

OPERATIONAL STRATEGY FOR THE FIRE MANAGEMENT PLAN

Golden Gate National Recreation Area

April 2008



OPERATIONAL STRATEGY FOR
THE FIRE MANAGEMENT PLAN

Golden Gate National Recreation Area

April 2008

Prepared by: Wendy Painsot
Wendy Painsot, Fire Program Planner

Prepared by: Roger P. Wong
Roger P. Wong, Fire Management Officer

Reviewed by: Sue Husari
Sue Husari, Regional Fire Management Officer, PWR

Approved by: Brian O'Neill
Brian O'Neill, General Superintendent

5-13-08
Date

TABLE OF CONTENTS

INTRODUCTION	1
1. FOUNDATION OF THE FMP	5
1.2 RELATIONSHIP TO FEDERAL FIRE MANAGEMENT POLICY	5
1.2.1 Federal Wildland Fire Management Policy (2001)	5
1.2.2 National Park Service Management Policies (2006)	6
1.2.3 Director's Order #18, Wildland Fire Management (2005).....	7
1.3 RELATIONSHIP OF FMP TO GGNRA PLANNING	8
1.3.1 GGNRA General Management Plan and General Management Plan Update.....	8
1.3.2 GGNRA Natural Resource Management Plan	9
1.3.3 GGNRA Cultural Resource Management Plan	9
1.4 RELATIONSHIP OF FMP TO LOCAL FIRE MANAGEMENT PLANNING.....	9
1.4.1 Marin County Fire Department.....	9
1.4.1.1 Marin County Fire Management Plan.....	9
1.4.1.2 Marin County Community Wildland Fire Protection Plan (CWPP)	10
1.4.2 Vegetation Management Plan, Presidio of San Francisco	12
1.4.3 Mt. Tamalpais Area Vegetation Management Plan.....	12
1.4.4 Point Reyes National Seashore Fire Management Plan	13
1.4.5 Cal Fire California Fire Plan	13
1.4.5.1 Cal Fire, San Mateo/Santa Cruz Unit	14
1.4.6 San Francisco Co., Recreation & Park Dept., Parks & Significant Natural Areas Program	14
1.4.7 San Francisco Peninsula Watershed Management Plan	15
1.4.8 San Mateo County Parks and Recreation Department Documents	16
1.4.8.1 Decision-Making Guidelines for Vegetation Management.....	16
1.4.8.2 Huddart and Wunderlich County Parks Draft Master Plan	16
2. FIRE MANAGEMENT STRATEGIES	19
2.1 FIRE MANAGEMENT GOALS.....	19
2.2 GENERAL MANAGEMENT CONSIDERATIONS.....	23
2.2.1 Legal Considerations.....	23
2.2.1.1 Enabling Legislation	23
2.2.1.2 Endangered Species Act.....	23
2.2.1.3 Clean Air Act	24
2.2.1.4 National Historic Preservation Act.....	24
The National Historic Preservation Act	24
2.2.2 Jurisdictional Considerations.....	25
2.2.2.1 Direct Protection Areas (DPA).....	25
2.2.3 Technical or Logistic Considerations.....	25
2.2.3.1 Limited Season for Effective Use of Prescribed Burning.....	25
2.2.3.2 Risk-related Considerations	25
2.2.3.3 Park Resources or Values Considerations.....	25
2.2.3.4 Staffing Considerations	26
2.3 WILDLAND FIRE MANAGEMENT OPTIONS	27

2.4	ENVIRONMENTAL FACTORS INFLUENCING FIRE MANAGEMENT	28
2.4.1	Fire Regime and Fire History	28
2.4.1.1	San Francisco Bay Area Fire Regime	28
2.4.1.2	San Francisco Bay Area Fire Regime Research.....	31
2.4.1.3	Recent Fire History in Marin and San Mateo Counties	32
2.4.2	Climatic and Topographic Influences	33
2.4.2.1	Relative Humidity	33
2.4.2.2	Wind Patterns.....	36
2.4.2.3	Recurrent Drought.....	37
2.4.3	Fire Weather.....	40
2.4.4	Prescribed Fire Windows	41
2.5	GGNRA WILDLAND FIRE RISK/HAZARD VALUE ANALYSIS MODEL	41
2.5.1	Objectives.....	41
2.5.2	Analysis Area	41
2.5.3	Methodology.....	41
2.5.3.1	Input Variables	42
2.5.3.2	Analysis using Asset Analyzer	45
2.5.3.3	Model Results and Discussion	46
2.6	MARIN COUNTY FIRE DEPT HAZARD MODEL.....	51
2.7	CAL FIRE RISK ASSESSMENT FOR SAN MATEO COUNTY	53
2.8	STRATEGIC APPROACH OF THE FMP	53
2.8.1	GGNRA Fire Management Units (FMU).....	55
2.8.2	Descriptions and Strategies of the FMUs.....	56
2.8.2.1	Wildland Urban Interface FMU	56
2.8.2.2	Park Interior FMU	56
2.8.2.3	Muir Woods FMU	59
2.9.	GGNRA PROJECT AREAS	61
2.9.1.	Marin County Project Areas	62
2.9.1.1	Alta Project Area	62
2.9.1.2	Fort Baker Project Area.....	62
2.9.1.3	Homestead Valley Project Area.....	65
2.9.1.4	Marin Headlands Project Area.....	65
2.9.1.5	Muir Beach/Green Gulch Project Area	66
2.9.1.6	Muir Woods Project Area	66
2.9.1.7	Oakwood Valley Project Area.....	67
2.9.1.8	Stinson Beach Project Area	67
2.9.1.9	Tamalpais Valley Project Area	67
2.9.1.10	Tennessee Valley Project Area	68
2.9.1.11	Wolfback Ridge/Sausalito Project Area.....	68
2.9.2	San Francisco County.....	68
2.9.2.1	San Francisco Project Area.....	68
2.9.3	San Mateo County.....	69
2.9.3.1	Milagra Ridge Project Area	69
2.9.3.2	Mori Point	69
2.9.3.3	Phleger Estate Project Area	69
2.9.3.4	Pedro Point Project Area.....	70
2.9.3.5	Sweeney Ridge/Cattle Hill Project Area	70
3.	FIRE MANAGEMENT PROGRAM COMPONENTS.....	73

3.1	DESIGNATION OF WILDLAND FIRE PROTECTION RESPONSIBILITY	73
3.2	GENERAL IMPLEMENTATION PROCEDURES FOR SUPPRESSION ACTIONS	74
3.3	AGREEMENTS GOVERNING SUPPRESSION ACTIONS	75
3.4	MINIMUM IMPACT SUPPRESSION TACTICS	76
3.5	PREPAREDNESS ACTIONS.....	76
3.5.1	Fire Prevention.....	77
3.5.1.1	Training and Fire Readiness	77
3.5.1.2	Fire Weather and Fire Danger.....	79
3.5.1.3	Range Of Potential Fire Behavior.....	80
3.5.1.4	Weather Stations	81
3.5.1.5	National Fire Danger Rating System (NFDRS)	82
3.5.2	Step-Up Plan.....	84
3.5.3	Detection	84
3.6	INITIAL ATTACK.....	85
3.6.1	Initial Attack Priorities and Closest Resources	86
3.6.2	Appropriate Management Response.....	86
3.6.3	Response Time Frames	86
3.6.4	Restrictions and Special Concerns	87
3.6.5	Extended Attack and Large Fire Suppression.....	90
3.6.5.1	The Wildland Fire Situation Analysis (WFSA) Development	92
3.6.5.2	Complexity Decision Process for Incident Management Transition.	92
3.6.5.3	Delegation of Authority for IC	92
3.6.6	Rehabilitation Guidelines and Procedures	92
3.6.7	Records and Reports	94
3.7	PRESCRIBED FIRE	95
3.7.1	Annual Planning, Review and Documentation for Prescribed Burning	96
3.7.1.1	Prioritizing and Review the Annual Implementation Plan	96
3.7.1.2	Review of Projects for NEPA Conformance	98
3.7.1.3	Developing Burn Plans	98
3.7.1.4	Long-Term Strategy	100
3.7.1.5	Personnel	100
3.7.1.6	Fire Behavior and Fire Effects Monitoring	100
3.7.1.7	Reporting and Documentation.....	100
3.7.1.8	Prescribed Burn Plan Elements.....	101
3.7.2	Exceeding Existing Prescribed Burn Plan	102
3.7.3	Air Quality and Smoke Management.....	103
3.7.3.1	Regulatory Compliance and the Approval Process	103
3.7.3.2	Regional Air Quality Considerations for Prescribed Burning.....	104
3.8	NON-FIRE TREATMENT APPLICATIONS.....	106
3.8.1	Annual Review	109
3.8.2	Equipment and Seasonal Use Restrictions	110
3.8.3	Effects Monitoring.....	110
3.8.4	Reporting and Documentation.....	110
3.8.5	Annual Planned Projects	110
3.9	FIRE COMMUNICATION AND EDUCATION.....	110
3.10	FIRE ECOLOGY AND FIRE EFFECTS MONITORING PROGRAMS	112

3.10.1	Programmatic and Policy Direction	112
3.10.2	Current Program.....	112
3.10.3	Monitoring Levels	112
3.10.4	Data Management and Analysis	113
3.10.5	Wildland and Prescribed Fire Monitoring and Research Plan.....	113
3.11	FIRE RESEARCH.....	113
4.	ROLES, FUNDING AND REVIEW.....	115
4.1	NPS ORGANIZATIONAL STRUCTURE, ROLES, AND RESPONSIBILITIES	115
4.1.1	GGNRA Positions.....	115
4.1.1.1	Park Superintendent.....	115
4.1.1.2	Chief Ranger	115
4.1.1.3	Bay Area Network Fire Management Officer.....	115
4.1.1.4	Fire GIS	116
4.1.1.5	Senior Engine Captain	116
4.1.1.6	Assistant Engine Captain	117
4.1.2	Shared / Consulting Network Positions	117
4.1.2.1	Fire Program Planner	117
4.1.2.2	Fuels/Prescribed Fire Specialist.....	117
4.1.2.3	Fire Communication and Education Specialist.....	118
4.1.2.4	Fire Ecologist.....	118
4.1.3	Shared Regional Positions	119
4.1.3.1	Lead Fire Effects Monitor	119
4.1.3.2	Fire Effects Crew Members (biological science technicians)	119
4.2	FUNDING	121
4.3	INTERAGENCY COOPERATION AND CONTACTS.....	121
4.4	INTERAGENCY AGREEMENTS.....	122
4.5	RECORDS AND REPORTS	123
4.6.	ANNUAL REVIEW OF THE FIVE YEAR FUELS TREATMENT PLAN AND FMP	123

LIST OF FIGURES

Figure 1	– GGNRA Lands	3
Figure 2	– Marin County CWPP Map	11
Figure 3	--Historic Fires in Marin County	34
Figure 4	-- Historic Fires, San Francisco & San Mateo Counties	35
Figure 5	– Predominant Wind Patterns in Central California	36
Figure 6	– California’s Historic Dry Periods (1850 – Present)	38
Figure 7	– Value Model Input Variables: WUI & Fire Density	47
Figure 8	-- Value Model Input Variables: Intensity & Crown Fire Potential	48
Figure 9	-- Risk Value Model Results: Equal Weight & Crown Behavior Emphasis.	49
Figure 10	-- Risk Value Model Results: Crown Fire & Ignition Risk Emphasis.	50

Figure 11 – Marin County Fire Department’s Fuel Ranking Map	51
Figure 12 – Marin County Fire Department’s, Areas Resistant to Wildfire Control	52
Figure 13 – Fire Management Units, Marin County.....	57
Figure 14 – Fire Management Units, San Francisco & San Mateo Counties	58
Figure 15 – FMP Project Areas, Marin County.....	64
Figure 16 – FMP Project Areas, San Francisco & San Mateo Counties.....	71
Figure 17 – Monthly Burning Index Levels (1981- 2000).....	78
Figure 18 – RAWs Weather Stations, San Mateo County	83
Figure 19 – Burning Index Levels during Past Wildfires	85
Figure 20 – GGNRA Fire Management Branch Organizational Chart.....	120

LIST OF TABLES

Table 1 – CWPP Fuelbreak Sections on GGNRA Lands	12
Table 2 -- San Francisco Bay Area Climatic Changes	28
Table 3 -- Wildfire History of Coastal Marin and San Mateo Counties.....	32
Table 4 – GGNRA Recent Wildfire History.....	33
Table 5 -- GGNRA Vegetation Types and Fuel Model Types.....	43
Table 6 – Annual Maximum Achievement	53
Table 7 -- Distribution of FMU Acreage by County.....	55
Table 8 – Acres of Vegetation Type by Project Area.....	63
Table 9 -- Acres of Vegetation by Project Area	64
Table 10 – Vicinity RAWs Stations	82
Table 11 – Red Flag Warning Matrix.....	84
Table 12 – Contacts	121
Table 13 – Interagency Agreements	122
Table 14 – Records and Reports	123

APPENDICES

APPENDIX A. REFERENCES AND CONTRIBUTORS	A-1
APPENDIX B. SPECIES OF CONCERN	B-1
APPENDIX C. GGNRA FMP RECORD OF DECISION	C-1
APPENDIX D. FMP MITIGATION MEASURES	D-1
APPENDIX E. SUPPLEMENTAL INFORMATION	
1. GGNRA Run Card	E-1
2. Daily Resource Availability/Officer Duty Call Sheet	E-3
3. Weather Information Management System Walk-through	E-5
4. GGNRA Dispatch Protocol for Wildland Fire.....	E-7
5. NFDRS Indices and Park Visitor Fire Restrictions	E-11
6. Fire Step-up Plan (SOP 37)	E-13
7. Bay Area Network Parks Burn Index Graph.....	E-19
8. Delegation from Superintendent GGNRA to Network FMO	E-21
9. Marin Emergency Radio Authority (MERA) Radio Talk Group Matrix...	E-23
10. MIST Guidelines	E-25
11. Wildland Fire Situation Analysis.....	E-39
12. Incident Complexity Analysis: Types 5, 4 and Transition to Type 3 Incident.....	E-53
13. Redbook Complexity Analysis – Types 1 and 2.....	E-55
14. Minimum Tool Flow Chart.....	E-59
15. Example of Delegation of Authority Form	E-75
16. Briefing Checklist Template	E-77
17. Briefing to the Incident Management Team Template	E-79
18. Prescribed Fire Plan Template	E-87
19. BAAQMD Application for Pile Burning	E-107
20. FMU Maps of Past and Proposed Fire Management Projects	E-109
21. Ignition Index and Fuel Hazard Rating.....	E-111
22. GGNRA FMU Vegetation Maps.....	E-115
APPENDIX F. WILDLAND AND PRESCRIBED FIRE MONITORING AND RESEARCH PLAN (<i>in preparation</i>)	
APPENDIX G. FIRE COMMUNICATION AND EDUCATION PLAN (<i>in preparation</i>)	

INTRODUCTION

The Fire Management Plan (FMP) for Golden Gate National Recreation Area (GGNRA) is an operational manual containing the standards, practices and guidelines in use by the Fire Management Branch of the Law Enforcement Division of GGNRA for conducting actions within the 15,700 acres of primary jurisdiction (see Figure 1, GGNRA Lands). The legislative boundary of GGNRA is much larger than the area of primary jurisdiction and covers 74,816 acres in Marin, San Francisco and San Mateo counties. The majority of these lands are administered by agencies other than the National Park Service (NPS) such as the California State Department of Park and Recreation, the San Francisco Public Utilities Commission (San Francisco Watershed Lands), the Presidio Trust¹, the San Mateo County Parks and Recreation Division and the Marin Municipal Water District. An additional 15,400 acres of GGNRA lands on Bolinas Ridge in Marin County are managed by Point Reyes National Seashore (PRNS) under an agreement between PRNS and GGNRA; this area is covered in the PRNS FMP.

For purposes of the FMP, GGNRA will be used to refer to the 15,700 acres directly managed by the NPS through GGNRA and those parcels that will soon pass to the management of GGNRA. The latter category includes Cattle Hill and Pedro Point in the San Mateo County adjacent to the City of Pacifica.

The FMP provides a framework for prioritizing, developing and implementing the fire management group's prevention and fuels reduction programs, conducting prescribed burns with resource benefit objectives and advance planning for response to wildland fires within the jurisdictional area. The FMP was built upon guidance provided by the fire management section of the NPS Management Policies (2006) and current Federal Wildland Fire Management Policy (2001). Federal wildland fire policy stresses the importance of the protection of the lives and safety of firefighters and the public, public and private property, and the protection, restoration and rehabilitation of the natural and cultural resources on federally-managed lands.

The fire management strategy to be implemented by this FMP was the subject of an Environmental Impact Statement (EIS) prepared by the NPS that underwent public review and comment, as required by the National Environmental Policy Act (NEPA). As part of the NEPA process, conformance requirements for the Endangered Species Act, the National Historic Preservation Act (NHPA), the Magnuson-Stevens Fishery Conservation and Management Act and the Coastal Zone Management Act were met.

FMP goals and specific strategies were developed and assessed for potential impact during the NEPA process, which concluded with signature of the Record of Decision

¹ The Presidio Trust manages the interior acres of the Presidio of San Francisco (Area B); the NPS manages the coastal areas (Area A). However, Congress made both management areas a part of GGNRA.

INTRODUCTION

(ROD) by the NPS Pacific West Regional Director on February 24, 2006. Mitigation measures included in the FMP EIS or recommended by the regulatory agencies for conformance with the Endangered Species Act regulators were adopted by the NPS as part of the ROD and are now incorporated into this operational FMP for GGNRA and included as Appendix D. The mitigation measures will be assigned to FMP projects by the interdisciplinary team review required for each project by NEPA project review and NHPA quintex review, processes that ensure regulatory conformance. Conformance requires that the impacts of implementing the fire management program remain within the levels anticipated during the NEPA process and do not result in impacts on the environment greater than those assumed when the ROD was adopted.

The FMP is organized to present the current strategies and tactics for the range of actions undertaken by the GGNRA Fire Management Branch. Program operations addressed include preparedness, prevention, suppression, fuels management, rehabilitation, fire communication and education, monitoring and fire and fuels research. The FMP is written to be used as a reference by GGNRA staff as they plan and implement fuel reduction, resource protection and rehabilitation projects and strategize for and conduct suppression actions.

Figure 1 – GGNRA Lands



1. FOUNDATION OF THE FMP

Federal agencies that manage large tracts of public land having vegetation capable of sustaining wildland fire are required by federal policy to develop FMPs and to ensure that the FMPs be updated to keep current with periodic changes to federal wildland fire management policy and must undergo NEPA and other environmental regulatory requirements. The GGNRA FMP develops the implementation strategy selected by the NPS Pacific West Regional Director at the conclusion of a multi-year EIS process involving public and regulatory agency consultations. The Operational FMP provides a framework for all fire management activities and the management of wildland fire and prescribed fire as a tool to safely accomplish protection and resource management objectives on NPS lands.

The ROD that concluded the NEPA process is Appendix C to this FMP; the Mitigation Measures adopted through the ROD are Appendix D. Together these documents summarize the findings of the EIS regarding the selected strategy, describe the decision taken and the decision-making process and list the specific procedures to protect the environment the NPS will follow when implementing FMP projects. The Operational FMP which provides specific implementation detail is grounded in the goals, objectives and implementation strategy developed in the NEPA process and is circumscribed by the park's commitment to the public and regulators to abide by the mitigation measures adopted through the ROD.

1.2 RELATIONSHIP TO FEDERAL FIRE MANAGEMENT POLICY

NPS fire management actions must conform to adopted plans and policies of the Department of the Interior and the National Park Service. These include the Federal Wildland Management Policy, NPS Management Policies (2006), Director's Order #18 (2005) and Reference Manual #18 (2006b), the guidance documents for wildland fire management in the NPS, as well as the General Management Plan and resource management plans for GGNRA.

1.2.1 Federal Wildland Fire Management Policy (2001)

In 2001, the Interagency Federal Wildland Fire Policy Review Working Group revised and updated the Federal Wildland Fire Management Policy (NIFC 2001), which applies to all federal land management agencies. The key element of the policy is that firefighter and public safety is the first priority. In addition, the policy states that fire, as a critical natural process, will be integrated into land and resource management plans and activities on a landscape scale, and across agency boundaries. The policy also directs that fire management plans and programs will be based on a foundation of sound science. Research will support ongoing efforts to increase our scientific knowledge of biological, physical, and sociological factors.

CHAPTER 1 – FOUNDATION OF THE FMP

1.2.2 National Park Service Management Policies (2006)

NPS adopted revised Management Policies on August 31, 2006 which update the 2001 Management Policies under which the FMP NEPA process was conducted. In Section 4.5, the 2006 Management Policies expand the scope of issues that specifically need to be addressed in FMPs to include:

- “determining in which situations natural regeneration of a burned ecosystem is appropriate and when management actions are needed to restore, stabilize, or rehabilitate an area following wildland fire”,
- “addressing the need for adequate funding and staffing to support the planned fire management program”,
- address[ing] strategies for preventing the accumulation of hazardous fuels *in specific areas* and for eliminating hazardous conditions that may have developed over time due to past fire suppression programs or ongoing development activities. These strategies will entail strategic planning, interdisciplinary coordination, and inter-organizational collaboration as needed to provide appropriate treatment using adaptive management practices that range from site specific to landscape level. “
- Measures to protect or rescue cultural resources in the event of an emergency, disaster, or fire will be developed as part of a park’s emergency operations and fire management planning processes (Section 5.3.1.1.)

The Management Policies direct each park to carefully consider the option of wildland fire use based on the specific environmental, safety and logistical conditions of each wildland fire. GGNRA carefully considered the option of wildland fire use in developing the FMP EIS and concluded that GGNRA will be a full suppression park employing Minimum Impact Suppression Tactics (MIST) to the extent possible and a flexible suppression strategy that permits the appropriate approach to be used to suppress a fire (confine, contain or control) based on input from park staff, suppression forces, and adjacent landowners.

All fire management plan requirements in the revised Management Policies that are not currently addressed in the FMP will be developed and adopted in subsequent FMP Annual Review processes. It is conceivable that the development of new park procedures may require additional NEPA and/or Endangered Species Act (ESA) compliance. More details on wildland fire management, including interagency and Department of the Interior policies and requirements, are contained in Director’s Order #18: Wildland Fire Management. These documents provide the detail necessary to develop the components of Fire Management Plans and other companion plans, such as monitoring or communication plans.

Excerpts from 2006 Management Policies, Section 4.5, Fire Management

Regarding Fire Management Plans: “Parks with vegetation capable of burning will prepare a fire management plan that is consistent with federal law and departmental fire management policies, and that includes addressing the need for adequate

funding and staffing to support the planned fire management program. The plan will be designed to guide a program that:

- responds to the park's natural and cultural resource objectives;
- provides for safety considerations for park visitors, employees, and developed facilities;
- addresses potential impacts on public and private neighbors and their property adjacent to the park; and
- protects public health and safety.

Regarding Overall Strategy: "All fires burning in natural or landscaped vegetation in parks will be classified as either wildland fires or prescribed fires. All wildland fires will be effectively managed through application of the appropriate strategic and tactical management options. These options will be selected after comprehensive consideration of the resource values to be protected, firefighter and public safety, and costs."

Regarding Wildland Fire Suppression: "All wildland fires will be effectively managed through application of the appropriate strategic and tactical management options as guided by the park's fire management plan. These options will be selected after comprehensive consideration of the resource values to be protected, firefighter and public safety, costs, availability of firefighting resources, weather, and fuel conditions. "

"All parks will use a systematic decision-making process identified in their fire management plans or other documents to determine the most appropriate management strategies for all unplanned ignitions and for any naturally or management-ignited fires that are no longer meeting resource management objectives."

1.2.3 Director's Order #18, Wildland Fire Management (2005)

Director's Order #18, Section 5(2)(a), builds on the requirement from the Federal Wildland Fire Management Policy and reiterated in the NPS Management Policies that, "Every park area with burnable vegetation must have a fire management plan approved by the Superintendent." Director's Order #18 (NPS 2005) specifically addresses the direction and content expected in the FMPs prepared for NPS units.

The FMPs will:

1. Reinforce the commitment that firefighter and public safety is the first priority.
2. Describe wildland fire management objectives that are derived from land, natural, and cultural resource management plans and address public health issues and values to be protected.
3. Address all potential wildland fire occurrences and consider the full range of wildland fire management actions.

CHAPTER 1 – FOUNDATION OF THE FMP

4. Promote an interagency approach to managing fires on an ecosystem basis across agency boundaries and in conformance with the natural ecological processes and conditions characteristic of the ecosystem.
5. Include a description of rehabilitation techniques and standards that comply with resource management plan objectives and mitigate immediate safety threats.
6. Be developed with internal and external interdisciplinary input and reviewed by appropriate subject matter experts and all pertinent interested parties, and approved by the park superintendent.
7. Comply with the NEPA and any other applicable regulatory requirements.
8. Include a wildland fire prevention analysis and plan.
9. Include a fuels management analysis and plan.
10. Include procedures for short and long term monitoring to document that overall programmatic objectives are being met and undesired effects are not occurring.

Director's Order 18 requires that a Reference Manual be prepared to "help NPS managers and field staff understand and implement Departmental and NPS policies applicable to fire management. The reference manual will contain detailed procedures emphasizing personnel safety, the use of wildland fire for beneficial purposes, monitoring of smoke behavior and the concept of risk management." The Reference Manual for DO #18 is published only online and is available at http://www.nps.gov/fire/fire/fir_wil_pla_reference18.cfm.

1.3 RELATIONSHIP OF FMP TO GGNRA PLANNING

1.3.1 GGNRA General Management Plan and General Management Plan Update

In 1980, GGNRA and PRNS collaborated on a joint planning and NEPA process that produced a joint General Management Plan (GMP) and Environmental Assessment. The GMP EA (NPS 1980) recognized the need to incorporate prescribed burning into research programs designed to enhance ecosystem management in the park. The GMP defined a series of land management zones to guide the strategy for "how the park will be managed and developed in the future based on legislative and administrative requirements, resource studies, and public preferences." This zoning approach allows for the treatment of specific resources, while relating them to an overall approach to the park as a whole. Fire management actions for different areas of the park need to respect and reflect this current zoning, to minimize visitor, user, and resource management conflicts.

The park is currently in the initial stages of preparing a new general management plan to replace and update the 1980 GMP. PRNS is undergoing a similar process. The new GGNRA GMP will address those lands directly administered by the park focusing on sites that do not have recent land use plans, such as Muir Woods National Monument and the San Mateo County lands that have been added to the park since 1980. Planning for Area A of the Presidio, Fort Baker, and lower Fort Mason Center will not be addressed in the GMP update as these sites have recently updated land use

management plans. Golden Gate lands north of the Bolinas-Fairfax Road will be addressed in the *Point Reyes National Seashore General Management Plan Update*; that process is ahead of the process at GGNRA and a Draft EIS will soon be released for public review.

1.3.2 GGNRA Natural Resource Management Plan

The Natural Resources Management Plan (1999) describes the status of GGNRA's natural resources and a park-wide program aimed at resource preservation, monitoring, maintenance, and restoration. A primary challenge identified by the plan is how the park will address the changes in ecosystem composition and accumulation of fuels resulting from the focus over the past century on suppression of all fires.

