National Monument regardless of whether there is any official parking provided. Muir Woods Road is public and connects to small coastal communities, so access to the monument by road cannot be prohibited or even limited. Some visitors will arrive from points west and north, and will not have an opportunity to board transit to get to the monument. Enforcement of parking regulations at the monument would have to increase significantly for the elimination of roadside parking to be effective. This cost would likely be borne by the National Park Service rather than Marin County, because county law enforcement staff is extremely limited in West Marin.

Transit service to the monument would be dramatically increased. The Muir Woods Shuttle would run every day of the year, and would include express service from and to downtown San Francisco. Shuttle service originating in Marin County could run every 10 minutes during the peak and shoulder seasons and on holidays; on other days, it would run every 30 minutes. Providing increased service from Sausalito and express service from San Francisco could be expected to reduce parking demand by 25% or more. A significant increase in transit service, including San Francisco Express and Muir Woods Shuttle service to the Sausalito Ferry, would have a long-term, major, beneficial impact on the functionality of the transportation system to Muir Woods National Monument by increasing the number and capacity of connections, increasing the availability and choices of modes of travel, and reducing congestion.

Operating costs for the increase in shuttle service required to carry all visitors to the monument are difficult to predict because of the unpredictable effect on visitation, and also the variable costs of administration and marketing. An analysis of the cost of shuttles was performed in the “Muir Woods Shuttle Alternatives” memo (Nelson\Nygaard 2008). In that analysis, based on the hourly cost of shuttle service, requirements for layovers and other factors, three cost estimates were developed for the zero-parking scenario, and are presented below. Scenarios involving complete removal of parking appear to be prohibitively expensive—as much as \$9.5 million per year for a package including San Francisco service. If tour bus access were removed, costs would increase further, to as much as \$11.5 million per year. Note that these estimates do not include the cost of the vehicles or bus stop amenities.

Table 27: Estimated Annual Cost of Shuttle Operations, No Parking at Muir Woods National Monument

Scenario	Peak offsite parking demand	Peak buses per hour	Fleet Require- ment	Annual Cost	
				\$75/hour	\$180/hour
Alternative 2 Scenario A: 0% onsite parking	690	23	23	\$3,000,000	\$7,300,000
Alternative 2 Scenario B: 0% onsite parking, S.F. shuttles	520	22	28	\$4,000,000	\$9,500,000
Alternative 2 Scenario C: 0% onsite parking, S.F. shuttles no tour buses,	550	25	34	\$4,800,000	\$11,500,000

Managers at the monument estimate that 20% of visitors arrive by tour bus. In this alternative, private tour buses would not be allowed in the monument. The elimination of tour bus service would significantly reduce access to this site for certain populations. People who use this mode are generally from out of the area, are travelling in groups, and want to visit multiple destinations on one trip—a significant factor for those choosing not to take the shuttle, according to surveys of monument visitors. Tour buses address the needs of this group and also allow them to visit the monument without an auto. Without tour bus service, this group may not visit the monument at all. This measure could have a long-term, moderate, adverse impact on access to the monument.

Conclusion

Alternative 2 proposes actions that would significantly alter the transportation system serving Muir Woods National Monument. Redesign of pedestrian access to the monument entrance is likely to have a long-term, moderate, beneficial impact on visitor access and safety.

In conjunction with the parking provided at the offsite welcome center and other remote parking lots, and the greatly increased transit service to the monument, this alternative would have a long-term, major, beneficial, impact on availability of transit, improved traffic flow, and number and capacity of transit connections.

Removing parking from Muir Woods National Monument is likely to result in a reduction in the number of cars on the roads in southwest Marin, allowing transit to better run on schedule and emergency vehicles to have access, and offering less auto congestion to residents. However, while expanded transportation options may increase visitation, from the point of view of the visitor who arrives at the monument by car and is unable to park, the impact would be long term, moderate, and adverse, limiting the ability of some visitors to visit the monument.

The increase in transit services from San Francisco and the Sausalito Ferry, if fully funded through points in south Marin, is likely to have long-term, major, beneficial effects on the transportation system to the monument as well as throughout southwest Marin County, by increasing multimodal opportunities to get to the monument and increasing connectivity to regional transportation.

Auto access may experience a long-term, minor to moderate, beneficial impact because there may be much less auto traffic on Muir Woods Road, while bus traffic on State Route 1 would increase significantly.

Alternative 3: Focusing on National Treasures (NPS Preferred Alternative for Muir Woods National Monument)

Transportation impacts for alternative 3 for Muir Woods National Monument are identical to those in alternative 1.