The Natural Resource Management Plan recognizes the benefits that can be gained through hazardous fuel reduction programs, including prescribed burning, geared towards preventing catastrophic losses of park resources from unplanned ignitions. Consistent with the GGNRA FMP in force at the time it was drafted, the Natural Resource Management Plan calls for prescribed fire to be used to revitalize fire-adapted communities and reduce the encroachment of fire-sensitive trees. Prescribed burning and fire effects monitoring is woven into strategies for protection of the endangered San Bruno elfin butterfly, Mission blue butterfly, Northern spotted owl, old-growth forest species, and a rare manzanita and ceanothus species found in GGNRA. Since habitat modification through prescribed fire and mechanical fuel reduction projects can have direct and indirect effects on wildlife and their habitats, the plan calls for careful interdisciplinary planning to protect existing habitat values and guide habitat enhancement.

1.3.3 GGNRA Cultural Resource Management Plan

The GGNRA Cultural Resource Management Plan (1998) is a prioritized listing of 128 cultural resource projects for the park providing a problem statement, description of the recommended project or activity, and an estimate of budget and staff needed to complete each project. The Cultural Resource Management Plan does not include overarching objectives for resource protection and does not address fire management planning as a strategy. A forthcoming update of this plan may incorporate objectives that integrate both fire and vegetation management as means to protect, restore, or rehabilitate cultural resources and landscapes within the park.

1.4 RELATIONSHIP OF FMP TO LOCAL FIRE MANAGEMENT PLANNING

1.4.1 Marin County Fire Department

1.4.1.1 Marin County Fire Management Plan

The Marin County Fire Department has developed a Marin County Fire Management Plan that addresses the threat and prevention of wildfires in Marin County.

1. To create wildfire protection zones that increase safety for firefighters and reduce risk to park neighbors.

CHAPTER 1 – FOUNDATION OF THE FMP

2. To assess all wildlands, not just the state responsibility areas. Analyses will include all wildland fire service providers: federal, state, local government, and private. It will identify high risk, high value areas, and develop information on and determine who is responsible, who is responding, and who is paying for wildland fire emergencies.
3. To identify and analyze key policy issues and develop recommendations for changes in public policy. Analysis will include alternatives to reduce the total losses by increasing fire protection system effectiveness.
4. To focus and monitor the wildland fire protection system in fiscal terms. This will include all public and private expenditures and economic losses.
5. To translate the analyses into public policies.

1.4.1.2 Marin County Community Wildland Fire Protection Plan (CWPP)

Adopted by the Marin County Board of Supervisors in July 2005, the CWPP provides guidance to the Marin County Fire Department (MCFD) in creating a more efficient fire-protection program focused on meaningful solutions to better protect Marin communities. The CWPP identifies areas where cost-effective, pre-fire management investments can be made to help minimize citizen losses and reduce costs from a major wildfire. With a CWPP approved and signed by the State Fire Marshall, MCFD may apply for National Fire Plan funding to complete the projects proposed in the CWPP.

The CWPP proposes a 5-part strategy to protect homes mapped as “at risk” by reducing fuel hazards using an integrated approach of the following elements:

- (1) Fuelbreak Network. MCFD has been working cooperatively with other local agencies and landowners to develop a 40-mile long system of fuel breaks (see Figure 2, Marin Co. CWPP Map) sited so as to take advantage of ridgetop roads and naturally occurring areas of lower fuels, such as grasslands. The fuel breaks will reduce the potential for a wildland fire to spread into the interface area from open space areas. The first several sections of the fuel breaks are proposed largely for GGNRA-managed lands (see Table 1, CWPP Fuelbreak Sections on GGNRA Lands).
- (2) Fire-Prone Forest Clearing. MCFD will continue clearing stands of flammable eucalyptus and Monterey pine that endanger residential communities.
- (3) Access Improvements. MCFD will continue to improve roadside fuel reduction and construct turnouts where needed.
- (4) Wildfire Awareness Campaign. MCFD will conduct community outreach to wildland-urban interface neighborhoods.
- (5) International Urban-Wildland Interface Code Adoption. The Board of Supervisors adopted a new County building code ordinance on 9/12/06, 2006 requiring each new residential project in the wildland urban interface zone (WUI) to have a fire protection plan. The Marin County WUI zone is shown in Figure 2, Marin Co. CWPP Map.

Figure 2 -- Marin County Community Wildfire Protection Plan Map

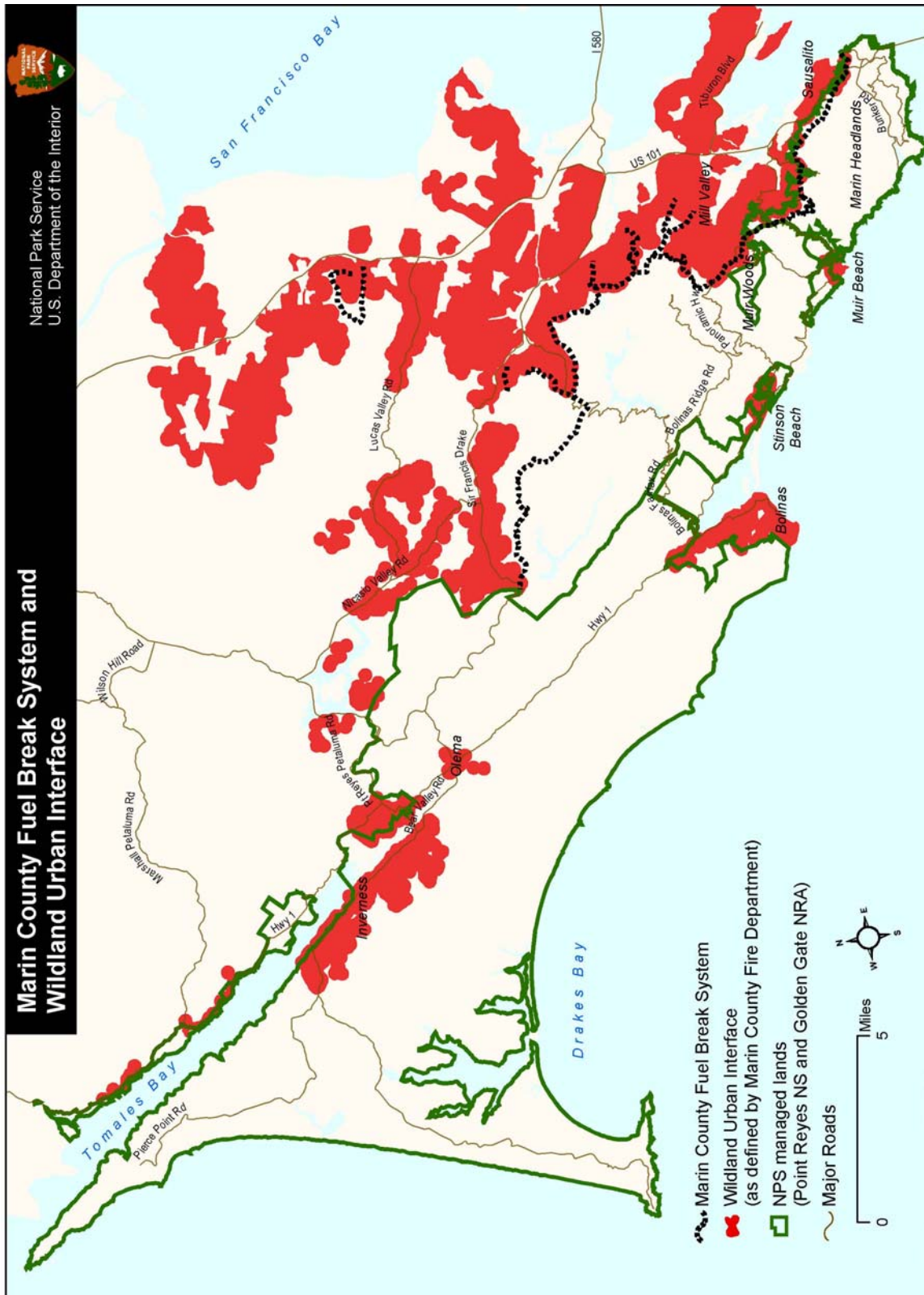


Table 1 – CWPP Fuelbreak Sections on GGNRA Lands

Fuelbreak Section	Description	Length (miles)	Miles Completed	Percent Complete
Sausalito	Shore of SF Bay over Waldo Tunnel to Alta Ave Fire Rd	2.3 mi	0	0%
Marin City	Alta Ave Fire Road to Tennessee Valley Rd	1.3	0.6	50%
Tamalpais Valley	Tennessee Valley Rd to 3 Corners (intersection of Highway 1 & Panoramic Hwy)	3.0	0.0	0%
Homestead Valley	3 Corners to Panoramic Highway to Mountain Home Inn	2.4	1.3	53%

Source: Marin Co. CWPP, 2006.

1.4.2 VEGETATION MANAGEMENT PLAN, PRESIDIO OF SAN FRANCISCO

The Vegetation Management Plan for the Presidio (VMP) (NPS 2001) was completed in 2001 as part of a collaborative planning effort between the NPS and the Presidio Trust for both Area A (under NPS management) and Area B (under Presidio Trust management) of the Presidio. The VMP addresses all vegetation resources and contains policies and actions that guide fire management activities as well as natural resources management activities, including efforts to test the efficacy, through research, of using fire to enhance and/or manage threatened and endangered plant species. Prescribed burns for resource benefit and fuel reduction projects in Area A or performed by NPS staff in Area B should conform to the resource objectives of the VMP and this FMP, meet any requirements for Section 7 consultations where habitat of listed plants is involved and be coordinated with the Presidio Trust.

1.4.3 Mt. Tamalpais Area Vegetation Management Plan

The Mt. Tamalpais Area Vegetation Management Plan (MTVMP), prepared in 1995, presents strategies for managing vegetation on the 19,000+ acres owned by the Marin Municipal Water District (MMWD) and an adjacent 1,150 acres owned by the Marin County Open Space District (MCOSD). The plan provides specific recommendations for reducing the risk of impacts from wildland fire and enhancing biodiversity, both primary goals of the plan. GGNRA lands are present in both MMWD watersheds (West Marin and Mt. Tamalpais) and have common boundaries with MMWD holdings. All jurisdictions in the MTVMP area face many of the same resource challenges such as high fuel accumulation, a complex and lengthy urban wildland interface, and the spread of highly flammable, nonnative plant species within the interface. Addressing the issues incrementally within each jurisdiction contributes to the overall success in combating these challenges.

The MTVMP called for a network of fuel breaks to help firefighters contain wildfires; both the MMWD and MCOSD have signed on as partners to the CWPP and its proposed fuelbreak system. The MTVMP also calls for prescribed burning of 100 to 200 acres per year (less than one percent of watershed land) to control nonnative plants, reduce fuels, and maintain natural habitats.

The FMP Final EIS anticipated that the NPS would continue to provide staff support and, when available, financial support, through the federal WUI funding program to support MTVMP projects. To qualify for federal funding under the National Fire Plan, projects should be included in the CWPP for that jurisdiction. Projects are selected by the California Fire Marshall following interagency consultation. The NPS would continue to seek opportunities to work cooperatively on projects with both agencies.

1.4.4 POINT REYES NATIONAL SEASHORE FIRE MANAGEMENT PLAN

The NEPA process for the PRNS FMP concluded with the signing of the ROD on 10/29/04. The Operational Strategy for the FMP describes the process PRNS will use in implementing the selected alternative in conformance with the commitments for environmental protection made in the ROD. The 18,000 acres of GGNRA lands included in the PRNS FMP are under the direct administration of PRNS through an agreement between the two parks. The alternative selected for implementation allows up to 2,000 acres of prescribed burning and 1,500 acres of mechanical treatment annually within the park. With the exception of smaller research burns, prescribed burning would not occur within the area currently leased for agriculture.

The GGNRA and PRNS FMPs share the same goals and a common boundary. The planning areas of the PRNS and GGNRA FMPs adjoin each other at the Bolinas–Fairfax Road, with PRNS managing lands north of the road and GGNRA managing lands to the south. In reference to this interface, the PRNS FMP states that “Prescribed burning in the southernmost portion of the ridge [Bolin Ridge] in coastal chaparral and mixed scrub habitats would also help achieve a natural resource benefit by simulative reproduction in the rare, fire adapted species Marin manzanita and Mason’s ceanothus” (NPS 2004). To the greatest extent possible, the San Francisco Bay Area Parks Network will work cooperatively to develop projects that address resource challenges common to the network parks and promote an efficiency of scale through joint staffing and/or funding of projects. The parks share a prescribed fire specialist position, duty stationed at PORE but serving both parks by developing a yearly program of work that includes prescribed fire and fuels planning, as well as project implementation

1.4.5 Cal Fire California Fire Plan

The California Department of Forestry and Fire Protection (Cal Fire) published the California Fire Plan (CFP) covering State Areas of Responsibility in July 2004. The goal of the CFP is the reduction of wildfire costs and losses through the protection of assets at risk by executing strategically sited vegetation management projects and a public education program stressing the homeowners responsibility to provide defensible space and use “fire safe” building materials. The implementation strategy of the CFP proposes:

- √ Creation of local forums to determine what the fire problem is through input from citizens, community groups, local agencies and other stakeholders.
- √ Identification of assets at risk, enabling the stakeholder forums and the Unit to set priorities for vegetation management project work. These assets include

CHAPTER 1 – FOUNDATION OF THE FMP

citizen and firefighter safety, structures, watersheds, wildlife and habitat, timber or unique areas of cultural or historic significance, and air quality.

- √ Development of wildfire protection zones through vegetation management projects that reduce the potential for large damaging wildland fires.
- √ Development and implementation of vegetation management projects cooperatively with stakeholder forums. Projects may include a combination of mechanical clearing or prescribed fire.

1.4.5.1 Cal Fire, San Mateo/Santa Cruz Unit

Cal Fire adopted a Fire Management Plan for its San Mateo/Santa Cruz unit in 2004 (<http://cdfdata.fire.ca.gov/pub/fireplan/fpupload/fpppdf136.pdf>). There is no mention of federal land management in the Plan nor are any of the individual national park units referred to or mapped. Battalion 1, consisting of Belmont Fire Station and Cordilleras Fire Station is responsible for the northern portion of San Mateo County including open space lands near Pacifica and the San Francisco Watershed lands adjacent to Sweeney Ridge. Battalion 5 serves the San Mateo portion of the Skyline Corridor with Fire Stations at Skylonda and Saratoga Summit.

GGNRA is in negotiation with Cal Fire with the objective of having that agency agree to accept GGNRA San Mateo lands as part of their Direct Protection Area (DPA). In conformance with the Master Cooperative Wildland Fire Management and Stafford Act Response Agreement between the State of California and federal land management agencies, the NPS would relinquish fire protection responsibilities to Cal Fire. As a result of turning over DPA responsibilities, the NPS would have only limited control over suppression actions at the time of a fire and would need to insert special resource protection instructions into the unit's Annual Operating Plan each April.

1.4.6 San Francisco Co., Recreation & Park Dept., Parks & Significant Natural Areas Program

The San Francisco Recreation and Park Department is responsible for managing the City's parks and "significant natural areas." The Natural Areas Management Plan was adopted in 1995 and the program staffed in 1997. It is a community-based habitat restoration program. San Francisco parks and natural areas adjacent to GGNRA lands include:

- Balboa Natural Area (1.8 acres) west of Sutro Heights and east across the Great Highway from Ocean Beach and the Cliff House,
- Lake Merced Park, east of Fort Funston, which has natural area designation for nearly half of its total acreage (395 acres out of a total of 814 acres),
- Mountain Lake Park, near Lake Street south of the Presidio is primarily within the jurisdiction of the Presidio Trust (13.1 of a total of the total 14.2 acres), includes a 1.1 acre section managed by City Recreation and Parks, and
- Sharp Park Golf Course in Pacifica bordered to the southwest by Mori Point and to the southeast and east by Sweeney Ridge. More than half of the golf course

lands (237.2 acres of the total 411 acres) are designated as a significant natural area.

Sharp Park is unique in the City's Significant Natural Areas Program in that it supports habitat for the federally-listed "endangered" San Francisco garter snake and "threatened" California red-legged frog; the common yellowthroat and the San Francisco fork-tailed damselfly, a federal bird of conservation concern; and possibly the bumblebee scarab beetle, a federal species of concern. Historic records indicate the park once supported the federally endangered Mission Blue Butterfly and the federally threatened Bay Checkerspot Butterfly.

Prescribed burning is included as a strategy for controlling the spread of nonnative plant species and encouraging the germination of native species in the San Francisco Recreation and Park Department's County Natural Areas Program (NAP). A principal management policy of the NAP is providing fire breaks where appropriate and maximizing indigenous vegetation for fire control. The management plan for Sharp Park calls for significant reduction in the cypress and eucalyptus stands on the eastern side of the park adjacent to Sweeney Ridge. There are opportunities here for GGNRA to work with City of San Francisco staff to reduce the expansion of and thin the density of existing groves along the common boundary.

1.4.7 San Francisco Peninsula Watershed Management Plan

The 23,000-acre San Francisco Peninsula Watershed, managed by the San Francisco Public Utilities Commission (SFPUC), shares a boundary with Sweeney Ridge on the north and the Phleger Estate on the south. The watershed lands are designated as a Hazardous Fire Area by the Cal Fire. As such, the area is subject to closure by the SFPUC, as necessary or as requested by Cal Fire, during times of high fire danger. A secondary goal of the Peninsula Watershed Management Plan (SFPUC 2002) is reducing the risk of wildland fire and potential adverse effects to the watershed, adjacent urban areas, and the public. Fire in the watershed would not only place nearby populated urban areas at risk but could also affect water quality, water supply to contract jurisdictions, and ecological and cultural resources within or near the watershed. A primary reason that the public has had restricted access to the watershed lands is to reduce the potential for the deliberate or accidental start of a wildland fire. Watershed Management Plan Policies call for the increased protection of watershed resources through the improvement of firefighting facilities and implementation of a fire management plan for the watershed.

In implementing the GGNRA FMP, the NPS will coordinate with the SFPUC Land and Resources Management Section to ensure that NPS actions conform to the Watershed Management Plan and FMP to the extent possible that allows NPS to its objectives. GGNRA staff meets annually with the SFPUC Land and Resources Management Section to discuss issues of joint interest and will inform SFPUC staff of proposed fire management actions at the Phleger Estate and Sweeney Ridge.

1.4.8 San Mateo County Parks and Recreation Department Documents

GGNRA shares common boundaries with two large parks managed by the San Mateo County Parks and Recreation Division of the Environmental Services Agency – San Pedro County Park and Huddart County Park.

The 974-acre Huddart County Park is on the southern boundary of Phleger Estate near the Town of Woodside in southern San Mateo County. Most visitors to Phleger park their cars in Huddart Park and hike in to Phleger on the connecting trail network. Huddart has similar vegetation community composition as is found in Phleger including redwood forest, mixed evergreen forest, oak woodlands and chaparral. Huddart itself is bordered to the west by Purissima Open Space Preserve and to the south by Teague Hill Open Space Preserve.

San Pedro Valley Park, south of Sweeney Ridge in Pacifica, encompasses 1,150 acres of coastal scrub, grasslands and riparian habitat that includes the middle and south forks of San Pedro Creek, which provides habitat for the federally threatened steelhead.

1.4.8.1 *Decision-Making Guidelines for Vegetation Management*

San Mateo County Parks recently completed this operational manual which presents clear and consistent guidelines and procedures for park staff to follow in conducting vegetation management activities and provides tools for selecting and prioritizing future vegetation management projects. The June 2006 document describes current fire management actions at County parks as limited to routine actions in and around developed areas of the parks using mowing, trimming overhead branches near fireplaces and herbicide use along fences, parking lots and to reduce non-native plants and poison oak.

The Guidelines recommend that County Parks come into compliance with Cal Fire requirements for a 100-foot wide fuel reduction zone between wildlands and developed areas. To meet with this requirement, the Guidelines recommend that parks with tracts of natural lands create and maintain the zone of reduced fuels on the parks' perimeters. Where the fuel reduction zone crosses forested areas, maintenance would be needed to treat small diameter trees and understory brush (pp. 46 and 74). Appendix A of the Guidelines contains the Department's procedures for conducting prescribed burns, flaming invasive non-native plants, grazing used for vegetation management, pile burning and establishing fuel breaks.

1.4.8.2 *Huddart and Wunderlich County Parks Draft Master Plan*

Released in May 2006, the draft plan includes a chapter prepared by Carol Rice of Wildland Resource Associates, dedicated to the reduction of risk of wildland fire in these two parks. Recommendations for Huddart Park, adjacent to the Phleger Estate include:

- Mowing grass to create 30-foot wide buffers along roads, park boundaries, parking and picnic areas and other areas with ignition potential.
- Restricting parking and vehicle use to paved surfaces.

CHAPTER 1 – FOUNDATION OF THE FMP

- Closing trails on Red Flag Days.
- Removing dead, downed material from roadsides, thinning forest understory and small diameter trees to create a vertical separation between the ground and canopy, thinning shrubs to form isolated groupings, and removing taller shrubs near trees.
- Providing a 100-foot radius of defensible space around structures by mowing, pruning, and removing flammable material from roofs, decks, and propane tanks.
- For newly landscaped areas, planting fire-resistant plants in groupings isolated by hardscape or mowed grass.
- Removing pyrophytic invasive, exotic plants and restoring habitat with less flammable native plants.
- Using goat and horse grazing to reduce fuels where appropriate.
- Assess hydrant siting, water pressure and volume and identify any needed improvements.
- Evaluate exterior construction features (e.g. roofing, siding) for ignition resistant construction.
- Improving the hairpin turn on Richards Rd. at McGarvey Gulch in Huddart Park to meet standards for Cal Fire and Woodside Fire Protection District vehicle weight and turning radii.
- Installing safety zones to make it safer for firefighters in order to increase the likelihood fire suppression resources will be committed to that location

CHAPTER 1 – FOUNDATION OF THE FMP

2. FIRE MANAGEMENT STRATEGIES

2.1 FIRE MANAGEMENT GOALS

As part of the NEPA process for the FMP, GGNRA staff developed goals for the overall fire management program based on guidance from Federal Wildland Fire Management Policy, NPS Management Policies, Director's Order #18, and other fire-related guidance documents, in conjunction with public input from meetings and workshops. In the listing below, elements of the adopted FMP alternative are paired with the seven FMP goals to demonstrate how the selected alternative will help the park achieve the goals of the FMP.

Goal 1. Ensure that firefighter and public safety is the highest priority for all fire management activities.

Objectives:

- √ In cooperation with Bay Area Network Parks, provide the fire management workforce with the training, equipment, operating procedures, safety measures, and information needed to manage risks and carry out their activities safely.
- √ Ensure that all fire management employees meet the Interagency Qualification Standards for their positions and those held while assigned to an incident.
- √ Identify, inform, and protect visitors, communities, park partners, and other groups and individuals that potentially would be affected by fire management activities.
- √ Comply with the National Wildfire Coordinating Group and agency medical standards and fitness requirements for staff and make sure staff has personal protective equipment appropriate to the job or assignment.
- √ Follow all aviation policies and practices during fire management activities. The fire management officer or designee will stay abreast of aviation policy changes by maintaining periodic contact with the regional aviation manager and the designated park Aviation Officer.

Goal 2. Reduce wildland fire risk to private and public property.

Objectives:

- √ Annually analyze fire hazards, fire values, and risks to inform project priority selection for fire management units (FMUs).
- √ Support the development of evacuation plans for wildland urban interface communities, where such plans do not exist.
- √ Develop prevention plans to reduce the number of human-caused ignitions.

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

Goal 3. Protect natural resources from adverse effects of fire and fire management activities, and use fire management wherever appropriate to sustain and restore natural resources.

Objectives:

- √ Manage ecosystems within the natural range of variability for plant community structure and fuel loads.
- √ Reduce potential spread of nonnative plant species to adjacent natural areas and ensure any fire activities include follow-up actions (planting, seeding, etc.) to meet overall vegetation goals. Ensure that any fill used and/or maintenance activities do not introduce weeds.
- √ Reduce nonnative trees and shrubs (Monterey pine, Monterey cypress, acacia, eucalyptus, etc.) to the greatest extent possible consistent with vegetation management objectives and to the extent that hazardous fuels are reduced.
- √ Protect and restore rare and endangered species and sensitive habitat through fire management activities and project implementation.
- √ Reduce erosion from fire roads and reduce sediment transport through ongoing maintenance of roads and the removal and site restoration of unnecessary fire roads.
- √ Develop standards for the use of water and retardants in fire management activities, such as minimization of the use of saltwater and brackish water, and avoidance of use of nearby water sources with rare species, for the protection of water quality and aquatic habitat characteristics.
- √ Identify and protect natural soundscapes through the course of mechanical treatment activities involving the extended use of power equipment.

Goal 4. Preserve historic structures, landscapes, and archeological resources from adverse effects of fire and fire management activities, and use fire management wherever appropriate to rehabilitate or restore these cultural resources.

Objectives:

- √ Survey for and identify historic resources within a project area in the earliest possible stage of planning fire management activity.
- √ Conduct surveys for areas of potential archeological resources (based on sensitivity modeling or prediction) prior to project implementation. Avoid ground disturbance prior to survey of sensitive areas for archeological resources. Protect archeological resources (known, predicted historical, or discovered sites).
- √ Develop standard procedures for projects calling for the use of fire and other treatments in order to maintain the setting of historic sites and to maintain the integrity of cultural resources.
- √ Regularly monitor fire management activities to assess their effects on cultural resources.
- √ Protect historic structures and landscape features through the course of fire management project implementation.

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

- √ Use fire management activities to preserve and in some cases to perpetuate historic vegetation patterns.
- √ Rehabilitate pastoral landscapes where fire danger would be lessened by the establishment of a lower fuel-loading plant community.

Goal 5. Refine management practices by improving knowledge and understanding of fire through research and monitoring.

Objectives:

- √ Monitor and evaluate the effects of fire and fuels management activities on park resources. Evaluate monitoring information to refine fire management actions and project objectives.
- √ Identify issues or missing information important to developing effective implementation of the park's fire and fuels management program.
- √ Continue ongoing inventory and baseline data collection to enhance existing resource information systems. Use vegetation maps, fire history maps, and other tools to develop risk assessments that will be used to identify and set priorities for appropriate treatments.
- √ Conduct research that will help park managers to understand fire regimes, refine prescriptions, provide data for fire behavior models, and effectively implement the fire management program.
- √ Research the role of fire in old-growth redwood forests.
- √ Conduct research into issues of Sudden Oak Death, and the potential of fire as a management tool.
- √ Determine how fire can be used to target nonnative plant species for eradication.
- √ Research the effects of fire exclusion.
- √ Determine how current fire frequency affects ecosystems with respect to the historic fire regime.
- √ Determine how post-fire recovery patterns may be used in restoration projects.

Goal 6. Develop and maintain staff expertise in all aspects of fire management.

Objectives:

- √ Implement annual program reviews for fire management office and personnel.
- √ Implement training plans for each employee to reach target qualifications for the positions in the fire management organization. Conduct annual training appropriate to instructor qualifications.
- √ Keep abreast of the latest developments and technology applicable to fire management.
- √ Establish and promote measurable qualifications and staff experience to accomplish fire management program objectives in a safe manner.
- √ Follow all safety standards and guidelines identified within the Interagency Incident Business Management Handbook.

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

Goal 7. Effectively integrate the fire management program into park and park partner activities.

Objectives:

- √ Develop a fire management program that is consistent with, and meets the goals of, the park's General Management Plan (GMP) and resource management plans.
- √ Encourage interdisciplinary pre-project planning for fire management activities.
- √ Plan for and conduct fire management activities in an integrated manner with respect for overall resource goals and in an effort not to exacerbate existing problems.
- √ Conduct educational outreach programs on the park's fire management activities and fire safety for park partners, including tenants in park structures within project areas.

Goal 8. Foster informed public participation in fire management activities.