PARK MANAGEMENT, OPERATIONS, AND FACILITIES

No-action Alternative

Analysis

Under the no-action alternative, current management, programs, operations, and funded construction projects would continue, along with the necessary annual operating funding.

Muir Woods maintains high standards of visitor service thanks to a committed team of NPS staff, partnerships with the Golden Gate National Parks Conservancy and concessions, and a team approach that also includes close working relationships with the state parks and neighboring communities. However, there is much operationally that is marginal due to the small staff size; this results in little time for long-term planning, major project implementation, and training.

Staffing levels would continue at current levels, which are inadequate to meet the responsibilities of the monument. With only 3.5 interpreters and no seasonal interpreters, there are often periods of time when no ranger is onsite, and the NPS presence is loosely covered by interns or volunteers. The interpreters handle educational programs and volunteer management, but there is no one to handle media, training, or partner programming. The law enforcement division operates with one staff member assigned to the area; which includes the monument as well as Muir Beach, Stinson Beach, Olema Valley, Slide Ranch, and Tennessee Valley. One seasonal law enforcement officer is assigned to the monument in the summer as well. This level of staffing is not enough to provide adequate coverage, and results in delays in response time—often interpreters onsite end up spending time responding to emergency incidents. Traffic congestion and conflict is one area of needed additional law enforcement staff. A ranger is needed to provide visitor use assistance for the shuttle and parking. The maintenance division is also understaffed to adequately maintain the monument in good condition. As a result, deferred maintenance has accrued at park facilities. Low staffing levels contribute to continued moderate, long-term, adverse impacts to park operations.

Primary monument partners are the Golden Gate National Parks Conservancy and the Muir Woods Trading Company, the concessions operation. These partners provide a host of valuable services and products to the monument, such as contact with the visitors, research, restoration, and messaging. They also provide needed funding from fee collection and concession sales. Other partners offer educational programs. The Save-the-Redwoods League is a major funder to enable young people to visit the park and support research. Marin County is a partner in providing shuttle service to the monument. The partners offer something invaluable that would not otherwise be provided and their continued involvement and support is a moderate, long-term, beneficial impact to park operations.

Volunteers are indispensable to the monument. They provide personal interpretive services, conduct special tours, support educational programs, complete much of the restoration work, and offer a special approach that the public responds to very favorably. Thousands of hours per year are logged by volunteers. Volunteer efforts are a continued long-term, moderate, beneficial impact to park operations.

Currently, the condition of many of the buildings is good, but not accessible for persons with disabilities. However, the monument has significant amounts of deferred maintenance. Even given the direction of the park asset management plan for prioritizing funds, a continued gap in maintenance funding (and staff) would result in an increasing deferred maintenance backlog. Some facilities are better maintained than others are; the Administration-Concession Building is in good condition. Maintenance facilities, such as the Old Inn, are generally in much poorer condition. Facilities in the Camino del Canyon and Conlon Avenue areas are also in poor condition. Infrastructure such as power, water, and phones need to be upgraded and frequently have lapses in service. Inadequate project funds and operational funds would result in moderate, long-term, adverse impacts to mission critical facilities at the monument.

Monument buildings are inadequate for their current uses due to small size and their lack of modern functionality. For example, in the office areas, all desks are shared, and half the computers are not hooked up to the internet. There are no break rooms or meeting rooms. The maintenance division does not have adequate storage space for equipment, or appropriate work space. Inadequate operational facilities would have a continued long-term, minor to moderate, adverse impact on park operations.

Conclusion

The continuation of current management would have both beneficial and adverse impacts on park operations. Continued long-term, moderate, beneficial impacts to operations would result from partner and volunteer efforts.

The continued impact of low staffing levels on park operations is moderate, long term, and adverse. Inadequate project and operational funding would result in major, long-term, adverse impacts to park facilities. Inappropriate space for staff would also result in continued long-term, minor to moderate, adverse impacts to monument operations.

Alternative 1: Connecting People with the Parks (NPS Preferred Alternative for Park Sites in Marin, San Francisco, and San Mateo Counties)

Analysis

There are several proposed changes identified in alternative 1 that would influence park management, operations, and facilities. While designed to contribute to the protection of resources and the enhancement of visitor opportunities, the proposed changes will achieve these ends only if staffing, capital funds, and operating funds are increased in accordance with the cost estimates identified. If funding and needed staffing levels are not made available when these actions are implemented, the proposed actions would have long-term, moderate, adverse effects on park operations.