Objectives:

- √ Continue and enhance communication and education programs to broaden an understanding of the NPS fire management mission, for both internal and external audiences.
- √ Maintain and expand the current park website to provide information about fire management activities in the park as well as fire safety.
- √ Support an increase in fire ecology and safety programs in schools.
- √ Increase public meetings and homeowners group presentations.
- √ Provide more interpretive programs on fire safety and ecology.
- √ Provide trailhead messages on fire safety.

Goal 9. Foster and maintain interagency fire management partnerships and contribute to the firefighting effort at the local, state, and national level.

Objectives:

- √ Maintain cooperative fire management agreements with county and city fire departments.
- √ Continue interagency coordination and cooperation with federal land management agencies and other related agencies supporting or participating as full partners in wildland fire management activities and programs.
- √ Attend interagency planning meetings prior to each fire season to enhance coordination and cooperation to maximize efficiency to manage wildland fire incidents.
- √ Continue participation in regular fire management coordination meetings to share information and discuss related issues with organizations such as FIRESafe Marin and Fire Safe San Mateo.

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

Goal 10. Minimize smoke generation during prescribed burning through the use of a smoke management plan (SMP) that details best management practices or non-burning alternatives where these options would meet resource management and fuel reduction objectives and also achieve emissions reduction.

Objectives:

- √ Confer regularly with Air Resources staff at the NPS Pacific West Regional Office, other parks, fire agencies, and the Bay Area Air Quality Management District (BAAQMD) to keep current on best management practices and non-burning alternatives.
- √ Maintain current information on smoke-related health issues affecting firefighters such as exposure limits, exposure monitoring, risk minimization, and respiration technology.

2.2 GENERAL MANAGEMENT CONSIDERATIONS**2.2.1 Legal Considerations**

The NPS is constrained from implementing fire management actions that do not comply with relevant federal laws, regulations, or policies. The most widely applied federal laws include the NPS Organic Act, the enabling legislation establishing GGNRA, NEPA, NHPA, the ESA, the Clean Water Act (CWA) and the Clean Air Act (CAA). NPS regulations and policies are developed on a national level in NPS Management Policies (2006) and the NPS Director's Orders addressing specific topics for example Director's Order 12 (Environmental Impact Analysis), Director's Order 18 (Wildland Fire Management), Director's Order 28 (Cultural Resource Management – *currently under revision*), and Director's Order 77 (Natural Resource Management - *currently under revision*). The Pacific West Regional Office generates policy guidance that applies to all national parks in the region. GGNRA issues policy guidance through "standard operating procedures" (SOPs) that only apply to the park and GGNRA staff.

2.2.1.1 Enabling Legislation

Congress established GGNRA by Public Law 92-589 "in order to preserve for public use and enjoyment certain areas of Marin and San Francisco Counties, California (San Mateo County added by P.L. #96-607)." In addition to providing for recreation and educational opportunities consistent with sound principles of land use planning and management, the NPS was also instructed to "preserve the recreation area, as far as possible, in its natural setting, and protect it from development and uses which would destroy the scenic beauty and natural character of the area."

2.2.1.2 Endangered Species Act

The Endangered Species Act (ESA), as amended, (PL 93-205, 87 Stat. 884, 16 USC §1531 et seq.) protects threatened and endangered species from unauthorized take and directs federal agencies to ensure that their actions do not jeopardize the continued existence of such species. There are approximately 1,300 species that found entirely or in part in the USA and its water that are listed or proposed for listing as threatened or

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

endangered under the ESA. Currently, 9 animal and 3 plant species as threatened or endangered under the ESA that occur on lands directly managed by GGNRA that could be affected by FMP projects. Further information on each of these species can be found in the GGNRA FMP Final EIS on pages 205 – 211.

Two federal agencies share responsibility for implementing the ESA -- generally, the USFWS manages land and freshwater species, while the NMFS manages marine and "anadromous²" fish species. As part of the NEPA process for the GGNRA FMP Final EIS, the NPS completed formal consultations with the USFWS and NMFS as required by Section 7 of the ESA. In signing the Record of Decision, the NPS adopted all the protective measures recommended by the NMFS and FWS to ensure that adverse effects to the listed plants and animals would be avoided. It is the responsibility of NPS staff to ensure these measures are followed as FMP projects are implemented.



California red-legged frog
by Marc Jennings

2.2.1.3 Clean Air Act

All GGNRA prescribed burns must be submitted to the Bay Area Air Quality Management District (BAAQMD) with a Smoke Management Plan for approval. The BAAQMD grants approval to the NPS to conduct burns based on air basin air quality and competing requests to burn submitted by other entities. Due to these extenuating circumstances, plans for burning may not always be approved for implementation if air basin conditions are poor or there are too many competing requests for approval to burn.

2.2.1.4 National Historic Preservation Act

The National Historic Preservation Act (1966), as amended, requires agencies to take into account the effects of their actions on properties listed in or eligible for listing in the National Register of Historic Places. The Advisory Council on Historic Preservation has developed implementing regulations (36 CFR 800) that allow agencies to develop agreements for consideration of these historic properties. The NPS, in consultation with the California State Historic Preservation Officer (SHPO), developed a detailed Programmatic Agreement for implementing FMP projects based upon an existing draft Department of the Interior Fire Management Plan Programmatic Agreement. The Programmatic



Murray Circle, East Fort Baker

² Anadromous fish are born in fresh water, migrate to the ocean to grow into adults, and then return to fresh water to spawn. In the FMP planning area, anadromous fish listed under the ESA are coho salmon and steelhead.

Agreement for the GGNRA FMP provides a process for NHPA compliance through stipulations for identification, evaluation, treatment, and mitigation of adverse effects of FMP actions which could affect historic properties. The requirements in the Programmatic Agreement are incorporated into the mitigation measures developed and adopted specifically for implementing FMP projects.

2.2.2 Jurisdictional Considerations

2.2.2.1 Direct Protection Areas (DPA)

The NPS has wildland fire protection responsibility for all federally owned lands inside the boundary of GGNRA. This makes federally-managed lands within the congressionally designated GGNRA boundary the Federal Responsibility Area or NPS - Direct Protection Area (DPA). The Northern Lands of GGNRA on Bolinas Ridge, managed under an agreement with Point Reyes NS are in the DPA of Point Reyes. The NPS has the financial responsibility, and the fire protection force to accomplish this. However due to the limited capacity of its protection force, Marin County Fire Department, San Francisco Fire Department, California Department of Forestry and Fire Protection, and other nearby fire agencies in Marin and San Mateo counties provide strong backup and reinforcement to any fire in or near lands directly managed by GGNRA.

2.2.3 TECHNICAL OR LOGISTIC CONSIDERATIONS

2.2.3.1 Limited Season for Effective Use of Prescribed Burning.

The normal weather window for prescribed burning at Golden Gate is from mid-April to November. Burning in grasslands should be conducted after the grasses have cured, which can be as late as early July. Summer and fall burns must be scheduled to take place between the dissipation of the morning coastal fog and the onset of strong afternoon sea breezes. Often the fog persists all day keeping much of GGNRA too wet for prescribed burning. The later months of the prescribed burning period, from late September until the first couple of rains in November, can be relatively fog free. Difficulties in scheduling prescribed burns still can occur because red flag conditions can develop quickly if the fuels moistures are already very low.

2.2.3.2 Risk-related Considerations

GGNRA has adopted a full suppression policy for all wildland fires, even those started naturally by lightning, due to high values at risk in the wildland urban interface. Consequently, there is no wildland fire use within GGNRA. Prescribed fires cannot burn overnight in GGNRA limiting the size of each prescribed burn unit to a size that can be successfully controlled within the normal burn window of a typical day. This precludes fire management strategies involving large-scale landscape fire restoration within the park.

2.2.3.3 Park Resources or Values Considerations

GGNRA has unique cultural and natural resources which affect the timing, location and layout of fire management projects. Recurring special events and the constraints of high year-round visitation by local visitors and tourists also require careful advance

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

planning. Some projects are modified from an optimal layout from the perspective of operational defensibility in order to avoid adverse impacts to viewsheds or privacy afforded by vegetation, especially on the park boundary.

Where sensitive resources are present within or near a project perimeter, GGNRA may be required to obtain additional permits from regulatory agencies, hold public meetings with homeowners associations, add staffing for prescribed burns, reduce smoke generation, or plan smaller burn units that incorporate buffers around sensitive resources.

2.2.3.4 Staffing Considerations

The NPS and interagency guidelines for prescribed burning require that all NPS prescribed burns have a Contingency Plan identifying “contingency resources” (such as fire trucks on stand-by) that must be available based on the prediction of a worst-case scenario (NPS 2006b, Chapter 10; USDA 2006). Resources may be requested from competing projects especially in the peak of the national fire season in the summer months when resources needed for prescribed burns are also needed for emergency fire suppression. According to the Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide, when specific contingency resources are identified for more than one prescribed fire, the local fire management organization(s) must evaluate and document the adequacy of all contingency resources within the area. The evaluation must consider: 1) Local, current, and predicted fire danger and 2) Local and regional wildland fire activities. Once a contingency resource is committed to a specific wildland fire action, it can no longer be considered a contingency resource for another prescribed fire project and a suitable replacement contingency resource must be identified or the ignition halted.

2.2.3.5 Funding Considerations

There are eight communities bordering GGNRA that are listed as federal “communities at risk from wildfire” under the National Fire Plan (Stinson Beach, Sausalito, Tamalpais & Homestead Valleys and Marin City in Marin County, the City of San Francisco, and the cities of Woodside, Daly City and Pacifica in San Mateo County). Communities are listed as “at risk” if they are within the wildland urban interface with federally managed lands. Each state, in cooperation with five federal land management agencies, originally submitted towns to be listed as communities at risk which were published in the Federal Register in 2001.

Currently, in California, the responsibility of adding or removing communities from the “at risk” list has been assigned to the California Fire Alliance by the Director of Cal Fire. Each September, the California Fire Alliance Board reviews application forms from individual communities requesting that they either be added or removed from the “at risk” list. The current communities at risk list for California, as well as the application form requesting a change in status, can be found on the California Fire Alliance website http://www.cafirealliance.org/communities_at_risk.

In 2003, the Healthy Forests Restoration Act (HFRA) provided communities with the opportunity to partner with federal agencies in planning and implementing fuel reduction

projects within the wildland urban interface with federal lands through the cooperative preparation of a Community Wildfire Protection Plan (CWPP). A CWPP identifies and prioritizes areas for hazardous fuel reduction treatments near federal lands and recommend the types and methods of treatment that will protect one or more at-risk communities and its essential infrastructure. The at-risk communities are so designated due to their proximity to undeveloped federal lands and the assumed high fire hazard these lands represent. A group of geographically-linked communities at risk may join together with adjacent federal land managers and local fire agencies to develop a strategy for hazard reduction through a CWPP. Communities with CWPPs in place are often given priority for funding of hazardous fuels reduction projects carried out under the HFRA and the National Fire Plan.

The 2007 Healthy Forests Report indicates that 46 states have identified and documented over 44,000 communities-at risk. Further, approximately 1100 CWPPs have been completed covering nearly 3000 communities; 450 additional CWPPs are being developed (USFS 2007).

2.3 WILDLAND FIRE MANAGEMENT OPTIONS

To accomplish FMP goals, wildland fires will be suppressed and prescribed fire will be introduced where appropriate for hazard fuel reduction and/or resource benefit. GGNRA, in accordance with NPS policy, uses Minimum Impact Suppression Tactics (MIST³) in all fire management activities. Mechanical fuel reduction projects will focus on Wildland Urban Interface areas and protection of park visitors, staff and sensitive natural and cultural resources. Mitigation measures addressing potential environmental impacts will be incorporated into site specific projects as assigned through interdisciplinary project review as required by the NEPA process completed for the FMP. Fire managers, in consultation with resource advisors, will balance the potential resource impacts of wildland fire with the potential impacts of fire suppression activities in choosing the appropriate management response to wildland fire and appropriate MIST techniques to apply.

GGNRA contains significant natural and cultural resource values. Values to be protected and their susceptibility to damage or loss by fire are discussed in more depth by Fire Management Unit (FMU), in Section 2.4 of this FMP and in Chapter 3, Affected Environment of the GGNRA FMP Final EIS. Resource management objectives drive strategies with the objectives of restoring and maintaining the naturally functioning ecosystems, restoring cultural landscapes and protecting sensitive resources.

Wildland fires at GGNRA are managed with supporting cooperation of local fire departments, state wildland firefighting organizations and federal land management agencies. This approach to wildland fire management involves partnership, cooperation and collaboration and is defined by the California Fire Protection Agreement and the

³ MIST is defined as the application of techniques that effectively accomplish wildland fire management objectives while minimizing the impacts to cultural and natural resources commensurate with ensuring public and firefighter safety and effective wildland fire control. Further information is provided in Section 3.2 and the MIST Guidelines are in Appendix E, Section 9.

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

California Fire Assistance Agreement. Cooperating fire departments include the Marin County Fire Department (MCFD), Southern Marin Fire Protection District, California Department of Forestry and Fire Protection (Cal Fire) and the North County Fire Authority (Northern San Mateo County). Cooperation with volunteer fire districts (Muir Beach and Stinson Beach) and homeowners associations is also critical and should be defined by locally developed agreements as well as the State Mutual Aid Agreement.

Along with other Bay Area Network Parks staff, the GGNRA Division of Fire Management provides technical assistance on fire management matters to two national park units in Contra Costa County on the east side of San Francisco Bay -- Eugene O'Neill National Historic Site and John Muir National Historic Site in Danville and Martinez, respectively. This relationship should be formalized by an inter-park agreement in the future. The network prescribed fire specialist is responsible for providing fuels management program advice to these parks.

2.4 ENVIRONMENTAL FACTORS INFLUENCING FIRE MANAGEMENT

2.4.1 Fire Regime and Fire History

2.4.1.1 San Francisco Bay Area Fire Regime

Five successive fire regimes have been identified for the Pleistocene era in the central California coast. The “management practices” or human influence on the landscape during last the last four eras have dramatically influenced the disturbance regime for this landscape, though to a lesser degree than change in climate.

Table 2 shows the changes in Bay Area climate over the last 128,000 years and summarizes the changes in the dominant vegetation. For central and northern California, pine is generally an indicator of cooler or glacial conditions, and oak is an indicator of warm conditions. Redwood is an indicator of increased moisture and moderated summer coastal temperature related to coastal fog, also related to coastal upwelling (Heusser 1998).

Table 2 -- San Francisco Bay Area Climatic Changes

Time Period	Climatic Characteristics	Dominant Plant Communities
128,000 – 28,000 BP	Much cooler than present	Conifers predominate
28,000 – 13,000 BP	Cold and dry	NA
13,000 – 7,500 BP	Warm and wet	Oaks begin to increase
7,500 – 2,900 BP	Warm and dry	Oak woodland, prairies, coastal scrub dominate until modern era
2,900 – 900 BP	Cooler	NA
900 – 625 BP	Warm and dry at end	Medieval Warm Period
625 – 500 BP	Current climate	NA
500 – 300 BP	Wetter and cooler	Little Ice Age
300 BP – present	Current climate	Nonnative plants introduced

Source: NPS, Pacific West Regional Office, 2004.

Note: BP = before present. NA = not applicable

Additional information on GGNRA Fire Regimes, Fire History, Climate and Fire Weather can be found in the GGNRA FMP Final EIS, pages 135 to 151 (November 2005).

Natural Fire Occurrence (128,000 to About 10,000 Years BP)

During the last 20,000 years, the Earth's climate underwent a dramatic transition from glacial to interglacial conditions, a change as large as any change during the past three million years. These climatic variations resulted in large biotic responses, including migrations of individual species and rearrangements of vegetation associations.

Prior to human settlement of central California, natural ignition sources for wildfire would be lightning or spontaneous combustion. Recent records of lightning strikes in the Bay Area show that fires could occur along the Marin coastline throughout much of the year, regardless of the high probability of dense fog. Without human intervention, it is thought that fire could linger in tree trunks for weeks, and reemerge under drier conditions; thus a fire could burn through the summer and fall until the rainy season began (Stuart 1987).

Native American Period (≈10,000 BP – 1775 AD)

There is increasing evidence that Native American land management practices, including the use of fire, caused cumulative and permanent effects in plant communities and species composition for many Bay Area vegetation types. Although information on their burning practices is scant, both the Coast Miwok and Ohlone peoples are known to have regularly burned extensive areas of coastal prairie, coastal scrub, marshlands, and oak woodland (Collier and Thalman 1996, Duncan 1992, Kelly 1978, Levy 1978).

Fire is thought to have been used as a tool for communication, driving game, security from human enemies and predators, improving the flow of springs, increasing productivity for grazing, increasing yield of food sources (acorns, grasses, forbs, tubers, bulbs, fruits, grains), controlling plant pests and diseases and removing competing conifers from oak woodland.

Fire management was more common in grassland, oak savannas, and ecotones of grassland and chaparral than in shrublands and forests (the latter two communities burning between 10 and 28 years on average). Sapsis and Martin (1994) estimated that fire burned from one half million to over 19 million acres of California's total area each year. The exact spatial extent of the influence of burning on the landscape is not known and has been debated. Still, the level of fire use necessary to maintain specific resources in conditions required by the various cultures suggests that extensive and very intensive burning would have been common in important vegetation types (Anderson and Moratto 1996).

Spanish-Mexican Influences (1769-1848)

Spanish and later Mexican settlement introduced year-long cattle and sheep grazing, burning, and cultivation that led to the extirpation of many native animal species and the further spread of nonnative plants. The rapid, extensive conversion of the landscape to nonnative annual vegetation was so complete that the original extent and species

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

composition of most native perennial grasslands are largely unknown (Burcham 1957, Holland and Keil 1995).

The move toward fire exclusion began early in California. The first law against starting fires was issued under Spanish rule in 1793 (Barrett 1935, Gordon 1977). It was aimed at halting Indian burning of grasslands that reduced the amount of forage available to Spanish horses and livestock. Ranchero owners burned coastal scrub, chaparral, and oak woodland to expand pastures. The rancho period, primarily under Mexican rule, was relatively short-lived (1822-1846), but it exerted such a strong influence on the landscape that the fence lines, roads, and vegetation pattern are still visible today. Within GGNRA, there were three ranchos in San Mateo County (Buri Buri, Corral de Tierra, and San Pedro), two in San Francisco (Laguna de la Merced and Cañada de Guadalupe, although the majority of the latter was in San Mateo County, and three in Marin County (Saucelito, Tomales y Baulines, and Las Baulines).

American Influences (1848-1945)

In this period, the large ranchos were subdivided into smaller farms, ranches, dairies and timber operations and a 1900-acre parcel in the Marin Headlands was sold to the Army. Beginning in the 1850's, fences went up, fertile marine terraces were tilled, and redwood and Douglas fir forests in Marin and San Mateo County were logged quickly and on a large scale. The entire Phleger property was logged and milled onsite 1852 to 1855. After redwood was removed, loggers focused on cordwood (oak, bishop pine, madrone, etc.). In some areas after the trees were cut, workers skimmed the soil for clay to make bricks (Fairley 1987).

Agriculture, farming, erosion control, landscaping and trade spread fire-adapted nonnative species changing the landscape and altering the fire regime. Eucalyptus was first planted in San Francisco Bay Area in 1856 (McClatchie 1902). Extolled for its qualities as a fast-growing timber species, eucalyptus became a widely planted for ornamental use, timber, and windbreaks. French broom (*Genista monspessulana*), Portuguese broom (*Cytisus striatus*), Scotch broom (*Cytisus scoparius*), and Spanish broom (*Spartium junceum*) all were introduced into California in the mid-1800s for landscaping and to control roadside erosion control. The ability of these plants to fix nitrogen, to produce copious amounts of long-lived seed, and to tolerate almost any soil condition allowed these species to grow rapidly and form dense stands, making regeneration of most native species difficult or impossible.

Wildland fires were frequent and large in the late 1800s and early 1900s (Perry 1984) preventing some grasslands from being invaded by brush. The Forest Reserve Act of 1891 introduced programs to control fire and grazing. By the 1880's, the State Board of Forestry was urging the public to support fire exclusion in forests to increase future wood production.

Modern Influences (1945-present)

Grazing by domesticated livestock and clearing of pastureland continued to be practiced until the 1960s (Burcham 1957). These practices had resulted in lighter fuel loading, especially near residential areas, markedly lowering the fire danger for the area. By

1990, explosive growth had filled in the central flats of the San Francisco Bay Area and agriculture had moved beyond the suburbs.

In general, disturbances by fire have gone from long intervals in the pre-human period to shorter intervals in the late Native American and Spanish-Mexican periods, moderate intervals in the early Anglo era, back to long intervals in the modern era. The altered fire regime has led to an increase in crown and surface fuels, increased tree density bringing high-intensity fires and higher fire frequency in some areas (which continued until 1940s), conversion of oak woodland to grassland, and the invasion of understory woody vegetation.

If current management strategies are continued indefinitely, it is difficult to predict where this change in fire regimes will ultimately lead, especially with the potential of future warmer and drier climate patterns resulting from global climate change. However, if warm, dry years become more common, as some suggest is likely (Fried et al. 2003, Union of Concerned Scientists 2002), the recent paradigm of large, severe fires would be expected to continue.

2.4.1.2 *San Francisco Bay Area Fire Regime Research*

Fire history can be reconstructed from a variety of data sources: tree-ring analysis (dendrochronology), cultural and historical accounts, written records, and the analysis of charcoal in sediment cores. Each of these data sources has its limitations in regards to spatial and temporal detail and accuracy.

Sunget and Martin (1984) studied the occurrence of lightning in the Marin coastal area and the potential for a fire start. Storms with lightning occurred 1.9 times per year at Mount Tamalpais in the years 1901 and 1908-1926. The weather station at this site indicates that 18 percent of these storms occurred in September coinciding with high fire hazard conditions.

Many researcher have studied the fire history in redwood and Douglas fir/hardwood forests in the Bay Area. A recently published analysis of tree ring fire scars in coast redwood forests in Point Reyes, Jackson State Forest (Mendocino area) and Redwood National Park finds that pre-20th century fire intervals ranged from seven to 20 years. It is thought that these forests experienced frequent, recurrent surface fires likely set by Native Americans (Brown, 2007). A recently published study of fire regimes of redwood forests in northern San Mateo County found an average fire return interval of 13 and 16 years for two sample sites in Huddart County Park, directly adjacent to GGNRA's Phleger Estate (Stephens and Fry, 2007).

Additional studies have been completed within the San Francisco Bay Area and are discussed in the GGNRA FMP Final EIS, November 2005, pages 147-150.

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

2.4.1.3 Recent Fire History in Marin and San Mateo Counties

Table 3 lists fires by date for the two counties, and Figures 3 and 4 show wildfire locations. Months are given when known. Table 4 presents a summary of GGNRA wildfire occurrences over the last two decades.

Table 3 -- Wildfire History of Coastal Marin and San Mateo Counties

Date	Description
1859 Sept.	Wildland fire, Mount Tamalpais, burned for three months.
1865	Woods of Marin along the shore of Bolinas Bay burned for two weeks.
1877	Area west of San Andreas Lake burned over large territory for more than three weeks.
1878	1,200-1,500 acres of chaparral, grass, and timber burned near Nicasio.
1880	Campers caused fires, burned 5-mile by 10-mile area in San Mateo County.
1881 Sept.	65,000-acre wildland fire burned for seven days, one fatality. Started near Blithedale Canyon, Mill Valley, by a man who set fire to a pile of brush.
1887	Fire spread from below San Andreas Lake to San Mateo Creek, burning 2,500 acres of second growth bay, oak, and madrone.
1889	On the ridge between San Andreas Lake and Crystal Springs Lake and two ridges west of San Andreas Lake. "For miles the hills are black and bare, the fire burned for at least 4 days spreading at least 1 ½ square miles a day."
1890 Oct.	More than 8,000 acres burned between San Rafael and Bolinas.
1891 June	12,000 acres of Mount Tamalpais burned; fire started in Bill Williams Gulch near Ross.
1892 Aug.	Fire started on Bolinas Road by two men cooking breakfast, spread over several hundred acres.
1893 Aug.	Fire thought to have been started by campers burned over 3,000 acres of Mount Tamalpais and Mill Valley.
1894 Sept.	Mill Valley fire originated from a campfire left by hunters started in redwood forest and "burned over a large stretch of country."
1904 Sept.	15,000-20,000 acres of grass and timber burned on the west side of Bolinas Ridge.
1913 July	On Mount Tamalpais, between 1,600 and 2,000 acres burned, from Rock Springs to Larkspur, including summit of mountain, Blithedale and Cascade Canyons, most of Fern Canyon, and spot fires beyond Muir Woods National Monument on the Dipsea Trail. Started west of West Point Inn at 10 A.M. probably by railroad sparks.
1919 Sept.	Fire started near Pipeline Reservoir, burned 40 houses on the ridge and stopped within 100 yards of Muir Woods.
1919	Fire swept from the hills above Sausalito, burned a hall, 5 stores, and 12 homes.
1923	Fire burned from Bolinas Ridge to within four miles of Fairfax, with a total size of 30-50 square miles.
1928	200 acres of brush burned around Fort Barry.
1929 July	"Great Mt. Tamalpais Fire," involving 2,500 acres of brush, forest, and grassland. Fire burned into Mill Valley from Fern and Cascade Canyons; 117 homes burned.
1929	A week-long fire around the town of Montara; completely burned down the town.
1931 Dec.	Illegal campfire in large group of charred redwoods in Cathedral Grove, Muir Woods.
1932 Nov.	Thanksgiving Eve Fire. Started at 10:25 P.M. in heavy grass 50 feet west of Panoramic Highway near Alpine Club. North winds spread it toward Muir Woods and Tourist Club. Sixty acres burned, including two acres of chaparral inside Muir Woods' boundaries.

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

Date	Description
1933 Dec.	Fires prohibited in Muir Woods; all fireplaces eliminated.
1945 Sept.	18,000-acre fire that began at the entrance to Carson Canyon (Kent Lake).
1946	Large intense fires in northern San Francisco watershed.
1959 July	2:53 A.M. fire report in Kent Canyon near logging operations on Brazil Ranch. No wind; burned 50 acres before being controlled by 75 men.
1965 Oct.	150 acre fire ¼ mile from Muir Woods, near southeast boundary.
1995 Oct. 3-7,	12,354 acres at Mount Vision in Point Reyes NS comprised of 11,598 acres NPS, 386 acres State Park lands and 370 acres private. Forty-eight structures destroyed; 1,200 firefighters participated, took 4 days to contain and 9 days to control fire.

Source: NPS, Pacific West Region, 2004.

Table 4 – GGNRA Recent Wildfire History

Area	Past Two Decades (1987-2006)		Past Decade (1997-2006)	
	Human-caused Fires (average per year)	Lightning Fires (Average per year)	Human-caused Fires (average per year)	Lightning Fires (Average per year)
All GGNRA Lands	7.5	0.15	8.5	0.2
GGNRA Marin County	4.15	0.05	4.8	0.1
GGNRA – San Francisco County	3.1	0.1	3.6	0.1
GGNRA – San Mateo County	0.25	0	0.1	0

Source: PWR GIS, 2007

2.4.2 CLIMATIC AND TOPOGRAPHIC INFLUENCES

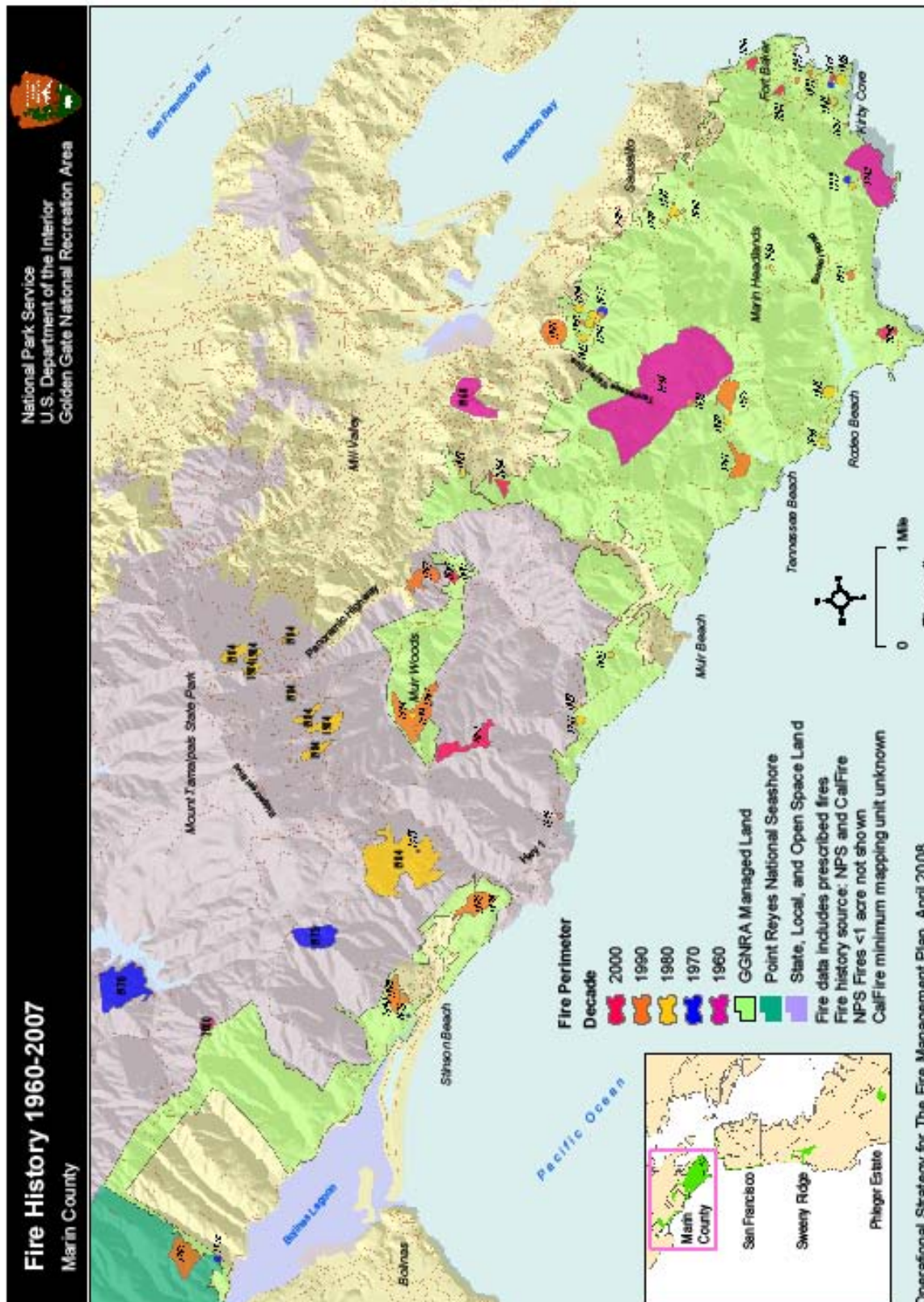
2.4.2.1 *Relative Humidity*

The average relative humidity of coastal California is high because of the frequent ocean winds and fogs. Dry northeasterly winds from the interior of the state bring fire weather to the Bay Area periodically during the fall, sending the humidity down to 20 percent.

In general, relative humidity is moderate to high along the coast throughout the year. Inland humidity is high during the winter and low during the summer. Since the ocean is the source of the cool, humid, maritime air of summer, it follows that relative humidity tends to decrease with increasing distance from the ocean. Where mountain barriers prevent the free flow of marine air inland, humidity decreases more rapidly. Where openings in these barriers permit a significant influx of cool, moist air it mixes with the drier inland air, resulting in a more gradual decrease of moisture. This pattern is characteristic of most coastal valleys (Golden Gate Weather Services 2002).

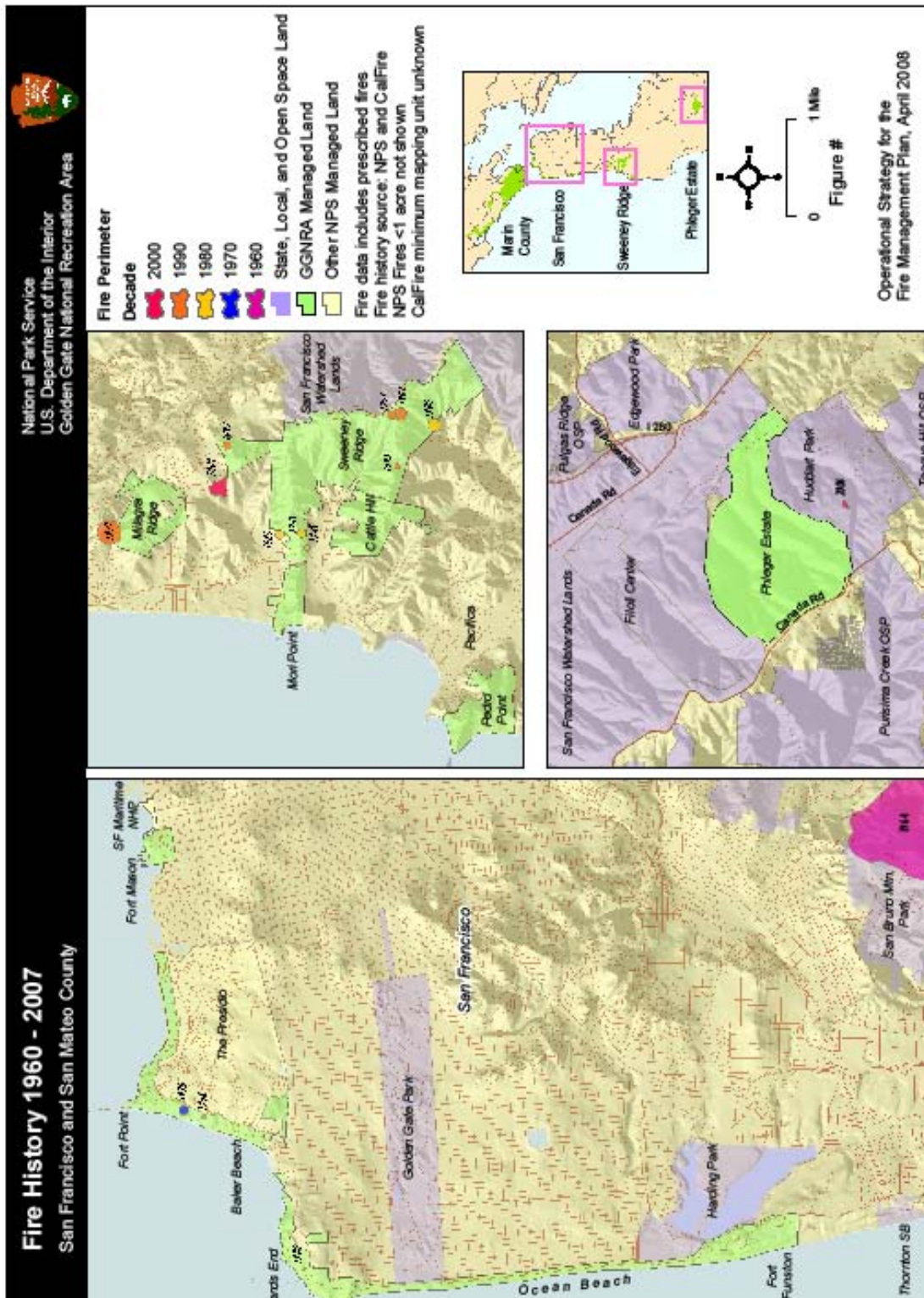
CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

Figure 3 – Locations of Historic Wildfires in Marin County



CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

Figure 4 – Locations of Historic Wildfires in San Francisco/San Mateo Counties

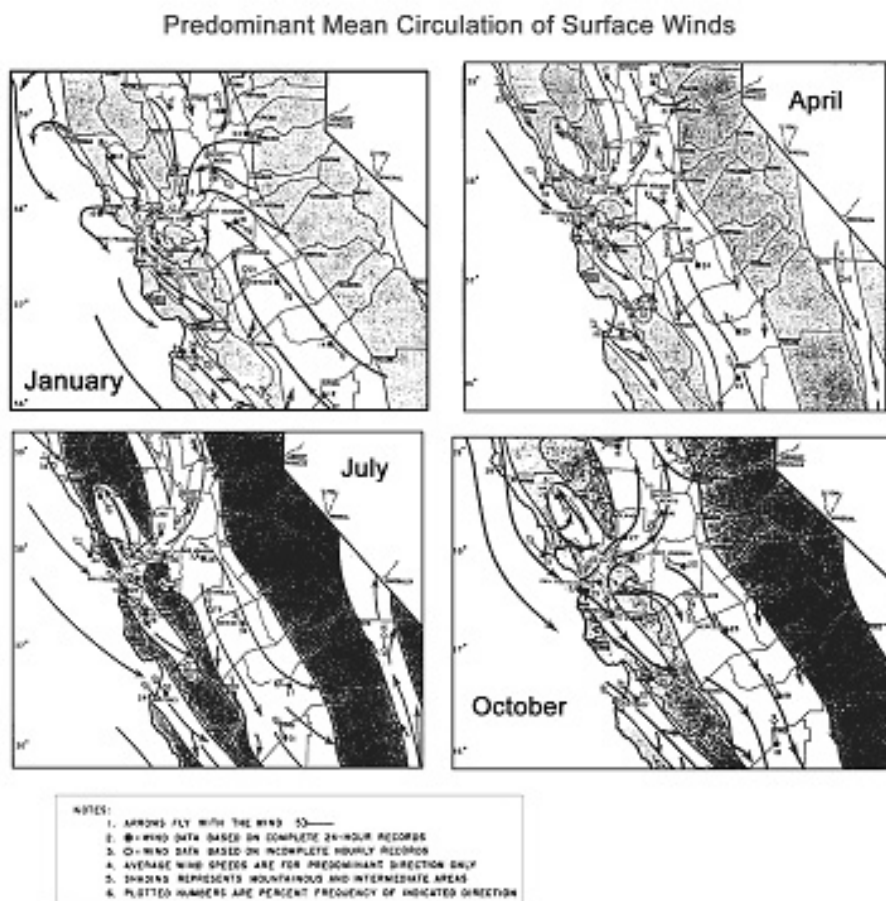


CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

2.4.2.2 Wind Patterns

California lies within the zone of prevailing westerlies and on the east side of the semi-permanent high-pressure area of the northeast Pacific Ocean. The basic flow in the free air above GGNRA is therefore from the west or northwest during most of the year. A local characteristic of the northwest wind alongshore is the creation of a jet effect around some of the more prominent headlands. Eddies form near the Golden Gate and just south of Point Reyes. Wind speeds in the immediate vicinity of these major headlands can be two or three times as great as the wind flow at nearby points (Golden Gate Weather Services 2002).

Figure 5 – Predominant Wind Patterns in Central California



Source: Bell 1958

The typical northwest summer wind is reinforced by the dynamics of the thermal low-pressure area located over the Central Valley and the southeastern desert area. In the San Francisco Bay Area, there is a marked diurnal pattern in the strength of the wind even though an onshore circulation tends to continue throughout the 24-hour period.

This helps to carry locally produced smoke away from the Bay Area, but creates problems for the regions immediately south and east of the source area.

When wind patterns shift from the prevailing pattern in the summer, winds can flow out of the Great Basin into the Central Valley, the Southeastern Desert Basin, and the South Coast. The result is high pressure over Nevada and lower pressure along the central California coast. The lower coastal pressure causes the hot interior air to be rapidly drawn to the west from the hot, dry interior. The winds are dry, strong, and gusty, sometimes exceeding 100 miles per hour, particularly near the mouths of canyons oriented along the direction of airflow. These interior winds are known as Diablo winds in the Bay Area, “northers” in the Sacramento and San Joaquin valleys, and Santa Ana winds in southern California (Golden Gate Weather Services 2002).

Figure 5 illustrates the predominant wind patterns in central California (Bell 1958). In the winter, the regional surface winds blow from the north-northeast. During spring and summer, stronger north-northwest winds dominate. These northwesterly winds are primarily caused and/or strengthened by the combination of high pressure offshore and the warmer air inland. During the fall transition, when warm easterly winds break through to the coast while inland conditions remain hot and dry, the coastal region faces its most significant fire threat.

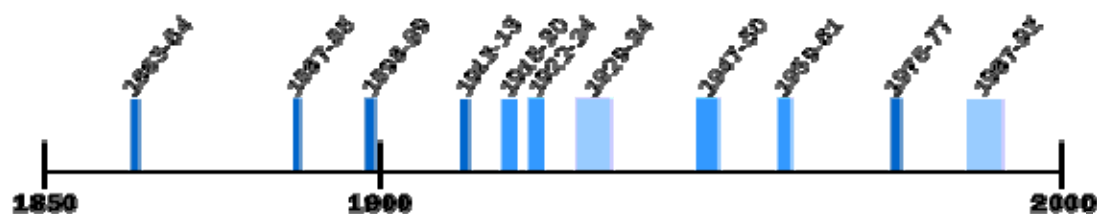
2.4.2.3 *Recurrent Drought*

One dry year does not normally constitute a drought in California. Droughts occur slowly, over a multiyear period. There is no universal definition of when a drought begins or ends. Areas most reliant on annual rainfall typically feel impacts of drought first.

Droughts exceeding three years are relatively rare in northern California, the area which is the source of much of the state’s developed water supply. The 1929-1934 drought years established the criteria commonly used in designing storage capacity and yield of large northern California reservoirs. Figure 6 compares the 1929-1934 droughts in the Sacramento and San Joaquin valleys to the 1976-1977 and 1987-1992 droughts. The driest single year of California’s measured hydrologic record was 1977. California’s most recent multiyear drought was 1987-1992.

Measured hydrologic data for droughts prior to 1900 are minimal. Multiyear dry periods in the second half of the 19th century can be qualitatively identified from the limited records available combined with historical accounts, as illustrated in Figure 6, but the severity of the dry periods cannot be directly quantified.

California sustained two epic drought periods, extending over centuries. The first epic drought lasted more than two centuries before the year 1112; the second drought lasted more than 140 years before 1350. Studies of epic droughts evaluated drowned tree stumps rooted in Mono Lake, Tenaya Lake, West Walker River, and Osgood Swamp in the central Sierra Nevada. These investigations indicate that California has been subject to droughts more severe and more prolonged than those evidenced by the brief historical record.

Figure 6 – California’s Historical Dry Periods, 1850-Present

Notes:

Dry periods prior to 1900 estimated from limited data.

Covers dry periods of statewide or major regional extent.

2.4.2.4 *El Niño and La Niña*

Under “normal” circumstances over the Pacific Ocean, trade winds rush toward the equator to replace rising sun-heated air and cause an upwelling of air off Peru. These winds are pushed farther west by a high-pressure zone over Tahiti and attracted by a low-pressure zone over northern Australia. During an El Niño episode, the situation is reversed, with a low over Tahiti and a high over Australia. The trade winds die, the upwelling stops, and the ocean surface warms up in the eastern Pacific. The jet stream over the North Pacific, which normally brings storms to Oregon, Washington, and British Columbia, moves south, picking up warmth from the warm-water bulge below, and drenches California (Gilliam 2002).

During severe El Niño episodes like 1982-1983 and 1997-1998, the Bay Area received more than twice its “normal” rainfall. Houses were destroyed by mudslides, bridges were washed out, and highways were blocked. Although El Niño events occur every four to seven years, they vary greatly in timing and strength. A mild El Niño will scarcely have any important effect, but a strong one can bring disaster. The outlook for El Niño episodes in the 21st century is uncertain. As global warming continues, increasing temperatures of both the air and the water, El Niño events may increase in frequency and intensity (Gilliam 2002).

The opposite of El Niño is the less well-known La Niña. La Niña occurs when trade winds are stronger than usual over the Pacific Ocean, pushing more sun-warmed surface waters westward, causing more upwelling off Peru, and further intensifying the oceanic currents of the northern Pacific Ocean (Gilliam 2002). The wintertime effect of La Niña in the Bay Area is likely to be colder, windier weather and perhaps abnormal rainfall in either direction, too much or too little (and sometimes neither), depending on the erratic location of the jet stream. If La Niña persists into the summer, stronger upwelling off the California coast brings more fog to the area (Gilliam 2002).

2.4.2.5 *Climate Change*

Surface temperature measurements recorded daily at hundreds of locations for more than 100 years indicate that the Earth’s surface has warmed by about 1 degree Fahrenheit in the past century. This warming has been particularly strong during the last 20 years, and has been accompanied by retreating glaciers, thinning arctic ice, rising

sea levels, lengthening of growing seasons for some, and earlier arrival of migratory birds (Union of Concerned Scientists 2004).

GGNRA winters will quite probably become warmer, windier and wetter during the next century (Fried et al. 2003, Union of Concerned Scientists 2004). Summers may well become warmer, though winter will become proportionally even warmer. El Niños may increase in intensity and/or frequency.

Changes in the timing or amount of precipitation over the next century are likely to have a greater impact than changes in temperature (Union of Concerned Scientists 2004). For example, increases in the amount of winter rains could change the extent and mix of plant communities, expanding grasslands will likely encroach on the foothill shrublands of the coastal ranges. In many cases, however, plant and animal species will not be able to shift northward or upslope because the potential habitat has been claimed by development or nonnative species, or contains unsuitable soils or other physical limitations.

The frequency and/or magnitude of wildfires, floods, and disease and pest outbreaks will likely change in coming decades. Fried et al. (2003) predict that these conditions will produce more intense, faster-spreading fires in most locations. Their model shows that, despite any enhancement of fire suppression efforts, the number of escaped fires (those exceeding initial containment limits) increased 51% in the San Francisco Bay Area. Area burned by contained fires could increase by 41%. Furthermore, Fried et al. (2003) predicted that fire return intervals in grass and brush vegetation types would be cut in half on average. Their reported estimates represent a minimum expected change, or best-case forecast. In addition to the increased suppression costs and economic damages, changes in fire severity of this magnitude would have widespread impacts on vegetation distribution, ecological condition, and carbon storage, and would greatly increase the risk to property, natural resources, and human life.

In August, 2006, the journal SCIENCE published the results of research conducted by Westerling *et al.* which concludes that global climate change has already increased the duration and intensity of the wildfire season in the western United States. They determined that, since 1970, the length of the wildfire season has increased by 78 days and the average burn duration of large fires has increased from 7.5 to 37.1 days. When examining wildland fires, between 1970 to 1986 versus wildland fires since 1986, Westerling *et al.* found a fourfold increase in major incidents and a six-fold increase in acreage burned. According to Westerling *et al.* four critical factors -- earlier snowmelt, higher summer temperatures, longer fire season, and expanded vulnerable area of high-elevation forests -- are causing the increase. During this period, spring and summer temperatures increased by ~0.9°C and mountain snowpack melted 1- to 4-week earlier. As a result, high altitude forests become combustible earlier in the year and remain in that state over a greater period of time due to sparse summer rainfall and low humidities. Look over the fire record for the recent past, they found that years with an earlier snowmelt (and a longer drier summer) had five times as many wildfires as years in which the snowpack melted later. According to the report in the August issue of SCIENCE:

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

The fires in Yellowstone Park in 1988 seemed to inaugurate this new era of major wildfires in the western United States. The fires lasted more than 3 months, burning 600,000 ha [~1.482 million acres] of forest, and -- despite the investment of \$120 million and deployment of 25,000 firefighters -- were only extinguished when snow began to fall in mid-September. The Yellowstone fires exemplify a common statistic of wildfires: Less than 5% of all wildfires account for more than 95% of the area burned. A small fraction of fires get very large and become uncontrollable despite human efforts to suppress them, regardless of money expended. Such efforts can cost more than \$20 million per day, and seasonal expenditures by governmental agencies in recent years have reached \$1.7 billion.”

An introductory article in the August 18, 2007 *SCIENCE* by S. Running, reports the results of seven general circulation models running future climate simulations for several different carbon emissions scenarios in preparation for the upcoming Intergovernmental Panel on Climate Change. The models all predict that June to August temperature would increase 2° to 5°C during the period of 2040 to 2069 in western North America. The models also predict that rainfall would decrease up to 15% during the same time period. If the increase was 3°, roughly between the highest and lowest predictions, the trend would show a spring/summer increase roughly three times the rate Westerling *et al.* determined for current trends. Wildfires in Canada and the western United States could increase by 74 to 118% in the next century.

2.4.3 Fire Weather

Post-frontal offshore flow can bring high fire danger to the Pacific Coast from British Columbia to southern California. The bulge of the Pacific High moving inland to the rear of a front produces offshore northeasterly winds (Fischer and Hardy 1976).

The fire season usually starts in June and lasts into October. Several synoptic weather types produce high fire danger. One is the cold-front passage followed by winds from the northeast quadrant. Another is similar to the east-wind type of the Pacific Northwest coast, except that the high is farther south in the Great Basin. This Great Basin High produces the foehn-type Diablo winds in the central Coast Ranges. Peak occurrence of these winds is in November, and there is a secondary peak in March. A third high fire-danger type occurs when a ridge or closed high aloft persists over the western portion of the United States. At the surface, this pattern produces very high temperatures, low humidity, and air mass instability (Fischer and Hardy 1976).

2.4.4 Prescribed Fire Windows

The approximate weather window for prescribed burns in grassland at GGNRA is from June to November. Burning can begin in some areas after annual grasses have cured, which does not normally occur until mid-June to early July. While areas with annual grasses generally have the most flexible burn windows in GGNRA, burns must still be timed to occur between the dissipation of the coastal fog and the onset of afternoon sea breezes.

In shrublands and forested areas, burning can be extremely difficult due to the narrow burning window from late September to early October when fuels dry out. Northeast wind events during this same timeframe can result in Red-Flag Days on which no prescribed or pile burning is allowed. “Burn days,” or days when burns would be in prescription, often do not coincide with weather conditions appropriate for burning in GGNRA, as on many of these days smoke dispersal would contribute to air quality problems.

2.5 GGNRA WILDLAND FIRE RISK/HAZARD VALUE ANALYSIS MODEL

2.5.1 Objectives

The GGNRA Risk/Hazard Value Analysis identifies and prioritizes areas of concern in the park due to the threat of wildfire. The products of the analysis are data and maps which will be used for fire management project planning such as prescribed burns and hazard fuel reduction. The analysis helps in prioritizing projects in order to meet objectives laid out in the fire management plan.

2.5.2 Analysis Area

The analysis area includes NPS lands managed by GGNRA, the Presidio Trust, PRNS and lands that will soon become part of GGNRA (i.e., Cattle Hill and Pedro Point). In addition, some lands outside of NPS jurisdiction were included such as Mount Tamalpais State Park and San Francisco Public Utilities Commission Peninsula Watershed. Lands outside of NPS management were included in the analysis because fuel model and other fire behavior input variables existed for these areas and their addition presents an overall perspective of fire risk, hazard, and values both within and surrounding NPS lands.

2.5.3 Methodology

A Geographic Information System (GIS) in combination with FlamMap fire and Asset Analyzer was used to analyze four variables consisting of fire risk (potential for ignition), fire hazard (potential fire behavior and crown fire), and values (potential loss due to fire, primarily the wildland urban interface). Asset Analyzer Arcview 3.3 extension was used to combine and weight the variables. Input variables were normalized from 0 to 100 (low priority to high priority) then weighted to define their contribution to the final output. The results were categorized into classes representing low, moderate, high areas of concern for fire management. The analysis does not address the ecological need to restore natural historic fire regimes. Instead, this analysis is intended to help direct fire

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

management projects (mechanical thinning, prescribed fire, etc.) for effective and cost efficient protection of highly valued resources.

2.5.3.1 Input Variables

Risk – potential for fire ignition

Fire risk was based on 26 years (1980-2006) of NPS historical fire ignition records. The assumption is that the greatest potential for future fire starts is related to where fires have historically occurred. A point density calculation was performed on the historical ignition locations to create a density of fire frequency throughout the analysis area. The result was a raster dataset consisting of fires/year/acre. The kernel method (radius 2000m) was used to create the density surface. Fire densities were then reclassified into low, moderate, high risk of ignition.

Fire Risk		
Fire Density (fires/year/acre)	Fire potential	Asset Analyzer Value
0 - 0.05	Low	33
0.06 – 0.28	Moderate	66
0.29 – 0.88	High	100

Hazard – potential fire behavior

Potential crown fire activity and fire line intensity as predicted by FlamMap fire modeling software were used as hazard variables in the analysis. FlamMap computes potential fire behavior based on spatial variables of elevation, slope, aspect, fuel model, canopy cover, tree height, canopy base height, and crown bulk density along with fuel moisture and wind direction variables.

In 2004, Fire ecologists, botanists, GIS specialists and local fire experts from GGNRA, PRNS, and the NPS Fire Program Analysis team convened to translate local vegetation types into fuel mode consistent with the Anderson framework (Anderson 1982). Fuels are any organic material (live and dead vegetation, litter, and duff) that may combust during a fire. Fuel models are a numeric description of the quantity and arrangement of fuels developed to allow easy input of environmental parameters and fuel characteristics into fire behavior prediction models. The fuel models used describe potential fire behavior for a given fuel loading (weight per area) and arrangement (surface versus crown fuels), which generally corresponds to a vegetation type (Rothermel 1972).

Vegetation maps from 1994 aerial photography were assigned fuel models based on the alliance-association vegetation type and field plot information. GGNRA and PRNS field crews measured vegetation and fuels during 2001-2002. Data collected to validate vegetation data was also used for the creation of the fuel model data including percent cover and height of each vegetation stratum ocularly measured at 1690 plots (Noonan 2003).

Table 5 -- GGNRA Vegetation Types and Fuel Model Types

Fuel Model Types with Predominant Vegetation Community	Fuel Model Acres	Composition of Vegetation Community by Fuel Model Type	Acres
1-Coastal Dunes	21	Coastal Dunes	183
1-Grassland	1,983	Fuel Model 1	21
2-Coastal Scrub/Chapparal	1,780	Fuel Model 5	8
4-Coastal Scrub/Chapparal	132	Fuel Model 8	154
5-Coastal Dunes	8	Grasslands	1,983
5-Coastal Scrub/Chapparal	623	Fuel Model 1	1,983
6-Coastal Scrub/Chapparal	4,991	Coastal Scrub/Chapparal	7,526
6-Douglas-fir/Coast Redwood	41	Fuel Model 2	1,780
6-Riparian Forest/Shrubland	8	Fuel Model 4	132
8-Coastal Dunes	154	Fuel Model 5	623
8-Douglas-fir/Coast Redwood	350	Fuel Model 6	4,991
8-Herbaceous Wetlands	92	Douglas-fir/Coast Redwood	1,556
8-Unclassifiable Vegetation	8	Fuel Model 6	41
8-Native Hardwood Forest	1,381	Fuel Model 8	350
8-Non-native Evergreen Forest	590	Fuel Model 9	924
8-Riparian Forest/Shrubland	328	Fuel Model 10	241
9-Douglas-fir/Coast Redwood	924	Herbaceous Wetlands	92
10-Douglas-fir/Coast Redwood	241	Fuel Model 8	92
10-Non-nat Evergreen Forest	9	Native Hardwood Forest	1,381
98-Water	45	Fuel Model 8	1,381
99-Built-up Disturbed (unburnable)	717	Nonnative Evergreen Forest	599
99-Unveg Shoreline/Outcrop (unburnable)	469	Fuel Model 8	590
Sum Acres	14,896	Fuel Model 10	9
		Riparian Forest/Shrubland	336
		Fuel Model 6	8
		Fuel Model 8	328
		Unclassifiable Vegetation	8
		Fuel Model 8	8
		Sum Burnable Acres	13,665

Source: NPS, GGNRA Fire GIS, GGNRA Fire Management Office, 2008.