Additional law enforcement officers are proposed to cover increased picnicking, expanded visitor activities, and the potential for a greater number of lost or injured people. Additional rangers would also assist in parking management at the shuttle station. New maintenance staff would support trail maintenance, upkeep of interpretive signs, increased picnicking, and relocated and new visitor facilities. Increased staff would result in long-term, moderate, beneficial impacts to operations if appropriate funding is available, otherwise the actions of this alternative would result in adverse impacts such as

an inability to maintain facilities and an inability to ensure public safety and protection of resources.

The proposed new or reconstructed facilities, such as the Highway 101 / State Route 1 welcome center and parking area, would require additional capital investments. Unless the cyclic maintenance budget is collaborated to maintain the park's facilities as identified in this alternative, the deferred maintenance will increase, even with an initial investment in that asset. Adjusting the operations and maintenance budget to realistically reflect the true costs of a facility will have a long-term, moderate, beneficial impact on park operations; otherwise, the impact would be adverse and result in an increase of deferred maintenance.

Removal of nonessential buildings and parking would reduce associated maintenance and utility costs. Construction, rehabilitation, restoration, and demolition projects proposed in the alternative would result in moderate, long-term, beneficial impacts to park operations. These activities would also have short-term, minor, adverse impacts on operations due to the closure of buildings and lands during construction or restoration.

Conclusion

Increased staff would result in moderate, long-term, beneficial impacts, if funded. If funding is available for construction, rehabilitation, restoration, and demolition projects, these projects would result in moderate, long-term, beneficial impacts to park operations. Construction and landscape restoration activities would also result in short-term, minor, adverse impacts while they are underway. However, if funding and needed staffing levels are not made available when these actions are implemented, the proposed actions would have long-term, moderate, adverse effects on park operations.

Alternative 2: Preserving and Enjoying Coastal Ecosystems

Analysis

If adequate funding is available for additional staff for the public safety division at Muir Woods National Monument, such increases would result in moderate, long-term, beneficial impacts to operations. Increased law enforcement staff is recommended to manage the controlled visitor areas and to protect sensitive resources. Additional rangers would also assist in parking management at the shuttle station. Maintenance staff would decrease under this alternative because of the reduced number of facilities.

The effort to remove most facilities from the monument would have both positive and negative impacts to the operations. While demolition and natural resource restoration would require additional project funding and require staff effort in the short term, over the long term, staff efforts in maintenance of facilities would be reduced, and deferred maintenance would be reduced. However, new proposed facilities, such as the Highway 101/State Route 1 welcome center and the Muir Woods National Monument welcome center would require adjustment of the operations and maintenance budget to realistically reflect the true costs of the facilities in order to have beneficial impacts on park operations; otherwise, the impact would be adverse and result in an increase of deferred maintenance. Construction, rehabilitation, restoration, and demolition projects proposed in the alternative would result in major, long-term, beneficial impacts to park operations

if funded. Construction and landscape restoration activities would result in short-term, minor, adverse impacts while they are underway due to area and facility closures.

Conclusion

Increased staff would result in moderate, long-term, beneficial impacts. If fully funded, construction, rehabilitation, restoration, and demolition projects proposed in the alternative would result in major, long-term, beneficial impacts to park operations. Construction and landscape restoration activities also would result in short-term, minor, adverse impacts to park operations. Removal of much of the development from inside the monument could make public safety responses more difficult, and would result in a minor to moderate, long-term, adverse impact to park operations. However, if funding and needed staffing levels are not made available when these actions are implemented, the proposed actions would have long-term, moderate, adverse effects on park operations.

Alternative 3: Focusing on National Treasures (NPS Preferred Alternative for Muir Woods National Monument)

Analysis

If adequate funding is available for additional public safety and maintenance staff at Muir Woods National Monument, such increases would result in moderate, long-term, beneficial impacts to operations. Additional law enforcement officers are proposed to cover increased picnicking, expanded visitor activities, and the potential for a greater number of lost and injured people. Additional rangers would also assist in parking management at the shuttle station. Additional maintenance staff would support trail maintenance, upkeep of interpretive signs, increased picnicking, and relocated welcome centers.

The proposed new or reconstructed facilities, such as the Highway 101 / State Route 1 welcome center and interpretive trail improvements, would require additional capital investment. Unless the cyclic maintenance budget is collaborated to maintain the park's facilities as identified in this alternative, the deferred maintenance will increase, even with an initial investment in that asset. Adjusting the operations and maintenance budget to realistically reflect the true costs of facilities would have a long-term, moderate, beneficial impact on park operations; otherwise, the impact would be adverse and would result in an increase in deferred maintenance.