Fire hazard was modeled for extreme conditions (97th percentile weather) using data derived from the Barnabe RAWS station. Corky Conover (NPS) analyzed historic data from the Barnabe Remote Automated Weather Station (RAWS) in Fire Family Plus (FF+) software program. The “G” model was used to obtain 97th percentile fuel moisture estimates for all fuels size classes. Barnabe RAWS is located in the San Geronimo Valley, east of Olema and may not represent weather conditions in all locations of GGNRA; however it was felt the data from this station is sufficient for fire planning purposes.

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

All wind directions were analyzed (1), and then only easterly wind directions (2), and finally all wind directions from the NW-SE in a clock wise manner (3). The lowest fuel moisture values from these three FF+ runs were used to create an initial fuel moisture file (*.fms) in the FARSITE program to use in the FlamMap model runs. Wind was modeled uphill at 7 miles per hour (mph). 97th percentile wind speed per Barnabe weather station is 15mph; however since FlamMap was set model winds uphill it was felt 15mph was too extreme to yield realistic results.

Initial fuel moisture percentages for all fuel models

1 Hr.	10 Hr.	100 Hr.	Herbaceous	Woody
2	5	8	30	93

FlamMap modeled output of fireline intensity (BTU/ft/s) was reclassified into rankings of low, moderate, high, and extreme based on the fire suppression guidelines (National Wildfire Coordinating Group 2004). Crown fire was reclassified into three rankings (unburned and surface fire, passive crown, active crown).

FlamMap potential fireline intensity

Fireline Intensity	Btu/ft/sec	Asset Analyzer Value
Unburnable	0 - unburnable	0
Low	1 – 100	25
Moderate	101 – 500	50
High	501 – 1000	75
Extreme	> 1000	100

FlamMap potential crown fire activity

Crown fire activity	FlamMap results	Asset Analyzer Value
Low	Unburned or surface fire	0
Moderate	Passive crown fire (torching)	50
High	Active crown fire	100

Values - values at risk from fire

GGNRA borders residential communities in San Mateo, San Francisco and Marin counties for approximately 40 miles. A wildland fire near this boundary could threaten homes and private property. The Wildland Urban Interface was used to delineate values at risk. Wildland Urban Interface is defined as the intermix of housing or developed lands with undeveloped lands. For the analysis a kernel method (radius 2000m) density calculation of tax parcel locations was reclassified into four categories ranking from low (rural) to high (urban). An attempt was made to eliminate parcels with no structures or housing units from the analysis using digital aerial photography from

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

2001 and 2004, however the data was not field verified. It was also assumed for the analysis that a parcel containing a structure represents one housing unit and does not take into account multiple-housing units such as apartment complexes. Developed GGNRA lands such as Capehart housing and Fort Cronkhite in the Marin Headlands were also classified as wildland urban interface.

Values at Risk (Density of developed lands)

Density description	Density	Asset Analyzer Value
Non-Wildland Urban Interface	Less than 1 unit / 40 acres	25
Rural	(1 unit / 40 acres) to (1 unit / 5 acres)	50
Intermix	(1 unit / 5 acres) to (1 unit / 1 acre)	75
Urban	Greater than 1 unit / 1 acre	100

2.5.3.2 Analysis using Asset Analyzer

Asset Analyzer is an Arcview 3.3 GIS software extension developed by the Southern Sierra Geographic Information Cooperative. Asset Analyzer applies a weighted sum to multiple variables in order to identify areas of high concern or priority. Input variables must be normalized on a scale of 0-100 (lowest priority to highest priority). Weighting the input variables allows a range of scenarios to be developed focusing on specific goals. For example, identifying areas of high fire behavior in relation to WUI or identifying areas prone to fire starts in relation to high fire behavior.

Asset Analyzer was run four times with different weighting schemes that emphasized different inputs. Asset Analyzer does not allow an input variable to be set at 0%; therefore 1% was used when a particular variable not to be considered in the analysis.

Input Variable Weighting for Asset Analyzer runs

Analysis Run	Risk of Ignition	Fireline Intensity	Crown Fire Potential	WUI Density	Variable Total
1. Equal Weight	25%	25%	25%	25%	100%
2. Fire Behavior Emphasis	1%	49%	49%	1%	100%
3. WUI/Crown Fire Emphasis	10%	10%	40%	40%	100%
4. Ignition Risk/Fire Behavior Emphasis	33%	33%	33%	1%	100%

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

2.5.3.3 *Model Results and Discussion*

Asset Analyzer offers the flexibility of emphasizing one or more of the input variables through the weighting process. Four results were presented to fire management for consideration when setting project priorities:

1. Equal Weighting of Variables – Weighting variables equally gives an overall estimate of ignition risk, fire behavior potential, and potential loss due to fire. It provides a broad picture of fire management areas of concern.
2. Fire Behavior Emphasis – Fireline intensity and crown fire potential give an estimate of fire control difficulty, likelihood of fire escaping initial attack, and fire costs.
3. Wildland Urban Interface and Crown Fire Emphasis – Crown fire in proximity to WUI is important for understanding the potential for extreme fire behavior and threats to human life and property and for estimating costs from a large fire.
4. Ignition Risk and Fire Behavior Emphasis – Likelihood of ignition in relation to potential fire behavior gives an estimate of potential fire frequency and fire control difficulty.

There is not a correct or ultimate input variable weighting combination that will yield a best or desired outcome. All four analyses will be considered when setting fire management priorities. It is important to look at each analysis and the weighting of each variable in order to understand what is driving the model. In order to understand why one area of the park falls into a particular category of “area of concern” versus another you need to look at the input variables – it could be close to WUI, could have high crown fire potential, a combination of variables, etc.

It is not surprising that portions of the park along the boundary rank higher in terms of the hazard model due to their close proximity to development and the fact that many of these areas contain heavy fuels, nonnative forest, and hilly terrain. Maps of the results of the analysis are represented in Figures 7 through 10.

Figure 7 –Value Model Input Variables: WUI & Fire Density

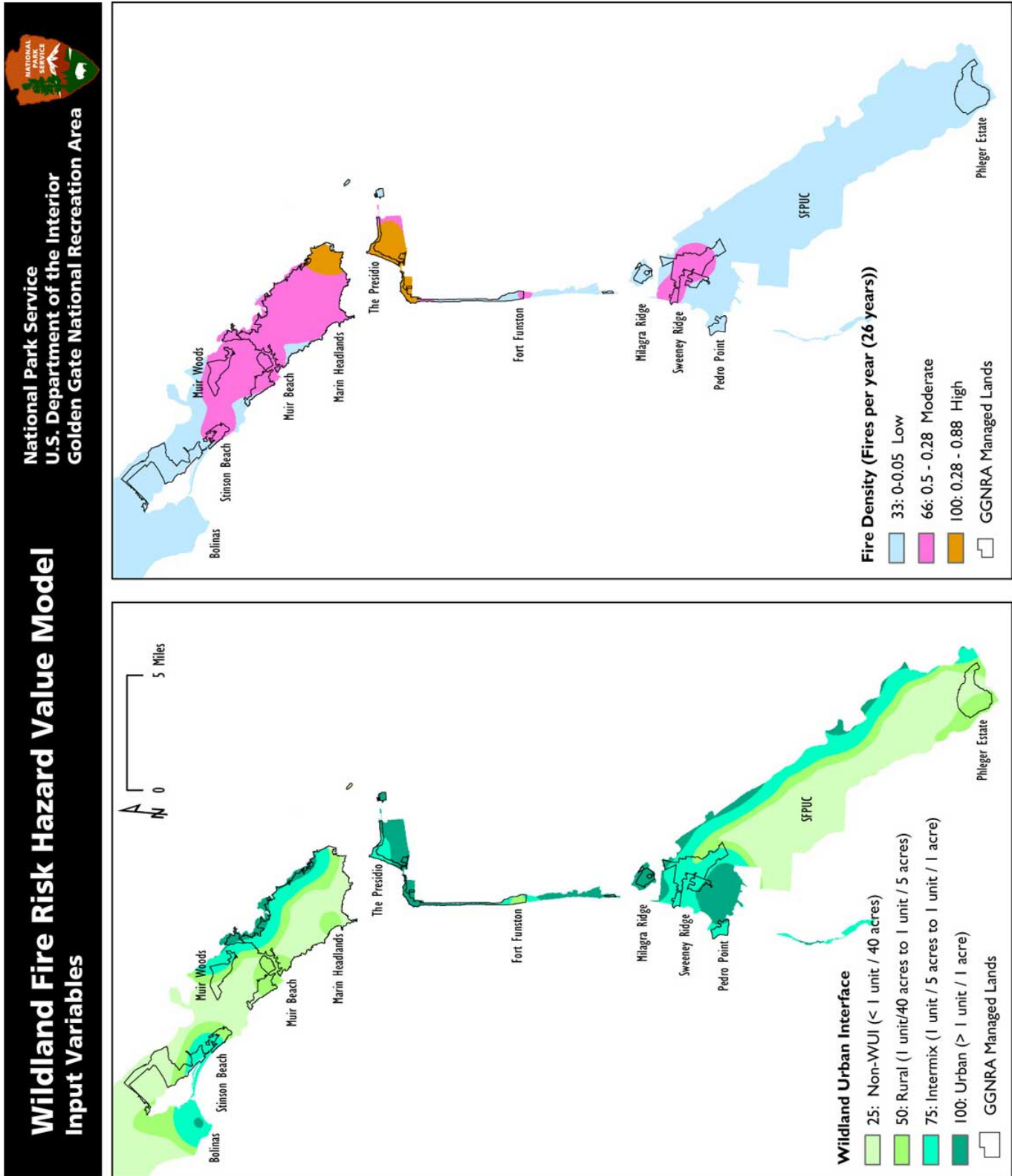


Figure 8 –Model Input Variables: Intensity & Crown Fire Potential

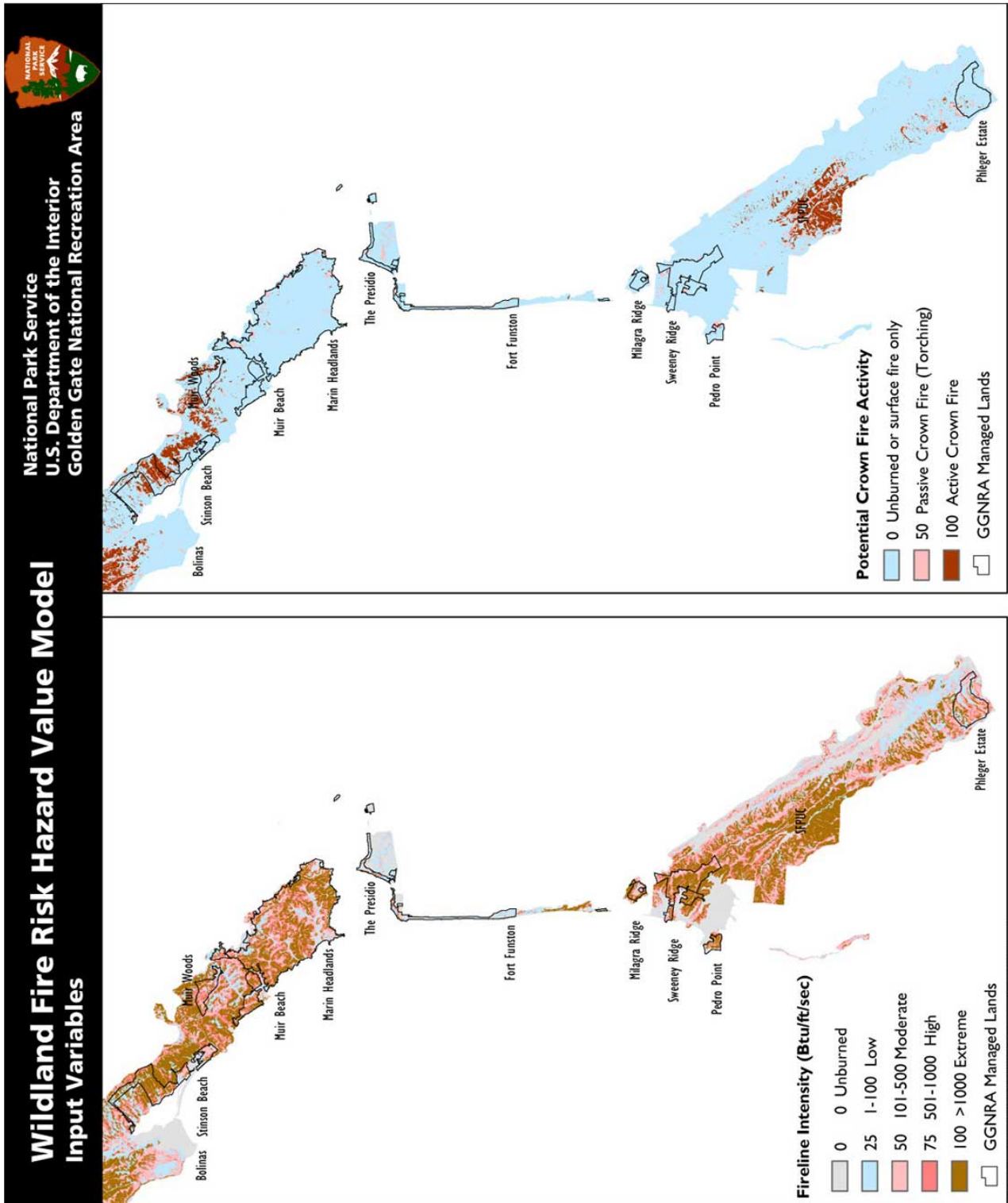
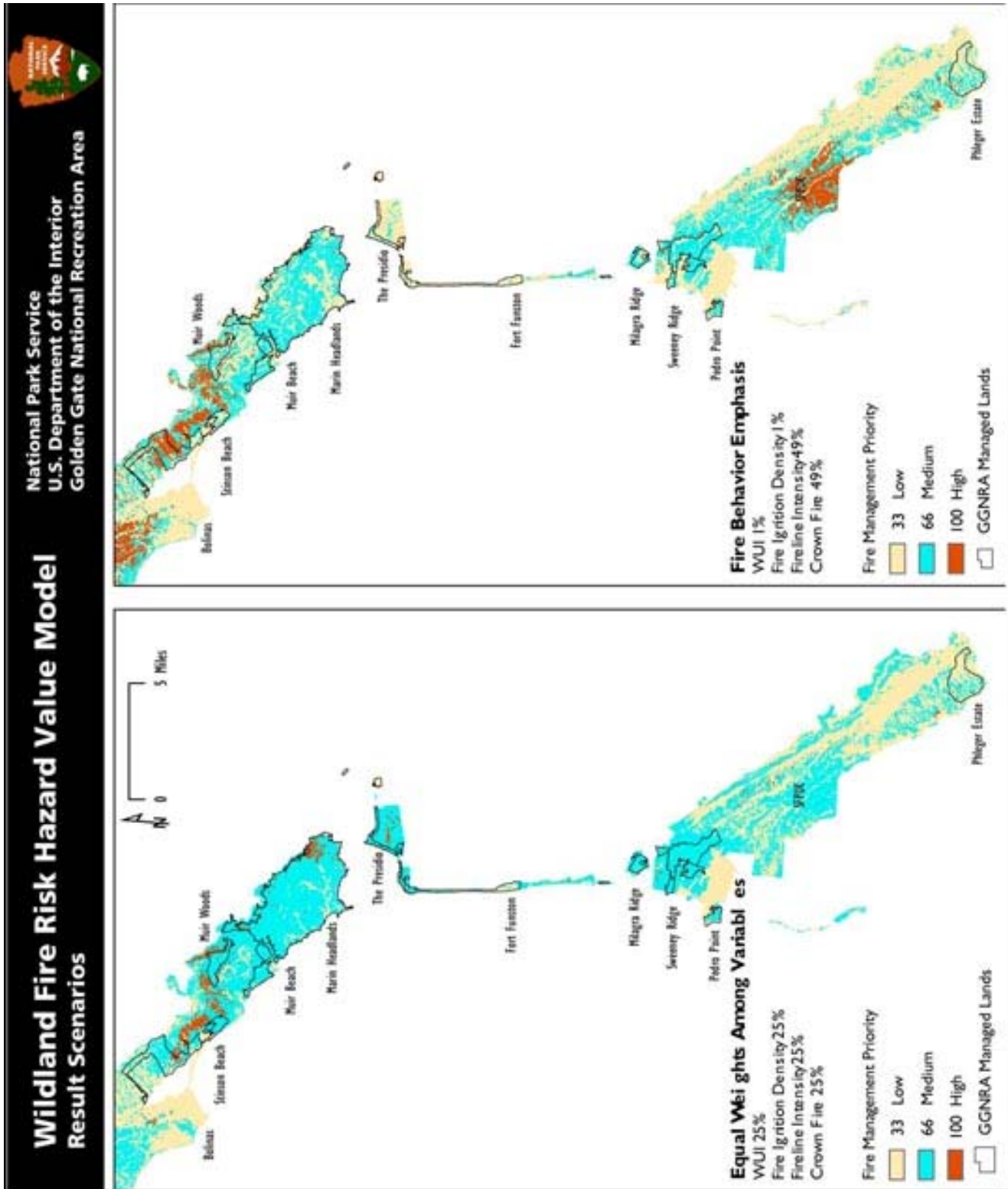
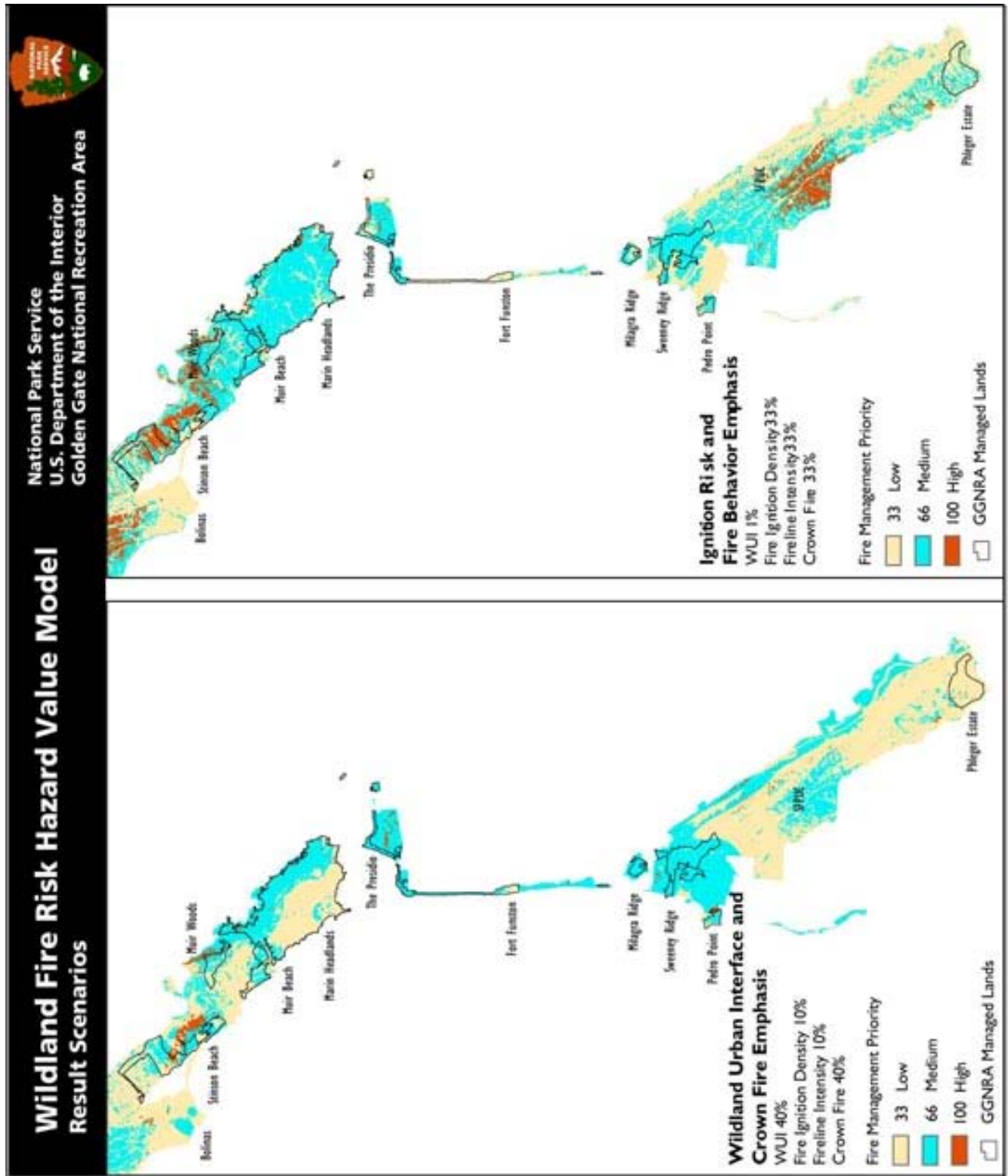


Figure 9 - Model Results: Equal Weight & Fire Behavior Emphasis



CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

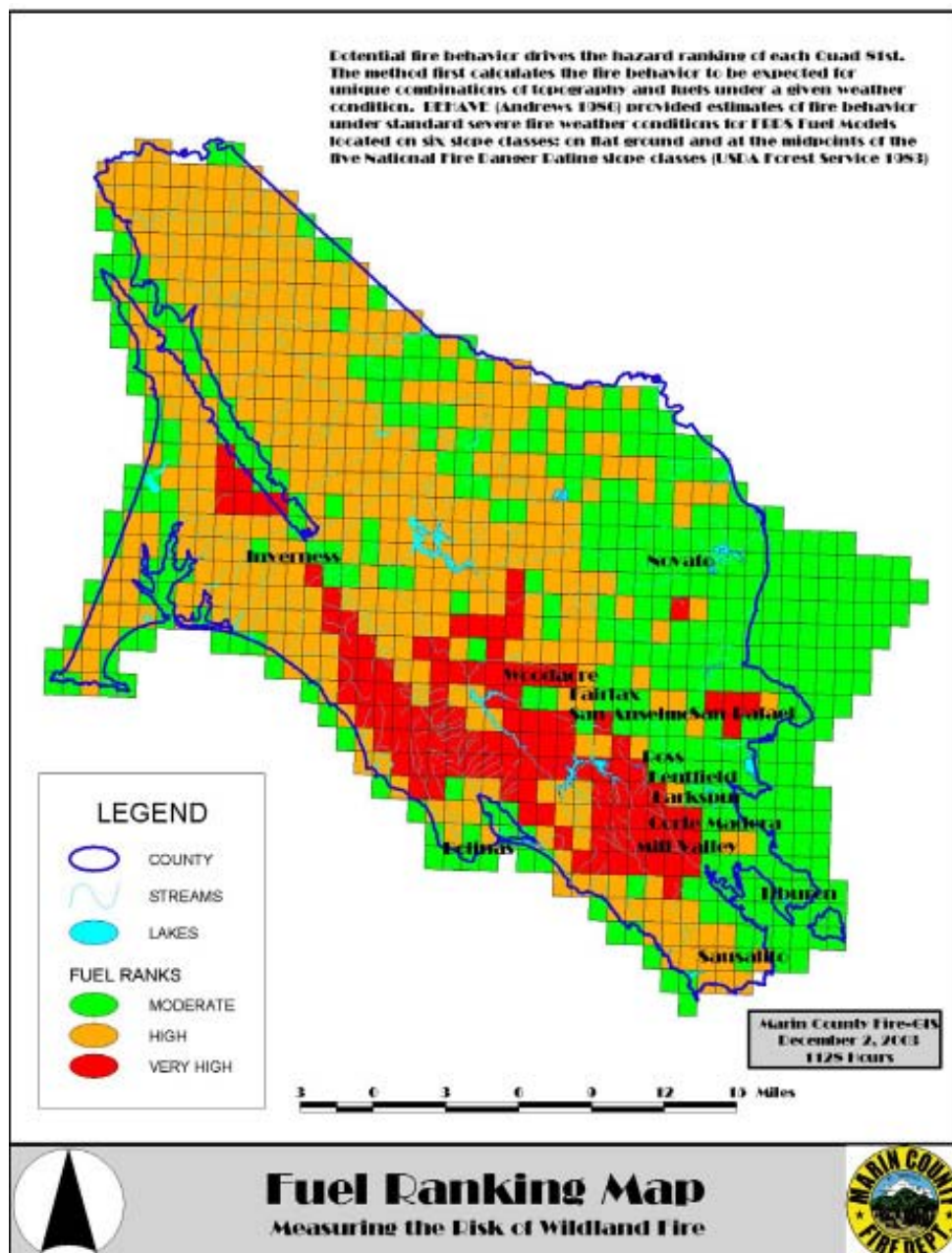
Figure 10 - Model Results: Crown Fire & Ignition Risk Emphasis



2.6 MARIN COUNTY FIRE DEPT HAZARD MODEL

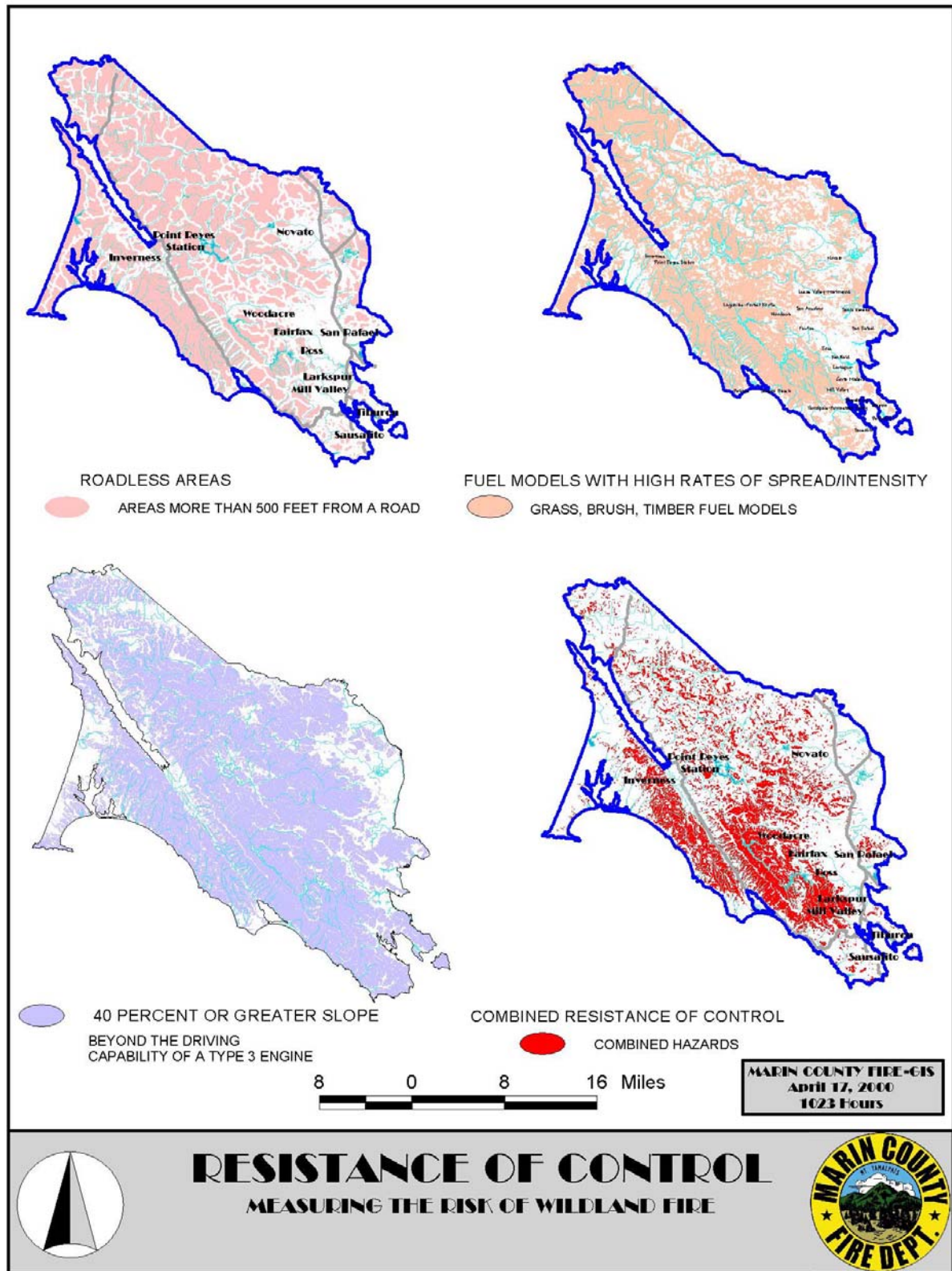
The Marin County Fire Department, using data provided by GGNRA Fire Management and GIS personnel, developed a wildland fire hazard model to identify the highest risk areas in the county. Fire behavior factors such as rate of fire spread and level of fire intensity, fuel type under extreme weather conditions (see Figure 11), was combined with variables such as slope, proximity to roads, etc. to map those areas of the county where it would be more difficult to control a wildland fire, denoting a higher level of risk. The results are shown in Figure 12.