Removal of nonessential buildings and parking would reduce associated maintenance and utility costs. If fully funded, construction, rehabilitation, restoration, and demolition projects proposed in the alternative would result in moderate, long-term, beneficial impacts to park operations. Construction and landscape restoration activities would result in short-term, minor, and adverse impacts park operations while the activities are underway.

Conclusion

Increased staff would result in moderate, long-term, beneficial impact if adequate funding is available. If funding is available, construction, rehabilitation, restoration, and demolition projects proposed in the alternative would result in moderate, long-term, beneficial impacts to park operations. Construction and landscape restoration activities

PART 8: POTENTIAL ENVIRONMENTAL CONSEQUENCES

also would result in short-term, minor, adverse impacts to park operations while the activities are underway. However, if funding and needed staffing levels are not made available when these actions are implemented, the proposed actions would have long-term, moderate, adverse effects on park operations.

Index to Volume II



INDEX TO VOLUME II

Battery Spencer, 157, 158

Bay Area Ridge Trail, 162, 220, 271, 284, 323, 326

Bolinas Lagoon, 33, 37, 38, 41, 45, 50, 53, 63, 80, 89, 104, 105, 108, 109, 214, 248, 249, 349

California Coastal Trail, 161, 162, 218, 219, 298, 323

Camino del Canyon, 41, 74, 338, 339, 340, 342, 343, 344, 351, 352, 355, 358, 361, 367, 368, 370, 371, 389

Cañada Road, 162, 220

Capehart Housing Area, 221, 228, 229, 232, 234, 239, 241, 267, 274, 280, 306, 315, 318, 319, 333

Carbon Footprint, 4, 25, 68, 196, 223, 335

Cattle Hill, 213, 247

China Beach, 33, 89, 105, 117, 187, 208, 219, 228, 233, 239, 243, 264, 270, 277, 284

Climate Change, 26, 27, 30, 196

Conzelman, 156, 158, 227, 228, 233, 239, 243, 246, 319, 321

Dipsea Trail, 74, 86, 99, 113, 154, 357, 358, 359, 361, 385

Druid Heights, 89, 105, 114, 338, 339, 340, 342, 343, 344, 351, 352, 355, 357, 358, 359, 360, 361

Fort Baker, 29, 39, 44, 63, 151, 155, 156, 157, 186, 218, 221, 246, 267

Fort Barry, 100, 101, 105, 322

Fort Cronkhite, 24, 100, 105, 186, 187

Fort Funston, 29, 33, 65, 98, 105, 117, 159, 160, 173, 181, 186, 187, 208, 219, 227, 228, 232, 233, 237, 239, 243, 249, 250, 257, 264, 303, 306, 323, 327, 328, 331

Fort Mason or Upper Fort Mason, 12, 33, 85, 89, 97, 98, 101, 102, 105, 108, 109, 111, 117, 121, 151, 167, 183, 184, 186, 187, 208, 218, 219, 228, 233, 239, 243, 244, 264, 269, 270, 276, 282, 283, 300, 303, 306, 307, 318, 320, 328, 331, 333

Fort Miley, 85, 98, 101, 102, 103, 186, 187, 208, 219, 228, 233, 239, 241, 243, 264, 270, 276, 277, 283, 284, 320, 333

Fort Point National Historic Site, 85, 95, 96, 181, 182

Gerbode Valley, 33, 228, 233, 239, 243

Golden Gate Dairy, 41, 87, 103, 228, 233, 239, 241, 243, 263, 267, 274, 281, 321

Golden Gate National Parks Conservancy, 117, 160, 179, 182, 187, 388

Gulf of the Farallones, 43, 44, 46

PART 8: POTENTIAL ENVIRONMENTAL CONSEQUENCES

Highway 101, 150, 152, 153, 154, 156, 158, 319, 326, 336, 337, 339, 342, 346, 379, 380, 382, 385, 390, 391

Hill 640, 87, 103, 263, 267, 274, 281

Huddart County Park, 161

Kent Canyon, 69, 70, 222, 380

Kirby Cove, 50, 228, 233, 237, 239, 243

Lower Redwood Creek, 9, 70, 71, 76, 227, 228, 231, 237, 248, 321

Marin City Ridge, 213, 228, 233, 239, 243

Martini Creek, 33, 90, 106

McNee Ranch State Park, 162, 323

Milagra Ridge, 57, 60, 62, 65, 66, 98, 161, 162, 219, 227, 228, 233, 239, 243, 246, 247, 253, 256, 259, 266, 273, 280