Figure 11 – Marin County Fire Department’s Fuel Ranking Map



CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

Figure 12 – Marin County, Inputs Fire Department’s Fuel Ranking Map



2.7 CAL FIRE RISK ASSESSMENT FOR SAN MATEO COUNTY

To develop a wildfire risk assessment for San Mateo County, Cal Fire gathered data on vegetation type, fire history, fire weather history, level of service (distance to a fire station), slope, presence of ladder fuel, and crown closure. Much of Sweeney Ridge, Pedro Point and Milagra Ridge are rated as having high fuel loading. In addition, Sweeney Ridge is rated as having a moderate to high level of assets at risk overall combining public and private assets into one value. The Sweeney Ridge rating may stem from its proximity to the San Francisco watershed as the Ridge is given a lower risk rating when only residential structures are considered. An assessment of risk is often prepared to support recommendations for vegetation management projects to reduce the potential for wildland fire to spread. Of the Cal Fire vegetation management proposals, one – the South Firebreak -- is near GGNRA property. The South Firebreak is near the Phleger Estate; extending from Canada Road north of Woodside west along the PG&E right of way, ending at Skyline Boulevard (Highway 35).

2.8 STRATEGIC APPROACH OF THE FMP

FMP implementation is based on the following strategies:

- Reduction of hazardous accumulations of vegetation (fuels) in areas where these activities would have the highest likelihood of reducing the potential risk of wildland fire to lives and property;
- Enhancement of the conditions of natural resources (e.g., increasing abundance or distribution of habitat for threatened and endangered species; reducing infestations of nonnative plants; increasing native plant cover); and
- Protection or enhancement of cultural resource elements and values (e.g., burning would be used to reduce vegetation in areas that are identified as important historic viewsapes).
- Annually, a maximum of 275 acres would be subject to mechanical fuel treatments, and a maximum of 320 acres would be subject to prescribed burning. Under maximum annual achievement, acreage treated by county is estimated as shown below in Table 6.

**Table 6 – Annual Maximum Achievement
Distribution of Acres by County**

Treatment Type	County	Acreage
Mechanical Treatment	Marin	225
	San Francisco	10
	San Mateo	40
	TOTAL	275
Prescribed Burning	Marin	285
	San Francisco	<1
	San Mateo	35
	TOTAL	320

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

- Prior to each funding cycle, fire management and resource management personnel would review the past year's accomplishment, modify the coming year's project list as necessary, and develop a new "fifth year" implementation schedule for the five-year plan to maintain its long-range implementation focus. After modification, the annual program will be presented to the park's internal review processes to ensure regulatory compliance and conformance to the GGNRA FMP Record of Decision and Final EIS.
- The FMP will be reviewed annually to determine if course corrections are needed based on the prior year's experience, recent research findings or changes in the environmental, policy or regulatory setting. Changes proposed to the FMP will also be subject to the park's internal review processes.
- Mechanical treatments will be used to reduce hazardous fuel accumulations and to create and maintain defensible space and fuel breaks. Some areas may be mechanically treated prior to burning to increase the efficacy of the burn.
- The focus for prescribed burns will be: 1) enhancing ecosystem health by reducing invasive nonnative plant species; 2) fostering the restoration of native habitat; 3) rehabilitating cultural landscapes; or 4) reducing hazardous fuel accumulations. Prescribed burns would be conducted to approximate natural fire intensity and fire intervals to the extent possible while ensuring the protection of life and property.
- Prescribed burns intended for resource enhancement will initially be small and will be intensively researched during preparation and monitored during implementation. If research results indicated that ecological conditions improved after burning, the size of the burns can be increased. All prescribed burns would be conducted under specific burn plans in accordance with national fire policy requirements. Research topics may include:
 1. The effects of fire on management of nonnative plant species such as eucalyptus, Scotch/French broom, and Harding grass;
 2. The effects of fire on the species composition and fuel load of coastal grassland and scrub communities;
 3. The role of fire in Douglas-fir/coastal redwood communities and the effect of fire on fuel loading in these communities;
 4. The interaction between plant diseases such as sudden oak death (SOD) and fire; and
 5. The effects of prescribed fires and wildfires on plant and/or animal communities, including rare or sensitive species and their habitat.

2.8.1 GGNRA Fire Management Units (FMU)

An FMU is any land management area that can be defined by management goals and constraints, topographic features, access corridors, values at risk or values to be protected, political boundaries, fuel types, or major fire regime groups that set it apart from management characteristics of an adjacent unit. FMUs provide the framework for development of a wildland fire program. As directed by NPS Reference Manual #18 (NPS 2006b), each FMU should be unique as evidenced by management strategies, objectives, and attributes; should be consistent with management goals and objectives found in land and resource management planning documents; should avoid redundancy and should be kept to a minimum.

In developing the FMUs for GGNRA, staff referenced the goals of the FMP, area topography and hydrology, adjacent development density, and distribution of park resources and divided the planning area into three FMUs:

- Unit 1. Wildland Urban Interface FMU: areas around the park exterior adjacent to suburban development and developed areas within the park;
- Unit 2. Park Interior FMU: larger, more open and undeveloped tracts of the park relatively distant from built-up areas; and
- Unit 3. Muir Woods FMU: targeting Muir Woods National Monument and its unique natural setting, high visitation levels and its access limitations.

The distribution of the three FMU types across GGNRA-managed lands in the three counties is shown below in Table 7 and depicted in Figures 13 and 14. Nearly sixty-six percent of the area to be treated under the FMP is in Marin County. All of the lands in San Francisco County are in the WUI FMU while San Mateo County lands are split between WUI FMU lands near Pacifica neighborhoods and Park Interior lands primarily at Sweeney Ridge.

Table 7 -- Distribution of FMU Acreage by County

FMU	Marin	San Francisco	San Mateo	Total Acres
Wildland Urban Interface	2,524	923	1,479	4,926
Park Interior	7,910	NA	1,765	9,675
Muir Woods	552	NA	NA	552
Total Acres	10,986	923	3,244	15,153

Source: GGNRA Fire Management Office Data 2004.

NA = not applicable

2.8.2 Descriptions and Strategies of the FMUs

2.8.2.1 *Wildland Urban Interface FMU*

The Wildland Urban Interface (WUI) FMU includes those lands that border developed or “interface” zones and totals 4,926 acres. For the GGNRA FMP, the WUI zone is defined as any land within 1,200 feet of an urban/developed area. Where it made practical sense, the WUI FMU boundary was extended to include fire roads, trails, and jurisdictional boundaries. Many of the lands in the WUI FMU are in close proximity to values at risk (i.e., homes, infrastructure, etc.); have high hazard fuel loading and steep slopes, are exposed to dry, easterly winds during the fire season and have high visitation (and, correspondingly, an increased chance of ignitions).

The primary strategy in the WUI FMU is to reduce hazardous fuel loads through mechanical fuel reduction projects and prescribed burning targeted to complement the mechanical treatments. Prescribed fire would be available as a resource management tool, but restricted in its use and applied to answer specific research questions.

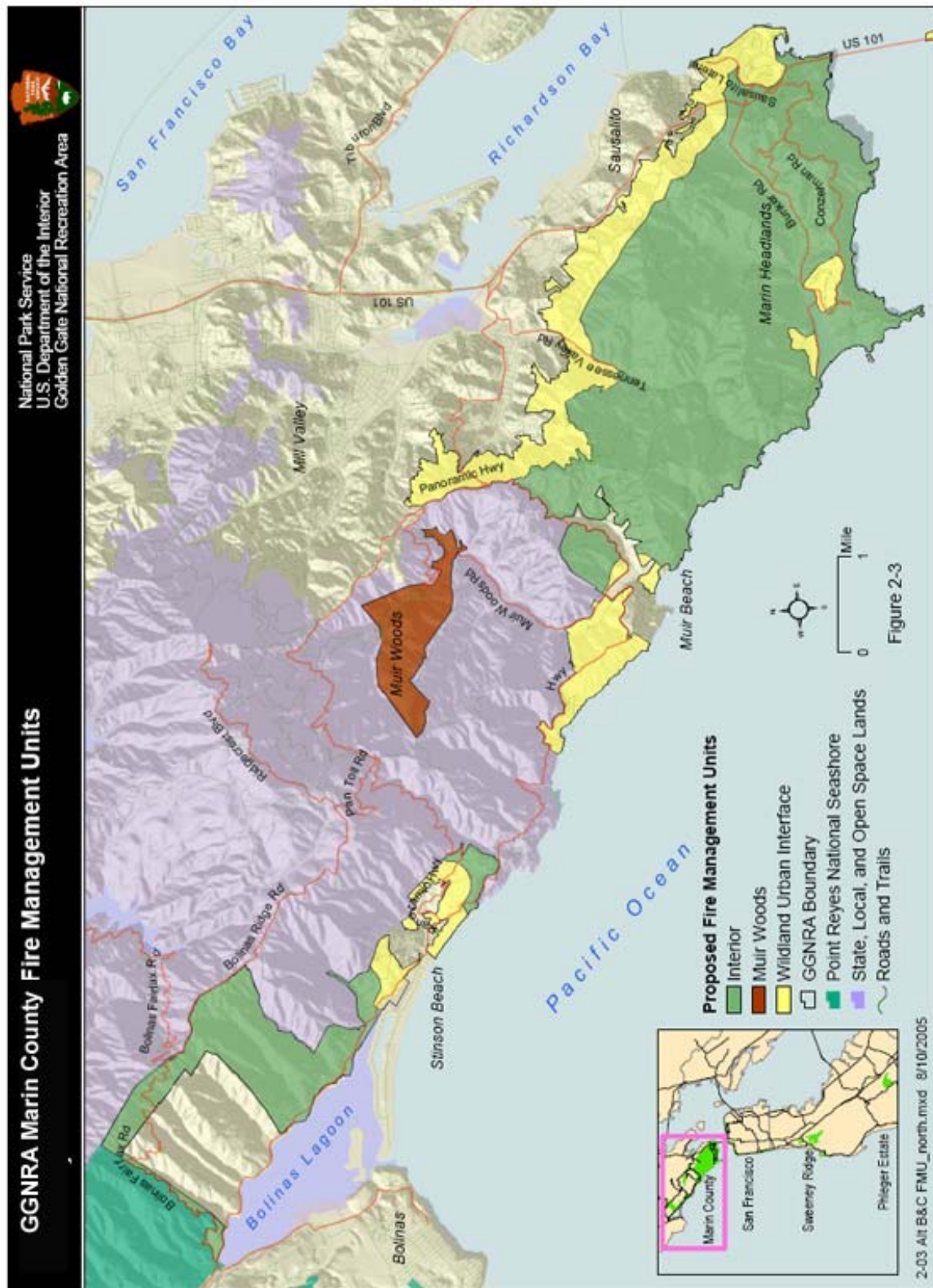
Examples of fire management treatments in this FMU would include:

- Removal of nonnative evergreen trees in most project areas where needed to achieve fire management objectives;
- Removal of nonnative evergreen trees that do not contribute to the historic setting and that are spreading beyond boundaries of the historic Forts Baker and Barry;
- Control and reduction of nonnative plant species in coastal scrub and grassland communities with mechanical treatments in combination with follow-up burning treatments in most project areas, and when possible, restoration and expansion of these native plant communities;
- Research prescribed burns to enhance Mission Blue Butterfly habitat;
- Limited research prescribed burns in the Douglas-fir/redwood community to reduce fuel loading at the Phleger Estate project area; and
- Research into prescribed burning for restoration of grassland communities.
- Reduction of hazardous fuel loading along the GGNRA boundary within close proximity to homes and other improvements which would prevent homeowners from meeting PRC 4291 addressing residential defensible space.

2.8.2.2 *Park Interior FMU*

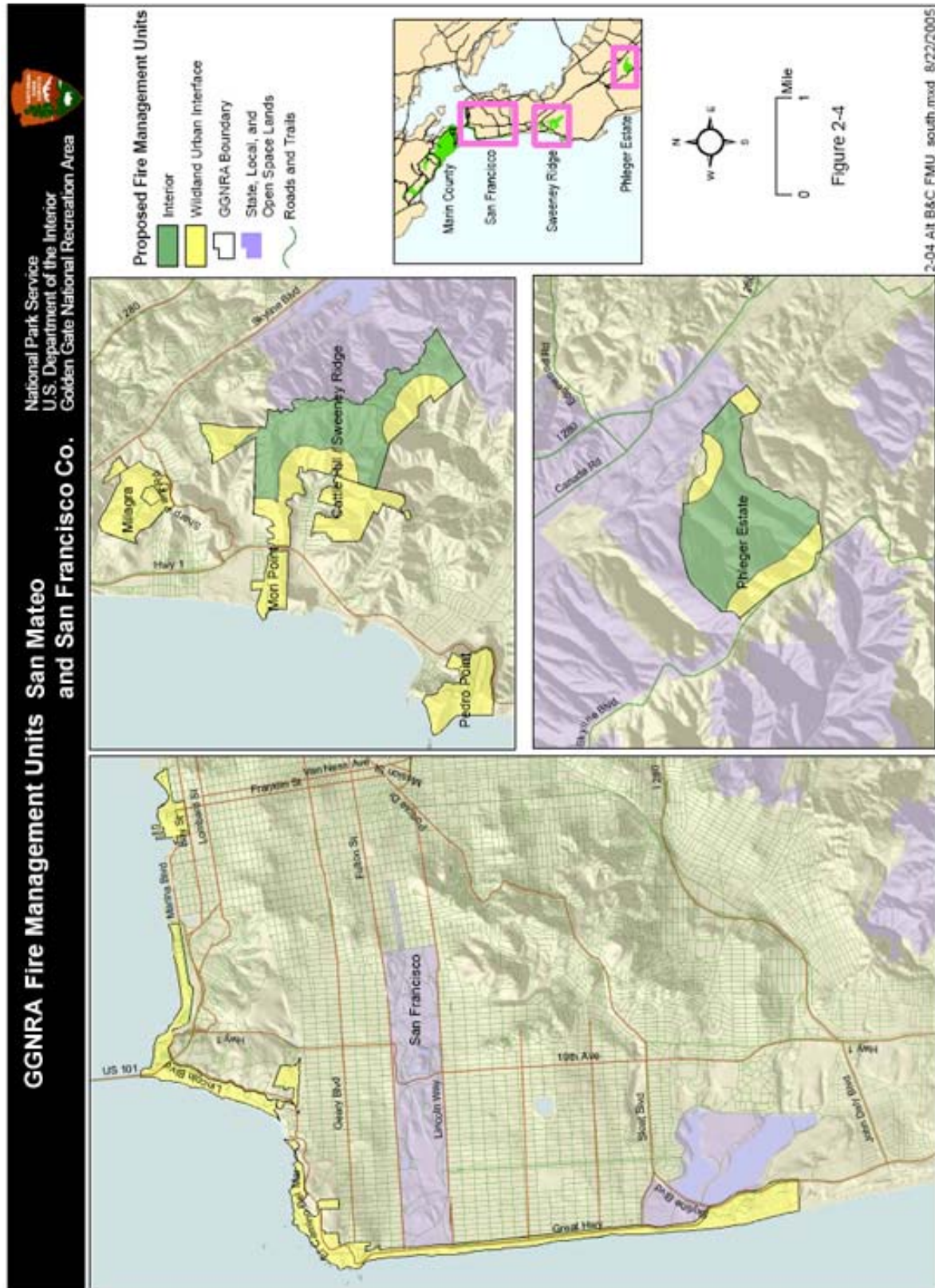
The Park Interior FMU is the largest FMU and is characterized by a lower probability of fire threatening structures and the potential to use prescribed fires to achieve some resource management goals. The park interior lands include larger expanses of natural areas and cultural landscapes, inclusive of ranching and farming lands, and contain relatively intact native plant communities and contiguous areas and corridors of wildlife habitat.

Figure 13 – Fire Management Units, Marin County



CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

Figure 14 – Fire Management Units, San Francisco & San Mateo Counties



All wildfires occurring in this FMU will receive prompt initial attack and subsequent aggressive suppression action.

Prescribed burns will be used reduce fuel loads and to implement natural and cultural resource management goals. Prescribed burn projects will take into account the vegetation type, restoration goals, and location and will have a strong research and monitoring component. Examples of the types of projects that would occur in this FMU include:

- Prescribed burns, including broadcast burns, to manage nonnative perennial grasses;
- Research burns, and potentially broadcast burns, for management of coastal scrub communities in the Marin Headlands;
- Research into use of fire for managing Sudden Oak Death syndrome in key locations;
- Use of some prescribed fire, including broadcast burns, for management of Harding grass and broom in the coastal scrub and grassland communities in Tennessee Valley.
- Mechanical treatment to reduce fuel loading and resistance to control of wildland fire starts along roads and near sensitive resources and historic properties.

2.8.2.3 *Muir Woods FMU*

Muir Woods National Monument is a separate FMU due to the area's unique values at risk (first-growth redwoods), the area's high visitation (and consequent ignition potential), and a successful and ongoing fire management program.

The management priority in the Muir Woods FMU is the protection of the pristine character of the National Monument. Many species contribute to the ecosystem in and around the Monument and this diversity calls for a variety of prescription parameters. The buildup of fuels in close proximity near residential development east of Panoramic Highway in Homestead Valley increases the risk of wildland fire. The exclusion of fire from the Monument over most of past century and a half has perpetuated and increased the likelihood of higher-intensity fires to occur. Prescribed fire will be used in the redwood/Douglas-fir forest to restore the role of fire to this ecosystem. Prescribed fire may also be used for management of nonnative species, such as in the Conlon Avenue area near the maintenance yard.

A fire chronology based on fire scar examination was done for two redwood (*Sequoia sempervirens*) forest sites in Marin County (McBride and Jacobs 1978). Fire frequencies averaged 21.7 and 27.3 years. The difference between the two sites was attributed to the increased influence of fog (Jacobs et al. 1985). The short interval is thought to be an artifact of Native American burning. Natural fires would ignite and burn through sections of the forest, cleaning out undergrowth, dead and down material, and litter on the forest

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

floor. The beneficial effects of this process were numerous in that nutrients were released into the soil, forest density was regulated, fire-dependent species were provided with a favorable environment for reproduction, and wildlife was provided with more favorable habitat. Redwoods themselves require bare mineral soil to reproduce successfully from seed after the passing of a fire. Conversely, pests and pathogens find conditions generally less favorable.

The interruption of this ecological cycle through 150 years of fire suppression has produced visible deleterious effects. The buildup of dead and down material on the forest floor and the density of undergrowth create conditions favorable to catastrophic fire. Increased amounts of fuel produce fires that burn faster, hotter, and with greater intensity. Control becomes more difficult and the likelihood of adverse ecological effects such as mortality in mature trees is increased.

The existing fire hazard can be illustrated by the Ben J. Fire of June 13, 2001, which may have been started by an illegal campfire. The fire burned on the slopes west of Redwood Creek and the Hillside Trail and south of the Ben Johnson Trail. NPS staff responded quickly and was able to contain the fire. If this fire had occurred in late summer/early fall, during the height of the fire season, it would have been much hotter and spread faster, posing a significant threat to the first-growth redwood groves.

The NPS reintroduced fire into the ecology of Muir Woods National Monument during the second half of the 1990s under the 1993 FMP. Three burns were conducted in the redwood/Douglas-fir forest. In 1996, the nine-acre Upper Deer Park prescribed burn between Deer Park Fire Road and the Dipsea Trail was conducted to serve as an anchor point for future suppression efforts and as a starting point for future burns. In 1997, the Deer Park 2 prescribed fire (52.5 acres) was completed, and in the following year in 1998, the Johnson prescribed fire (35 acres) was conducted on neighboring forested units. Two prescribed burns in the Conlon Avenue area at the lower end of Camino Del Canyon were completed in 1997 and 1999 (20 acres each) in order to reduce nonnative broom species in these grassland areas. Several other burns were planned but not executed. The California Department of Parks and Recreation conducted several burns around the FMU to create fuel breaks and manage nonnative plant species.

The objectives for the fire management strategy in the Muir Woods FMU are to:

- Restore the role of fire in the relevant vegetation communities;
- Reduce fuel loading and the threat of catastrophic wildfire; and
- Further study fire effects in old-growth coast redwood forest.

Strategies recommended for the Muir Woods FMU include:

- Prescribed burning to reduce fuel loading.
- Prescribed burning to reintroduction fire as a component in the FMU's fire-adapted plant communities.

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

- Small-scale mechanical fuel reduction projects, such as construction of shaded fuel breaks and understory thinning, to reduce the risk of a high-intensity fire.
- Mechanical fuel reduction treating roughly 5 acres annually. In woodlands hard hit by sudden oak death (SOD), thinning could be used to reduce standing snags and ladder fuels and to remove smaller-diameter trees.
- Mowing alone or followed by prescribed burning to control nonnative species. Mowed brush would be left to cure in place followed by prescribed fire.
- Prescribed burning to research the relationship between fire and SOD and to limit or control French broom in the Conlon Avenue area.
- Use of established trails, roads, and natural features as much as possible as fire control lines to limit disturbance to soil and subsurface cultural resources.
- Design all burn preparations and operations to minimize impact to FMU resources to the greatest degree possible.
- Post-burn rehabilitation will be planned in advance as part of a prescribed burn.
- Annual acreage of prescribed burning would range from small 0.5-acre research burns up to the annual maximum of 50 acres.
- Annual maximum of mechanical clearance of 5 acres includes clearing defensible space around park structures and treating areas of nonnative plants.
- Expansion of the public education program to support prescribed burn projects. Current interpretive opportunities at Muir Woods include school and public programs on fire ecology, a self-guided walk on fire ecology, a public display on fire ecology and control burning, a fire wayside exhibit, and placement of the fire weather station and interpretive information in an area visible to the public.

2.9. GGNRA PROJECT AREAS

The three FMUs are further broken down into a total of 17 project areas, to allow a finer level of understanding of existing resource values, vegetation and fire management conditions, treatment options, and management objectives specific to the referenced park area. It is the project areas that form the framework for planning the five-year implementation program. Project areas are delineated logically by practical and geographical boundaries such as roads and trails, watersheds, park boundary, and buffers from urban development (see Figures 15 and 16). Table 8 shows the park's acreages and vegetation classification by project area. The following descriptions of the 17 project areas are sorted by county.

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

2.9.1. Marin County Project Areas**2.9.1.1 Alta Project Area**

FMU: entirely within the WUI FMU.

Extent: Bordered on the northeast by Marin City and Sausalito, on the southwest by the Alta Trail, and on the southeast by the Wolfback Project Area.

Vegetation: More detailed mapping on this area is needed. Vegetation types include coastal scrub/chaparral, native hardwood forest, and nonnative evergreen forest (primarily eucalyptus).



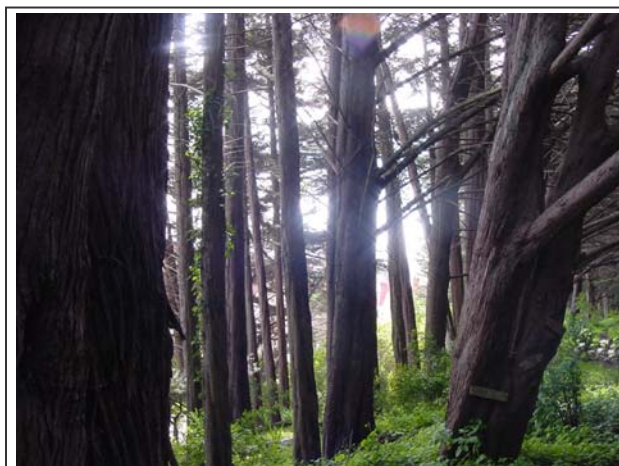
Special Resources: The project area has mission blue butterfly habitat.

Fire Management Issues: 1) large stands of nonnative evergreen forest adjacent to residential areas in Marin City and Tamalpais Valley, and 2) needed fuel reduction on fire roads, eliminating stands of broom and other nonnative vegetation and fostering the conversion to grassland and native scrub.

2.9.1.2 Fort Baker Project Area

FMU: entirely within the WUI FMU.

Extent: The project area includes the Fort Baker cantonments, the Bay Area Discovery Museum, the future Fort Baker Retreat and Conference Center, the U.S. Coast Guard station, the north anchorage of the Golden Gate Bridge and the Vista Point viewing area. It is bordered by San Francisco Bay to the east and south, Sausalito to the north, and the Marin Headlands project area to the west. The most developed areas of Fort Baker are those closest to the Bay.



Vegetation: a mix of coastal scrub, grasslands, oak woodland, and nonnative forests.

Special Resources: The project area contains important mission blue butterfly habitat.

Fire Management Issues: (1) dense stands of nonnative trees that have expanded beyond the historic landscaping boundaries are a fire hazard putting nearby historic structures at risk; (2) need to reduce fuel loading in the Highway 101 and Alexander Avenue corridors; and (3) reduction of fuels to improve defensible space around buildings and below the High Vista neighborhood.