Montara Lighthouse, 117, 123, 271, 277, 313

Montara Mountain, 214, 323

Mori Point, 29, 66, 109, 120, 123, 161, 162, 219, 227, 228, 231, 237, 245, 247, 298, 323

Mount Tamalpais State Park, 68, 112, 124, 127, 158, 385

Muir Beach, 38, 39, 42, 50, 68, 69, 70, 72, 76, 87, 90, 100, 105, 109, 124, 154, 156, 158, 218, 231, 286, 288, 289, 290, 291, 298, 319, 320, 321, 326, 327, 388

Muir Woods Addition, 346, 347, 348

Mussel Rock, 219

Native Americans, 100, 107, 109, 114, 212, 214, 217, 218

Nike Missile Site, 110, 186

Oakwood Valley, 41, 322

Ocean Beach, 29, 33, 65, 89, 102, 105, 117, 158, 159, 160, 173, 181, 208, 219, 227, 228, 243, 248, 249, 264, 271, 303, 306, 323

Panoramic Highway, 152, 301, 304, 307, 319, 320, 322, 379

Park Collections, 14, 110, 111, 115, 206, 212, 214, 216, 221, 291, 294, 295, 296, 297, 298, 333, 366

Pedro Point, 162, 323

Phleger Estate, 21, 29, 38, 43, 90, 105, 109, 161, 162, 177, 220, 228, 233, 239, 243

Picardo Ranch, 38, 219, 311, 326

Presidio of San Francisco, 38, 53, 86, 95, 96, 100, 102, 105, 110, 111, 160, 221

Rancho Corral de Tierra, 9, 39, 90, 105, 161, 162, 213, 228, 231, 232, 233, 234, 239, 241, 243, 247, 265, 271, 277, 284, 300, 301, 303, 306, 311, 314, 316, 323, 331, 333

Redwood Creek, 9, 33, 37, 38, 39, 40, 41, 44, 45, 52, 53, 60, 63, 68, 69, 70, 71, 72, 73, 74, 75, 76, 78, 79, 80, 100, 103, 105, 108, 109, 113, 114, 124, 212, 214, 219, 227, 228, 229, 231, 234, 237, 241, 248, 253, 256, 260, 321, 336, 337, 339, 340, 341, 343, 344, 345, 347, 348, 349, 353, 354, 355, 359, 361, 364, 382, 385

San Andreas, 28, 37, 38, 161, 162

San Francisco Bay Discovery Site, 83, 88, 95, 97, 265, 271, 277, 284, 323

San Francisco Maritime National Historical Park, 88, 98, 111, 270, 276, 283

Sawyer Camp, 161, 162, 323

Shelldance Nursery, 90, 106, 123, 161, 187, 216, 217, 218, 219, 220, 228, 233, 265, 271, 278, 285, 306, 323

Skyline Boulevard, 160, 161, 162, 219, 220

Slide Ranch, 50, 118, 182, 227, 228, 229, 233, 239, 241, 243, 303, 304, 306, 314, 315, 316, 388

Sneath Lane, 161, 162, 326

State Route 1, 37, 41, 70, 104, 123, 150, 151, 152, 153, 154, 156, 160, 161, 162, 219, 227, 228, 229, 233, 239, 243, 249, 301, 304, 306, 307, 315, 316, 319, 320, 321, 322, 323, 326, 327, 340, 350, 379, 380, 382, 385, 387, 390, 391

Stinson Beach, 37, 39, 41, 46, 99, 103, 113, 154, 156, 158, 163, 181, 185, 186, 187, 196, 208, 218, 220, 227, 228, 231, 232, 233, 234, 239, 243, 248, 315, 320, 322, 325, 326, 327, 385, 388

Sweeney Ridge, 21, 33, 62, 66, 97, 120, 123, 162, 219, 220, 228, 233, 239, 243, 246, 266, 273, 277, 280, 323, 326

Tennessee Valley, 33, 37, 41, 62, 101, 104, 108, 109, 117, 152, 155, 156, 158, 186, 187, 220, 228, 232, 233, 239, 243, 252, 268, 275, 300, 311, 319, 322, 325, 331, 388

Thornton State Beach, 219



As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historic places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

NPS 641/108779; NPS 112/108782; August 2011/Printed on recycled paper.