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

Table 8 – Acres of Vegetation Type by Project Area

Table 3-10: Acres Within Each General Vegetation Class By Project Area

Project Area	FMU	County	Acres	Developed	Coastal Dunes	Coastal Scrub/Chaparral	Douglas-Fir/Coast Redwood	Grassland	Herbaceous Wetlands	Native Hardwood Forest	Nonnative Evergreen Forest	Riparian Forest/Shrubland	Unvegetated Shoreline/Outcrop
Alta	WUI	Marin	153			55				60	38		
Fort Baker	WUI	Marin	178	75		34		26		12	31		
Homestead Valley	WUI	Marin	166			94		23		44	5		
Marin Headlands	Park Interior	Marin	3,667	202	30	2,230	3	785	53	11	92	116	145
Milagra Ridge	WUI	San Mateo	245	10		204		23			3	5	
Mori Point	WUI	San Mateo	110	3		15		79	3			2	8
Muir Beach/Green Gulch	WUI/Park Interior	Marin	1,202	15		905		208	4	3	11	25	31
Muir Woods National Monument	Muir Woods	Marin	558	6		2	472	2		59	2	15	
Oakwood Valley	WUI/Park Interior	Marin	567	2		310		27		171	45	12	
Phleger Estate	WUI	San Mateo	1,205			82	556	9		558			
San Francisco	WUI	San Francisco	923	347	150	69				8	122	75	152
San Pedro Point	WUI	San Mateo	229	1		142					33		53
Stinson Beach	WUI/Park Interior	Marin	1,683	38		555	561	172	13	265	10	34	35
Sweeney Ridge/Cattle Hill	WUI	San Mateo	1,432	29		1,231		95			64	13	
Tam. Valley	WUI	Marin	495	3		147	1	42		188	109	5	
Tennessee Valley	Park Interior	Marin	1,928	16		1,348		453	19	2	18	30	42
Wolfback/ Sausalito	WUI	Marin	398	14		231		60		49	41	3	
Total			15,139	761	180	7,654	1,593	2,004	92	1,430	624	335	466

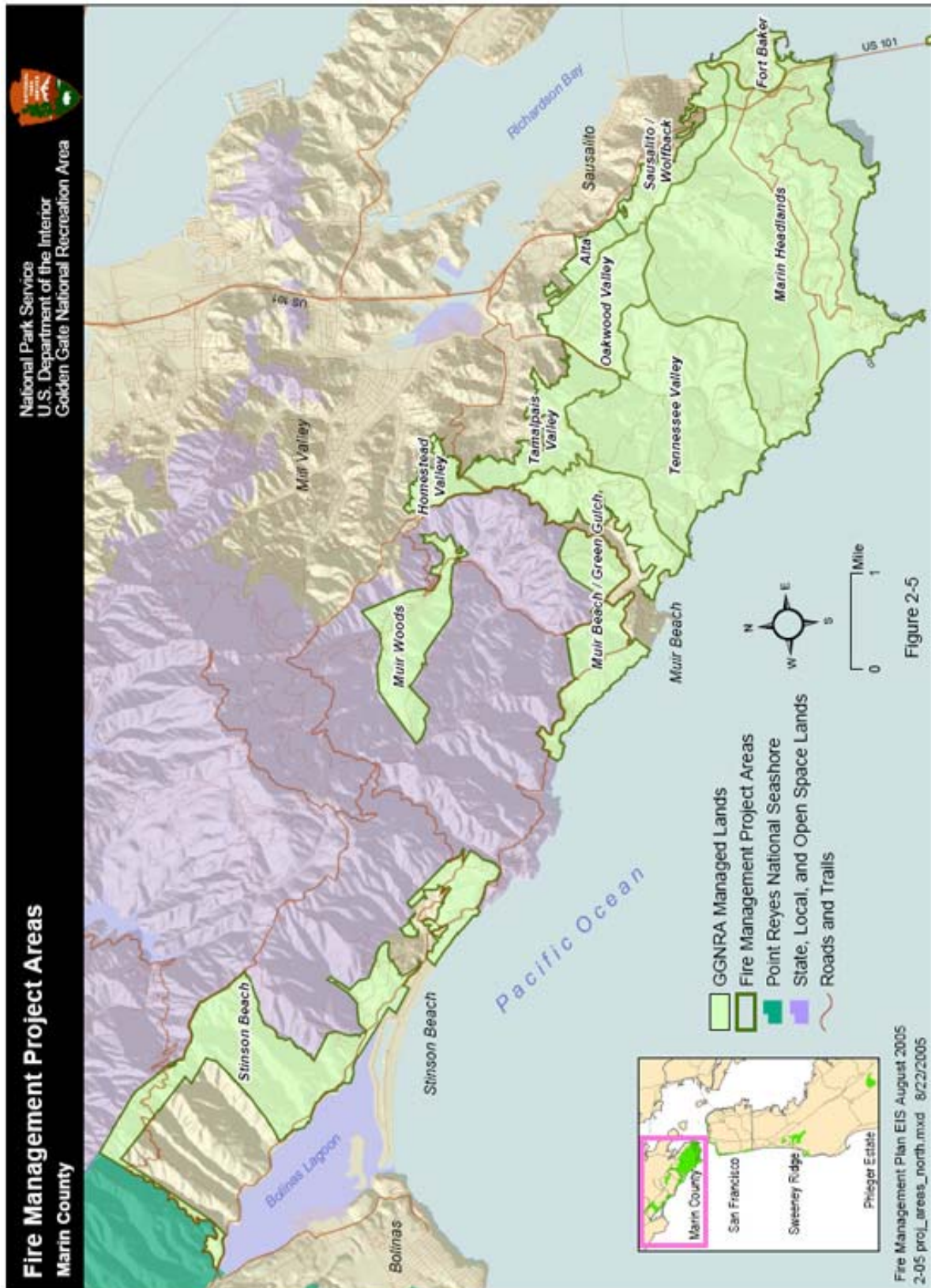
Source: NPS, GGNRA Fire Management Office, 2004.

FMU = Fire Management Unit

WUI = Wildland Urban Interface

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

Figure 15 – FMP Project Areas, Marin County



2.9.1.3 Homestead Valley Project Area

FMU: entirely within the WUI FMU.

Extent: bordered by Panoramic Highway to the west, Shoreline Highway to the south, and the Homestead Valley neighborhood to the north and east.

Vegetation: coastal scrub, grassland, native hardwood forest, and nonnative evergreen forests (eucalyptus and Monterey cypress).

Special Resources: The Douglas fir/redwood forest in the north part of the project area provide habitat for the northern spotted owl.

Fire Management Issues: buildup of hazardous fuels in close proximity to residential areas of Homestead Valley and Tamalpais Valley.

2.9.1.4 Marin Headlands Project Area

FMU: Park Interior FMU except Fort Barry and Fort Cronkhite which are in the WUI FMU.

Extent: The Gerbode Valley and Rodeo Valley watersheds bordered by the Fort Baker Project Area and the City of Sausalito to the east, the Tennessee Valley Project Area to the northwest, and the Pacific Ocean to the west and south.



Vegetation: dominated by coastal scrub and grasslands, with herbaceous wetlands and riparian scrub in the low-lying areas. Nonnative stands of eucalyptus and Monterey pine are present in some of the developed areas, and native hardwood forest is present in Gerbode Valley. A large portion of the land along the Pacific Ocean is unvegetated rocky slopes.

Special Resources: The larger clusters of development from the past military occupation include Fort Barry, Fort Cronkhite, a former Nike missile site, historic coastal fortifications, and the Marine Mammal Center area. The project area supports habitat for several plant and animal species listed under the Endangered Species Act, including the threatened California red-legged frog, the endangered tidewater goby and endangered mission blue butterfly. Two species of bats that are federal species of concern use buildings in this Project Area.

Fire Management Issues: buildup of hazardous fuels adjacent to historic structures, nearby residential communities, and the draw of popular visitor destinations within the project area served by roads that could limit access by emergency responders.

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

2.9.1.5 *Muir Beach/Green Gulch Project Area*

FMU: Park Interior FMU with WUI FMU at the community of Muir Beach, the developed area of Green Gulch Zen Center and along Highway One.

Extent: comprised of the land surrounding the Muir Beach community and the Green Gulch Zen Center and the Banducci Ranch. The area is bordered by Tennessee Valley Project Area to the south, the Tamalpais Valley Project Area to the east, Mount Tamalpais State Park to the north, and the Pacific Ocean to the west.

Vegetation: Primarily coastal scrub and grassland, with herbaceous wetlands and riparian forests in the drainages as well as stands of native hardwood and Douglas fir/redwood forest and nonnative eucalyptus.

Special Resources: Streams providing habitat for coho salmon, steelhead, and the California red-legged frog.

Fire Management Issues: 1) eucalyptus stand adjacent to GGNRA could spread into the park at project area; 2) dune scrub on Muir Beach is often ignited by beach fires which could spread into the residential area; and 3) Muir Beach draws high visitation but is served by Highway One and one access road both of which are bordered in part by areas of high fuel loading that could impede access by emergency responders.

2.9.1.6 *Muir Woods Project Area*

FMU: entirely within the Muir Woods FMU.

Extent: defined by the boundaries of the National Monument. It is west of Mill Valley off Panoramic Highway. Camino Del Canyon, in the eastern section of the Project Area, has several residences, and structures that could have historic significance.

Vegetation: predominantly native hardwood and evergreen forests, including Douglas-fir, old-growth and second-growth redwoods, bay, tanoak, and madrone. The Camino Del Canyon portion includes riparian forest, grassland, and a large stand of eucalyptus around the residential area.



Special Resources: Habitat for the northern spotted owl, marbled murrelet, salmonids, California red-legged frogs. Ten species of bats, including 4 federal or state species of concern, are found in the Project Area.

Fire Management Issues: an area with very high visitation served by a road that could limit access to emergency responders; fuel reduction needed along ingress/egress routes, isolated Camino del Canyon amidst a large eucalyptus stand and is served by a road that is subject to washouts.

2.9.1.7 *Oakwood Valley Project Area*

FMU: Park Interior FMU and WUI FMU.

Extent: bordered by Alta Fire Road to the northeast, Tennessee Valley Road to the northwest, and the Miwok Trail to the south. The Oakwood Valley and Marinview residential communities are adjacent to this project area.

Vegetation: mainly native hardwood forests (oaks), coastal scrub, and some grassland. Riparian forests, as well as nonnative eucalyptus, are present in the drainages.

Fire Management Issues: maintain low fuel conditions and adequate fire road access/egress particularly along the residential community interface.

2.9.1.8 *Stinson Beach Project Area*

FMU: predominantly within the Park Interior FMU and acreage around the Stinson Beach community within the WUI FMU.

Extent: parklands north of Stinson Beach, south of the Bolinas/Fairfax Road and south of Stinson Beach along Panoramic Highway.

Vegetation: large tracts of coastal scrub, grasslands, Douglas-fir/coast redwood, and native hardwood forest, unvegetated shoreline and smaller areas of herbaceous wetlands, riparian forests, and nonnative evergreen forests.

Special Resources: Spotted owl habitat in Stinson Gulch. Several Bolinas Lagoon tributaries, including Easkoot Creek, support coho salmon and steelhead.

Fire Management Issues: 1) fuel reduction needed on parklands surrounding the residential area; and 2) provision of safe fire road ingress/egress especially on days of very high visitation.

2.9.1.9 *Tamalpais Valley Project Area*

FMU: entirely in the WUI FMU.

Extent: bounded by the Miwok Trail on the south and west, Tennessee Valley Road to the southeast, and the unincorporated community of Tamalpais Valley to the northeast. The Homestead Valley Project Area lies due north, the Tennessee Valley Project Area to the south, Muir Beach Project Area to the west southwest and Oakwood Valley Project Area to the southeast.

Vegetation: primarily coastal scrub, grassland, and native hardwood forest, with some large stands of eucalyptus and a riparian forest corridor along Tennessee Valley Road.

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

Special Resources: Tennessee Valley Creek provides habitat for the California red-legged frog. Fire management issues in this area include the need to reduce fuel loads between the park and adjacent communities and to provide for safe fire road access and egress routes.

2.9.1.10 Tennessee Valley Project Area

FMU: entirely within the Park Interior FMU.

Extent: bounded by the Pacific Ocean to the southwest, Coyote Ridge to the northwest, the Miwok Trail to the northeast, and the Hill 88 Ridge to the south.

Vegetation: mainly coastal scrub with roughly a fifth of the acreage in grassland. Herbaceous wetlands, riparian scrub, and nonnative evergreen forests are present in the drainages. Disturbed lands and remnant landscape is found in and around the Miwok riding stables and the old farmhouse. Much of the coastline is unvegetated rock outcrops.

Special Resources: California red-legged frogs.

Fire Management Issues: maintaining adequate fire road access, reducing roadside fuel loading to this area with heavily visited trails.

2.9.1.11 Wolfback Ridge/Sausalito Project Area

FMU: entirely within the WUI FMU.

Extent: Highway 101 and Sausalito to the east, the Marin Headlands Project Area to the west and south, the Oakwood Valley Project Area on the northwest, and the Alta Project Area to the north. Lands lie to the west AND east of the Wolfback Ridge neighborhood.

Vegetation: principally coastal scrub and grassland, native hardwood forest, riparian forest, and nonnative evergreen forest (mostly eucalyptus).

Special Resources: Mission blue butterfly habitat north of Fort Baker.

Fire Management Issues: reducing the density of the eucalyptus forest west and east of the Wolfback Ridge neighborhood.

2.9.2 SAN FRANCISCO COUNTY

2.9.2.1 San Francisco Project Area

FMU: entirely within the WUI FMU.

Extent: all NPS lands within San Francisco County including Fort Mason, Alcatraz, Area A of the Presidio, Fort Point National Historic Site, and the coast from Fort Miley to Fort Funston.

Vegetation: Coastal dune communities, with areas of coastal scrub, native hardwood forest, and riparian scrub and large stands of nonnative evergreen forest and landscaping.

Special Resources: Raven’s manzanita, Marin dwarf flax, and the San Francisco lessingia, western snowy plover, the Presidio Historic Landmark District, Fort Mason and other historic coastal military structures, Sutro Heights, Fort Point Historic Site.

Fire Management Issues: maintenance of defensible space around park buildings (working closely with the Presidio Fire Department responsible for structural fire prevention and suppression), reducing fuels at the interface with residences and conducting limited research burns, in conjunction with FWS consultation, to benefit federally listed plant species.

2.9.3 San Mateo County

2.9.3.1 Milagra Ridge Project Area

FMU: entirely within the WUI FMU.

Extent: In northern Pacifica, the project area borders on Sharp Park Road to the south, Oceana High School to the southwest, a City of San Bruno neighborhood to the southeast, undeveloped , a new Pacifica residential development to the west and the Edgemar area of Pacifica to the northwest.

Special Resources: significant cultural and historical resources, and mission blue butterfly and San Bruno elfin butterfly habitat, California red-legged frog and San Francisco garter snake habitat.

Vegetation: primarily coastal scrub with areas of grassland and riparian forest. Nonnative evergreen forest is also present.

Fire Management Issues: reduction of hazardous fuels adjacent to residential communities.

2.9.3.2 Mori Point

FMU: entirely within the WUI FMU.

Extent: From the Pacific Ocean on the west to Highway 1 across from Sweeney Ridge on the east, near Shelldance Nursery. The City of San Francisco Sharp Park Golf Course and Natural Area is to the north and the former quarry to the south.

Vegetation: dominated by grassland interspersed with coastal scrub. The low-lying areas contain herbaceous wetlands and riparian scrub.

Special Resources: San Francisco garter snake and the California red-legged frog.

Fire Management Issues: none identified in the FMP.

2.9.3.3 Phleger Estate Project Area

FMU: primarily in the Park Interior FMU with a strip of WUI FMU along Skyline Boulevard and Woodside’s Raymundo Road.

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

Extent: From Huddart County Park and the town of Woodside on the south and southeast, respectively, to Highway 35/Skyline Highway to the west and San Francisco Public Utilities Commission's Peninsula Watershed to the north.

Vegetation: dominated by second-growth Douglas-fir/coast redwood and native hardwood forest with several acres of coastal scrub along the northern boundary and a small area of grassland on the east.

Special Resources: The area is in the West Union/Francisquito Creek watershed, which supports steelhead.

Fire Management Issues: buildup of hazardous fuels with the potential for wildland fire in close proximity to developed areas in Woodside or the Peninsula Watershed.

2.9.3.4 *Pedro Point Project Area*

FMU: entirely within WUI FMU.

Extent: bounded on the east by Highway 1 and to the west by the Pacific coast. The Pedro Park area of Pacifica lies to the north and undeveloped lands to the south.

Vegetation: mostly coastal scrub, with nonnative evergreen forest encroaching from the northern boundary and rocky coastal bluffs to the west.

Fire Management Issues: large, dense stand of eucalyptus forest adjacent to the Highway 1 corridor and the Pedro Point section of Pacifica.

2.9.3.5 *Sweeney Ridge/Cattle Hill Project Area*

FMU: divided equally between the Park Interior FMU and the WUI FMU.

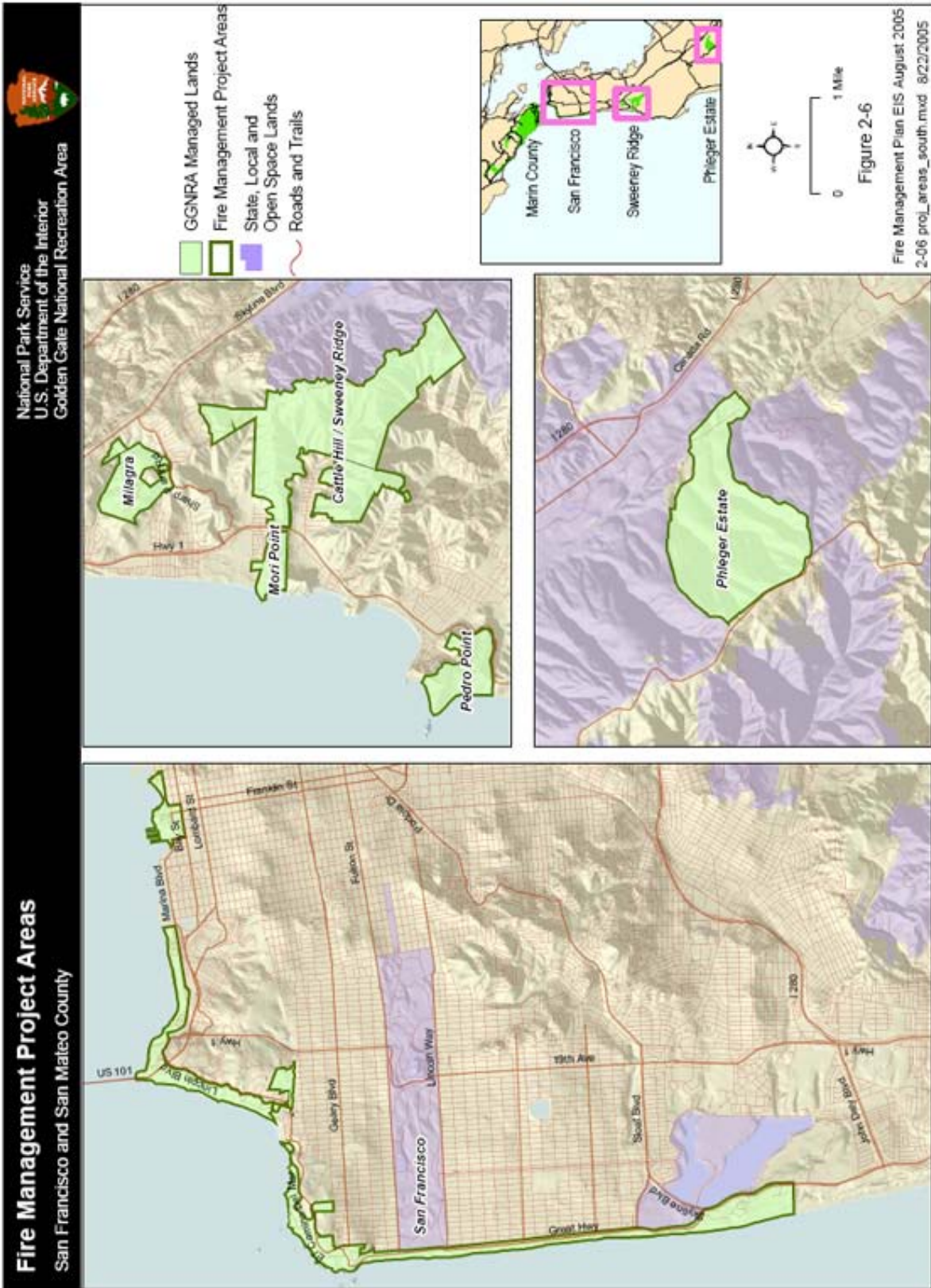
Extent: Lying east of Pacifica, Sweeny Ridge borders the Vallemar neighborhood to the north and east while Cattle Hill forms the southern boundary of this Pacifica neighborhood. Sweeney Ridge is bordered to the south and southeast by San Francisco Public Utility Commission's Peninsula Watershed, the Terra Nova neighborhood of Pacifica on the southwest and Skyline Junior College and residential areas of the City of San Bruno on the north.

Vegetation: primarily coastal scrub, with extensive grasslands in the north and riparian scrub in several of the drainages. Stands of nonnative evergreen forest (mostly eucalyptus) encroach into the project area from outside the park boundary.

Fire Management Issues: reduce fuel loading on the boundary with the Vallemar neighborhood and Skyline Junior College where fuels may pose a threat to structures and urban developments; maintain adequate fire road access for local fire agencies .

CHAPTER 2 – FIRE MANAGEMENT STRATEGIES

Figure 16 – FMP Project Areas, San Francisco & San Mateo Counties



CHAPTER 3 – FIRE MANAGEMENT PROGRAM COMPONENTS

3. FIRE MANAGEMENT PROGRAM COMPONENTS

The fire management plan addresses strategies for reducing the accumulation of hazardous fuels in specific areas and for abating hazardous fire conditions resulting from past fire suppression programs, expansion of urbanization to park borders, or establishment of non-native, invasive plants. These strategies will entail strategic planning, interdisciplinary coordination, and inter-organizational collaboration as needed to provide appropriate treatment using adaptive management practices that range from site specific to landscape level. Fire management planning will also include monitoring programs that record fire behavior, smoke behavior, fire decisions, and fire effects to provide information on whether specific objectives are met and to improve future fire management. Fire education and communication are critical components of all preventive fire management planning and allow for communication of hazardous fuel reduction and fire prevention strategies across park boundaries.

Although prescribed fire remains the preferred and most widely used NPS tool for managing the accumulation of hazardous fuels, fire management planning will incorporate other activities, such as manual, mechanical, biological and, rarely, chemical treatments (applying integrated pest management principles), that may be appropriate in specific instances, as guided by NPS and DOI policies and legal requirement.

All components of fire management planning, including suppression, prescribed fire, or mechanical fuel reduction, will factor in the protection of natural and cultural resources, while maintaining that safety of employees and private citizens.

3.1 DESIGNATION OF WILDLAND FIRE PROTECTION RESPONSIBILITY

Federal land management agencies own and administer 48 million acres in California and have wildland fire protection responsibility for these lands designated as the Federal Responsibility Area (FRA). For GGNRA, the NPS FRA includes all lands managed by the NPS within the GGNRA legislative boundary. Unincorporated areas of the State of California, excluding the federal lands, are within the State Responsibility Area (SRA). The SRA is mainly privately owned forestlands, watersheds, rangelands, unincorporated communities with some non-federal public owned lands.

The federal agencies and Cal Fire, in conformance with their "Cooperative Fire Protection Agreement", have examine the unincorporated lands in the State and identified areas of the FRA and SRA where an exchange of wildland fire responsibilities would improve overall firefighting capabilities. The redrawn boundaries that result from the exchange define the "Direct Protection Area" (DPA) for an agency – the area of primary responsibility delineated by practical boundaries regardless of ownership. The objective of the DPA is to maximize on efficiency and effectiveness of each jurisdiction's resources. For example, if Cal Fire can only access a group of privately owned parcels in the SRA via an NPS road, it may make more sense for these parcels to be protected

by NPS firefighters who have a quicker response time. The exchange of responsibility is formalized by an agreement signed between the agencies.

3.2 GENERAL IMPLEMENTATION PROCEDURES FOR SUPPRESSION ACTIONS

All wildland fires will receive prompt and aggressive initial attack action to reduce burned acreage and protect improvements and residences in close proximity to wildland fuels (NPS 2006b). The objective of wildland fire suppression, as an integral part of wildland fire management in the NPS, is to manage wildland fires safely and efficiently to accomplish protection objectives. It is integrated into land and resource management plans and activities on a landscape scale, across agency boundaries, and is based on best available science. Protection priorities are (1) human life and (2) property and natural/cultural resources (NPS 2005b).

Federal agencies and Cal Fire have entered into Cooperative Fire Protection Agreements which provide for interagency cooperation. Because GGNRA has limited fire management capabilities, most suppression activities will be accomplished in

conjunction with the local fire agencies. Wildland fire suppression is accomplished by the closest available resources, whether federal, state or local government agencies through cooperative agreements. For GGNRA, Cal Fire and its mutual aid partners provide aggressive initial response and assume interim Incident Command of initial attack actions until a qualified federal Incident Commander and personnel arrives to assume Unified Command of the incident.

Under all circumstances, the NPS Incident Commander (IC) must be qualified for the complexity of the wildland fire incident. The GOGA-PORE Incident Complexity Analysis for Type 4 and 5 Incidents shall be used to determine the complexity of the incident. (see Appendix A, Part 12).

Within the boundary of the park, all wildland fires will be suppressed according to federal and local government protocols as determined by the Unified Incident Commanders. Federal actions will be consistent with direction provided in RM #18, Director's Order #60 Aviation Management (2003) and Interagency Standards for Fire and Fire Aviation Operations (NIFC 2006).

Agencies that have been given direct protection responsibility have the option of not requesting NPS tactical resources if they so desire. NPS units may have a delayed response that could be as much as four to twelve hours. Depending upon the severity



of the fire, NPS resources will provide liaison and agency representation, develop rehabilitation plans and provide tactical resources as requested by Cal Fire. Other fire agencies may be called upon by Cal Fire through its mutual aid agreements. If qualified for wildland firefighting, the Presidio Fire Department (the structural fire agency for GGNRA) will provide suppression assistance, as requested by the GGNRA wildland fire staff.

An Agency Representative will be requested to proceed to all fires or to fires that have the potential to spread into NPS lands. The Agency Representative is responsible for requesting a Resource Advisor through the Incident Ordering Point (ex., CAL FIRE Felton EEC) through Park Dispatch and/or the Fire Management Office.

The Resource Advisor will assist in identifying sensitive resources and provide input on appropriate actions to minimize the impacts to these resources. The Agency Representative will work through the IC whose agency has the DPA responsibility to emphasize those concerns and implement appropriate actions.

3.3 AGREEMENTS GOVERNING SUPPRESSION ACTIONS

In Marin County, all suppression activities on federal lands will be managed in cooperation with Marin County Fire Department, the Southern Marin Fire Protection District and other local government fire agencies. Due to the proximity of numerous local government and Cal Fire jurisdictional protection areas, Unified Command with Marin County Fire Department is often required for actual or potential multi-jurisdictional threats.

If qualified for wildland fire response, the Presidio Fire Department Station at Fort Cronkhite could respond to wildland fires as initial attack at Fort Baker, Fort Barry, Fort Cronkhite and the Capehart Housing area as well as Conzelman Road (M. Kiolassa, Ass't Chief, Presidio Fire Dept., pers. comm. 3/4/08).

Woodacre Emergency Command Center (ECC) is responsible for contacting the appropriate fire management or law enforcement personnel to respond to a report of a wildland fire. Typically the Fire Management Officer, Fire Duty Officer or Chief Ranger (as qualified), responds to the Incident Command Post and serves as a Unified Incident Commander, Agency Representative or Resource Advisor (as qualified). Other NPS fire resources will respond depending upon availability.

In City and County of San Francisco. The closest available fire resource will be dispatched along with NPS units. All fires will be managed using ICS. The Presidio Fire Department responds to structural and wildfire in the Presidio (both NPS and Presidio Trust jurisdictions), Fort Mason, Aquatic Park, Fort Point and, through a separate agreement, the San Francisco Maritime Museum. Through a mutual aid agreement with the Presidio Fire Department, the San Francisco Fire Department provides first response services to the Ocean Beach corridor, including Fort Funston, and Lands End, Sutro Heights, and Fort Miley (M. Kiolassa, Ass't Chief, Presidio Fire Dept., pers. comm. 3/4/08).

CHAPTER 3 – FIRE MANAGEMENT PROGRAM COMPONENTS

In San Mateo County. NPS lands in San Mateo County are the Phleger Estate, Sweeney Ridge, Cattle Hill, Pedro Point, Mori Point and Milagra Ridge. With the exception of Phleger Estate, adjacent to the Town of Woodside at the southern limits of San Mateo County, the remaining NPS areas are clustered around the City of Pacifica in northern San Mateo County and occupy coastal bluffs, slopes and ridgetops.

The San Francisco Peninsula Watershed, situated between Sweeney Ridge to the north and the Phleger Estate to the south, is an SRA land managed by the San Francisco Public Utilities Commission. Watershed management personnel of the Peninsula Watershed are equipped with wildland fire patrol units and can provide limited immediate response to wildland fires on NPS lands adjacent to Peninsula Watershed lands (T. Ramirez, pers. comm. 12/05/06).

The NPS is currently negotiating an agreement with Cal Fire whereby that agency would add all NPS properties in San Mateo County to the Cal Fire DPA. The agreement conforms to the requirements of the Master Cooperative Wildland Fire Management and Stafford Act Response Agreement between the State of California and federal land management agencies with holdings in California. In turn, once this interagency agreement is adopted, those mutual aid agreements that local fire departments in the County have with Cal Fire would apply to the Cal Fire DPA revised to include the NPS lands.

3.4 Minimum Impact Suppression Tactics

The policy at GGNRA is to suppress all unplanned ignitions using Minimum Impact Suppression Tactics (MIST) to the extent feasible given the constraints along the urban interface. Suppression of fires will be aggressive and will be conducted with the highest regard for human safety. MIST Guidelines for GGNRA are in FMP Appendix A, Part 9.

Suppression will be accomplished through a combination of cooperative agreements with local fire agencies and qualified park fire personnel. Annual operating plans will identify individual suppression concerns in order to minimize suppression impacts. Furthermore, all control efforts will be evaluated for consideration of effects on resource values.

3.5 PREPAREDNESS ACTIONS

The term “preparedness” refers to activities that lead to a safe, efficient and cost-effective fire management program in support of land and resource management objectives through appropriate planning and coordination.

The Network approach to the Fire Management Program requires, close coordination and operational consistency with PRNS in preparation for fire season is important. The FMOs from each unit should meet on a regular basis to coordinate preparedness activities, establish joint projects and procedures for wildland fire, mechanical fuels reduction and prescribed fire, readiness, funding issues, problem areas, and other items.

The following items will be reviewed annually by the GGNRA FMO:

- Conduct preparedness review.
- Prepare mutual severity needs analysis for coming fire season when conditions exceed those of a normal fire year (consider: pre-positioning of suppression resources; augmentation and support outside local organization needed).
- Review new policies, roles and responsibilities.
- Review and update as necessary all delegations of authority and Agency Administrator Briefing Package.
- Identify any mutual safety issues and mitigating actions required.
- Clarify mutual criteria for team transitions, managing mutual multiple fire activity.
- Update WFSAs and designate ID teams for preparing WFSAs for fires which escape initial attack.
- Develop mutual and integrated action items to implement staffing levels (Ref: Step-up Plan).
- Identify strategies to communicate fire program principles to cooperators and publics (Red Flag alerts, severity, closures, etc.).
- Agree on mutual standards to evaluate performance of the preparedness operations within the Bay Area National Parks Network.
- Address other issues requiring coordination.

3.5.1 Fire Prevention

Prevention objectives for the planning area will include:

- Reduce the number of human-caused wildland fires.
- Integrate fire prevention messages into a variety of programs, ranger activities, and local media, targeting the community, schools, visitors, and landowners.
- Coordinate fire prevention efforts with all cooperators and affected landowners.
- Prepare and post prevention-related signs and messages.

3.5.1.1 Training and Fire Readiness

The purpose of wildland and prescribed fire training is to promote safe and effective individual performance in accomplishing fire management goals and objectives.

All wildland fire personnel will be qualified and certified for the position(s) assigned, according to the Wildland and Prescribed Fire Qualifications System Guide (PMS 310-1, 2006). The Interagency Standards for Fire and Fire Aviation Operations, Chapter 2, "Requirements for Fire Management Positions" details additional requirements for fire positions (NIFC 2006). Reference Manual #18 (NPS 2006b) and Director's Order #18 (NPS 2005) provide the guidelines for training and readiness.

CHAPTER 3 – FIRE MANAGEMENT PROGRAM COMPONENTS

All employees involved in wildland fire and prescribed fire operations will have their qualification records entered into and maintained annually in the Incident Qualification and Certification System (IQCS) and ROSS.

Refresher courses (firefighter safety, basic aviation operations, etc) and other required annual training will be coordinated by qualified staff and held annually.

Readiness actions (in addition to those listed above) are described below.

- Fire caches and equipment shall be inspected and documented for completeness and serviceability on a pre-season and fire season basis.
- Ensure timely follow-up actions to preparedness inspections.
- GGNRA will maintain supplies, materials, and equipment at the Fire Cache at the Fort Cronkhite Fire Management Office to meet normal fire-year requirements for two Type 6 engines. Minimum staffing during fire season includes 1-Duty Officer, 1-Engine Operator and 1-Firefighter for 5 days/week coverage. Per Interagency Red Book, this minimal staffing allows for response to in-park incidents only. Preferred and optimal staffing includes the 1-Duty Officer, 1-Engine Boss/Engine Module Leader, 1-Engine Operator and 1-Firefighter for 7 days/week coverage. This optimal staffing allows for the full range of wildland responses both in-park and out-of-park.

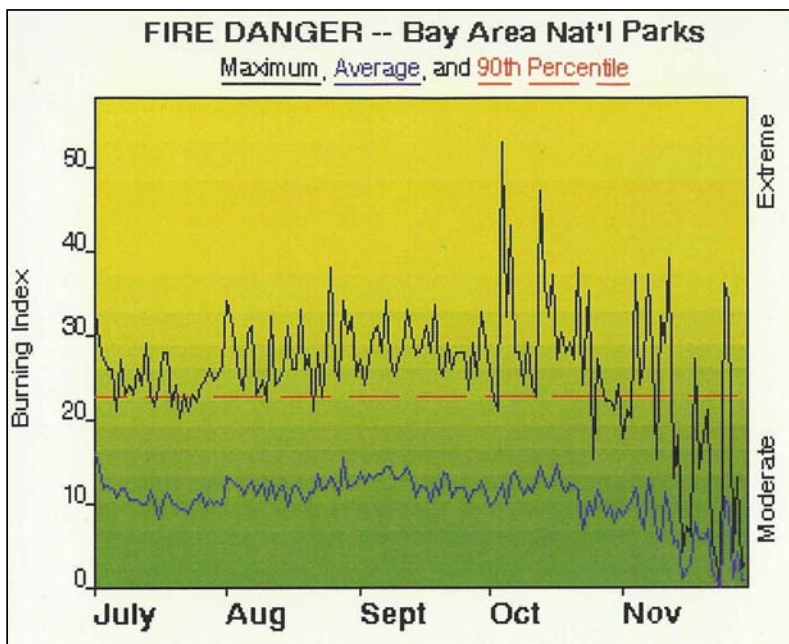
The following preparedness activity schedule will be followed annually as appropriate:

1. Year-round: NFDRS Weather Station (#042308) monitored daily.
2. Annually: Local Preparedness Review.
3. May 1: Annual Operating Plan (AOP) between Marin County Fire Department will be updated and agreed to by all parties.
4. May 1: Annual Operating Plans will be updated with Cal Fire for San Mateo County.
5. May 1– June 15: All fire line qualified permanent personnel will take the Work Capacity Test; seasonal personnel will be tested upon entering on duty.
6. May 1 – June 30: All GGNRA Red Carded employees will have completed both annual refresher and Work Capacity Test.
7. May 1 – July 30: Red Cards will be signed by FMO and distributed to employees.
8. June 15 – 30: All engines and support equipment will be serviced and fire-ready; Step-Up Plan reviewed and updated.
9. May 15 – June 30: Training for all seasonal employees completed, including mandatory refresher for all carded employees.
10. May 1 – end of season: Roster of all fire qualified personnel maintained, with PPE/initial attack gear/Red pack ready for two-hour callout.

11. July 15: Annual Preparedness Review (RM#18 & 2006 Interagency Standards for Fire and Fire and Fire Aviation Operations, Chapter 19).
12. November 15: Fire Training and Experience Records will be entered in IQCS for permanent employees.
13. November 31: Equipment winterized, cache inventoried, post-season reviews and reports completed.

California Seasonal and Monthly Outlooks, prepared by the Northern California Geographical Area Predictive Services Unit will be analyzed as early as conditions

Figure 17 – Monthly Burning Index Levels (1981 – 2000)



warrant before and during fire season. Severity funding requests, if indicated from the Outlooks, should also be prepared and finalized in coordination with PRNS. Submissions will move through agency fire channels to Fire Program Staff at the Regional Office. Refer to Interagency Standards for Fire and Fire Aviation Operations, Chapter 9 (NIFC 2006), and/or RM #18, Chapter 18 (NPS 2006b).

3.5.1.2 Fire Weather and Fire Danger

Following the cessation of

winter rains in mid-April, fuels dry rapidly and the light fuels of the annual grassland (2,000 - 7,000 lbs/acre) cure and live, dead and downed round wood material and duff in the understory of the forest stands gradually lose moisture.

Fire season at GGNRA begins in early June. At this time, high-pressure air masses frequently stagnate over the Great Basin. Strong foehn winds, referred to as Mono winds in central California, may develop if there is a low-pressure trough off the coast. These winds bring warm, dry air to the central coast and cause rapid drying of fuels. These episodes usually last 1-2 days and fire danger can be extreme. In typical years, a persistent coastal fog bank is formed by July 1, following the stabilization of the Pacific high over central California. From July through early September, fog moves inland and back out to sea in a 3-4 day cycle in response to heating and cooling in California's Central Valley. Fine fuel moisture fluctuates in this cycle, while wood fuels and duff remain relatively wet. In mid-September the fog pattern changes and fuel moistures drop steadily. It is at this time that conditions contributing to Mono winds occur. The

combination of prolonged drought, low relative humidity and a peak in fuel production often causes fire danger to be high through September and October. In addition, almost one fifth of the area's annual lightning storms occur during this period (Martin and Sugnet, 1984).

In summary, the fire season at GGNRA differs somewhat from most areas in the western United States. Bimodal peaks of fire danger occur in late spring and late summer/early fall. In most years, persistent fog keeps fire danger moderate in July and August when danger is highest in most of the western United States. The period from September 1 through October 31 can be considered the most critical time of fire danger for GGNRA (see Figure 17, Monthly Burning Index Levels). Figure 17 displays the FireFamily Plus Analysis for the FMP area indicating the periods when burning indices are at average, maximum and 90th percentile.

3.5.1.3 *Range Of Potential Fire Behavior*

All of the wildland fuels complexes represented at GGNRA display a range of fire behavior; the most typical are described below.

- May and June. Creeping ground fires in herbaceous litter and underlying duff with overall lighter fuels and soil moistures such as early in the fire season.
- July. Surface fire spread with active flame front generally occurs during periods of lowering fuel moistures.
- August and Early September. Active surface fire spread with torching, short range spotting, usually due to higher frontal winds and/or lower humidity.
- September and October. Running surface fire with torching, intermittent or sustained crown fire, short and long-range spotting under high winds, low humidity, low foliar and surface fuel moistures, during north and east wind conditions where indices can be over the 90th percentile.

Typical fire behavior for predominant vegetation types during the fire season at GGNRA are described below.

- Grasslands. The critical concern in this vegetation type is the rate of spread and ease of ignition with grasslands acting as a vector to ignite other vegetation types. This is one of the most dangerous wildfire types for firefighter safety due to its rapid frontal spread under dry and windy conditions. Production of airborne embers ahead of the flame front is not typical due to the rapid rate of spread.
- Brush and Scrub Dominated Communities. The Coastal Scrub vegetation types tend to be difficult to ignite. However, once ignited, fires in this community are difficult to suppress due to the dense stands and presence of volatile oils that make them burn faster and hotter.
- Non-native Evergreen Forests. The ignition potential of these forests is very high and directly related to the depth of the litter and dead materials on the ground. A continuity of fuel from the ground to the crown of the forest and the

potential for a crown fire to occur is the highest risk factor associated with the 340 acres of eucalyptus in GGNRA-managed lands.

- Hardwood forest. This vegetation type with a closed canopy presents a lower risk for wildland fire due to its relatively light surface fuels and moderate ignition potential is moderate due to the fairly continuous canopy cover. Fire behavior is dependent on the buildup of surface fuels and dead materials within the tree that can carry fire to the crown.
- Redwood/Douglas fir forest – Due to high coastal precipitation and summertime fog drip, wildland fire concerns for this plant community are focused on the extreme weather conditions that develop with offshore winds (Diablo winds) typically in late fall. Accumulations of dead and downed material can increase hazardous fuels and lead to an increased risk of fire during drier time periods. Some of this forest is bounded by eucalyptus groves and/or dense stands of exotics such as French broom. A fire in these adjacent areas with heavy fuels could result in an abnormally hot and fast fire that spreads into the neighboring redwood/fir forest with a higher than expected heat intensity than would be developed under similar environmental conditions in native scrub.
- Riparian forest, shrubland and herbaceous wetlands. The behavior of fire in this type of vegetation can be fairly benign due to high fuel moistures and high humidity, however at certain times of the year significant fire behavior can occur.

3.5.1.4 Weather Stations

GGNRA covers such a wide area across three counties that no single Remote Automated Weather Station (RAWS) could provide accurate fire weather. To increase the range of weather data that is available park-wide three primary RAWS sites can be accessed.

The Barnabe RAWS is located at the 800 foot elevation level in the San Geronimo Valley of Marin County. The weather readings from this station reflect inland valley, non-coastal areas such as Mill Valley, Tennessee Valley and other parts of GGNRA away from beaches. The station will over-predict weather for the Ocean Beach/Lands End area in San Francisco, the Marin Headlands and coastal beaches, Muir Woods and Fort Mason. Barnabe RAWS is cataloged in Weather Information Management System (WIMS) as #042308 and can provide NFDRS indices. The unit is maintained by Bay Area Network Preparedness Staff. Barnabe RAWS is part of Northern California Fire Weather Station 205 and Forecast Trend Zone 562. It is used for the GGNRA Step-Up Plan for Marin and San Francisco County areas.

La Honda RAWS, in San Mateo County, is located on Highway 84, 6.5 miles west of the intersection with Skyline Boulevard at Skylonda and ½ mile north of the intersection with Pescadero Road (see Figure 18, RAWS Weather Stations, San Mateo). The RAWS is located in the upper mid-slope of a ridge at the 800 foot elevation band and the station captures coastal influence weather readings for San Mateo Cal Fire. La Honda RAWS can also be used to determine fire weather for NPS managed lands at Milagra Ridge, Sweeny Ridge, Mori Point, Cattle Hill and Pedro Point. The station will be used for

CHAPTER 3 – FIRE MANAGEMENT PROGRAM COMPONENTS

Corral de Tierra lands just south of Moss Beach on the San Mateo Coast once acquisition is finalized. La Honda RAWS is in Fire Weather Zone (FWZ) 275 -- San Mateo Hills -- and Forecast Zone 550. Felton ECC in Santa Cruz County manages the WIMS account and maintains this RAWS unit. It is not currently used to determine any Step-Up actions.

Pulgas RAWS, in San Mateo County, is located north of the Phleger Estate and Town of Woodside near the intersection Edgewood Road exit on I-280 (See Figure 18, RAWS Weather Stations, San Mateo County). Located at 600 foot elevation, this station reflects drier inland weather readings as it is situated on the east side of the Coastal Range. Pulgas RAWS picks up fire weather for the Phleger Estate and the southern portions of Crystal Springs Reservoir. The unit is FWZ 275 – San Mateo Hills -- and it is in Forecast Trend Zone 550. Felton ECC in Santa Cruz County manages the WIMS account but the RAWS is maintained by San Francisco Public Utilities Commission staff which manages 23,000-acre Peninsula Watershed just north of the RAWS. This unit is not used for any Step-Up actions.

Station Name	Station ID	MesoWest ID	Fuel Model	Location	Elevation	Owner
Barnabe	042308	BBEC1	7A2A2	38.0281 122.7022	810 feet	NPS/Marin County
La Honda (off Log Cabin Ranch Rd., ±2 mi SE of La Honda)	043304	LAHC1	2	37.3053 122:255	872 feet	SF PUC
Pulgas (Vista Pt., on I-280 NW of Edgewood Rd.)	043309	PUGC1	2	37.4750 122:2981	644 feet	Cal Fire

3.3.1.5 National Fire Danger Rating System (NFDRS)

NFDRS is a multiple index system developed to provide information about current and predicted fire danger conditions. Analysis of fire weather information from Barnabe RAWS uses NFDRS Model A, Slope Class 2 (0-25 percent), perennial herbs, and Climate Class of 2 (semi-arid). Restriction thresholds for Park Visitor Activities will be developed in 2008 for the FMP update. The Northern California Coordination Center Predictive Services Group, in conjunction with the National Weather Service San Francisco Bay/Monterey Weather Forecasting Office, monitors, analyzes and predicts fire weather, fire danger and fire management resource impacts across the Bay Area and East Bay Hills.

Red Flag Warnings are issued to warn of an impending or unusually severe fire weather event. As shown in Table 10, a warning is issued when the combination of conditions shown in the chart are occurring or expected within 24 hours.

Figure 18 – RAWs Weather Stations – San Mateo County

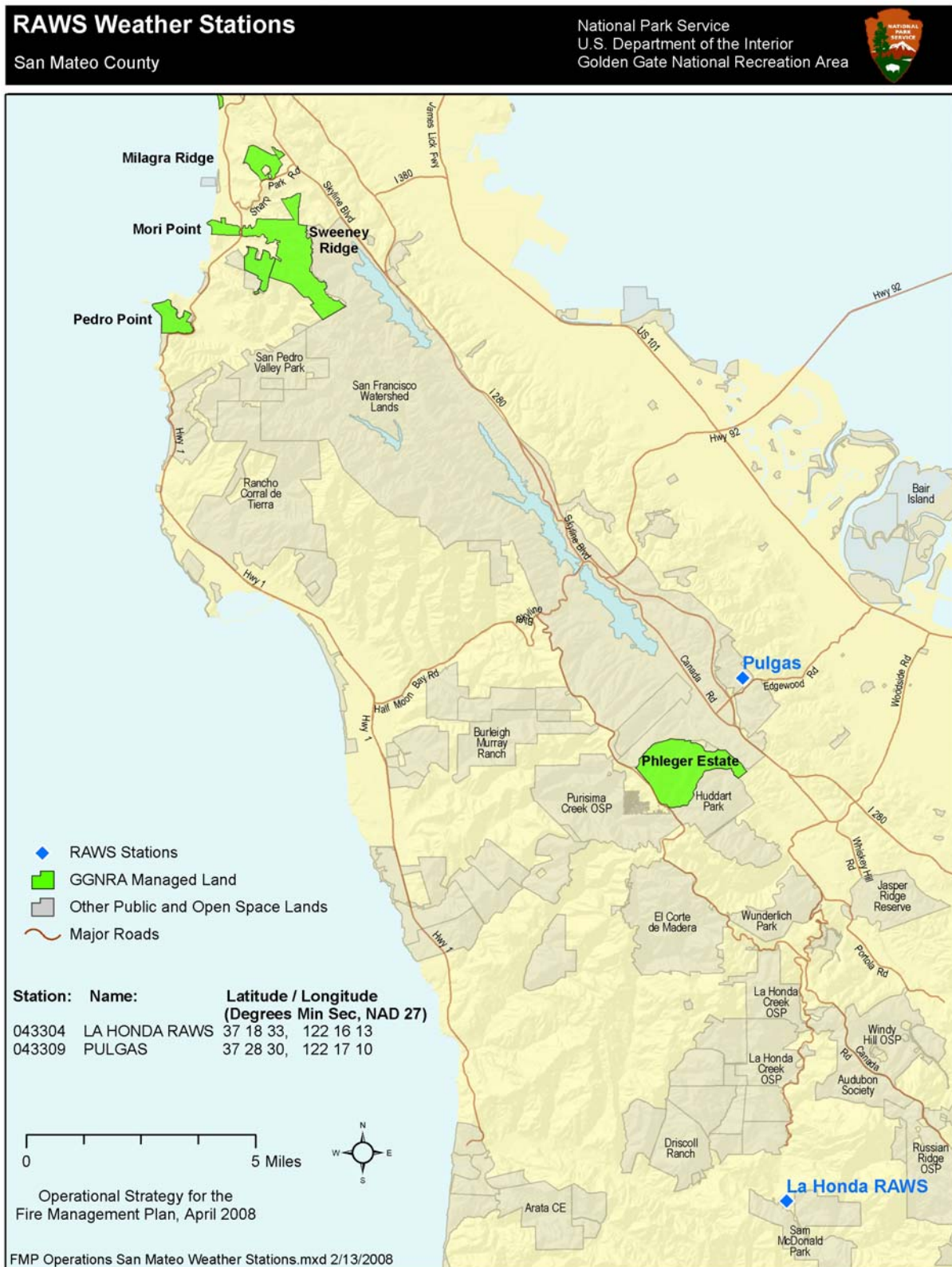


Table 11 – Red Flag Warning Matrix

Red Flag Guidance/Verification Matrix				
The matrix below assume 10-hour fuel moisture of less than 6%, annual grasses are cured, and no wetting rain (greater than 0.10 inch) has fallen in the past 24 hours.				
Relative Humidity	Sustained 20 foot Wind Speed (Note: the wind event should be expected to last at least 8 hours)			
	Sustained Wind 6-11 mph	Sustained Wind 12-20 mph	Sustained Wind 21-29 mph	Sustained Wind 30+ mph
<u>Day MIN 29-42%</u> <u>Ngt MAX 61-80%</u>				RED FLAG WARNING
<u>Day MIN 19-28%</u> <u>Ngt MAX 46-60%</u>			RED FLAG WARNING	RED FLAG WARNING
<u>Day MIN 9-18%</u> <u>Ngt MAX 30-45%</u>		RED FLAG WARNING	RED FLAG WARNING	RED FLAG WARNING
<u>Day MIN < 9%</u> <u>Ngt MAX < 30%</u>	RED FLAG WARNING	RED FLAG WARNING	RED FLAG WARNING	RED FLAG WARNING
To help verify Red Flag Warnings the links above will show you what RAWS sites have met the RFW criteria during the last 24 hours. After clicking on the Day MAX or Ngt MAX RH link <u>double check the times on the observations</u> . Both day and night observations will show up.				

Fire managers can use the NFDRS for computing daily and forecasted fire danger. Local thresholds documented on Fire Danger Pocket Cards that shout “Watch Out” are: 20 foot wind speeds exceed 15 mph, RH less than 25% and temperature over 80 degrees. The pocket card also uses the Burn Index (BI) of above the 90th percentile as a key indicator of increased fire activity. The graphic below from the Bay Area Parks Network Fire Danger Pocket Card shows the BI in relation to past major and minor incidents (See Figure 19, Burning Index Levels during Past Wildfires).

3.5.2 Step-Up Plan

The Step-Up Plan describes a series of escalating management responses which are intended to supplement normal wildland fire capabilities for short periods (i.e., normally one burn period). This policy-compliant plan is in table format and is located in Appendix A, Part 5.

3.5.3 Detection

Typically, most fires will be discovered and reported by local residents or members of the public recreating at GGNRA. It is expected that most individuals wishing to report a

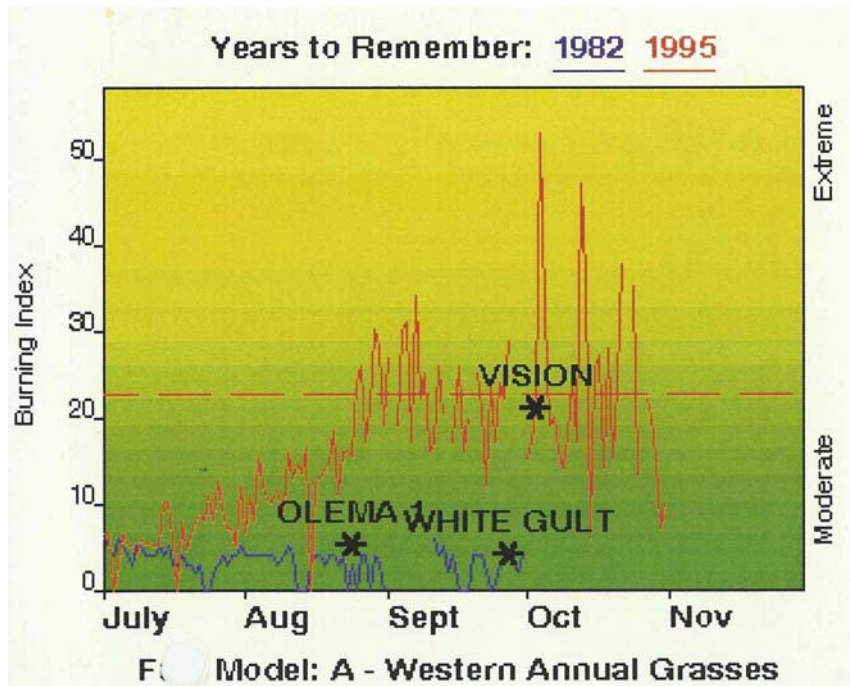
fire would contact 911 rather than notifying GGNRA staff directly. In Marin County, 911 calls are routed to the Marin County Sheriffs Department Communications Center (“Comm Center”). If the 911 call is in reference to a reported wildland fire, the Comm Center transfers the caller to Marin County Fire Department’s Woodacre ECC. Woodacre ECC then makes the appropriate notifications and tactical resource dispatching. There is also the potential for park visitors in Marin County and San Francisco parks to notify an NPS employee. In this event, the park employee will contact GGNRA Park Dispatch at the Presidio. GGNRA Park Dispatch will, in turn, notify Woodacre ECC and also begin the dispatching of NPS fire resources.

3.6 INITIAL ATTACK

Initial Attack is an aggressive suppression action consistent with firefighter and public safety and values to be protected.

All unplanned wildland fires must receive aggressive initial attack action (IA) by the nearest available suppression forces. Generally, first on scene would be a local fire department engine company. In Marin County, this would likely be Southern Marin Fire for Alta Ridge or Marin County Fire Department. In San Francisco, the Presidio Fire Department would respond to wildland fires in the Presidio, Fort Mason, Fort Point and San Francisco Maritime Museum. The San Francisco Fire Department would be the initial responder to

Figure 19 – Burning Index Levels during Past Wildfires



fires at Fort Funston, Sutro Heights, Land’s End and Fort Miley. Cal Fire would respond to Phleger Estate and the North Coast Fire Authority along with Cal Fire would respond to Sweeney Ridge, Milagra Ridge, Cattle Hill, Mori Point and Pedro Point near Pacifica.

NPS personnel will respond after notifying GGNRA Park Dispatch and Woodacre ECC (for Marin County) or Cal Fire’s Felton

ECC (for San Mateo County). Woodacre ECC will be the ordering point for all initial attack fires within GGNRA in Marin County. Cal Fire’s Felton ECC will be the ordering unit for fires in San Mateo County. If a federal Type 3 IC is not immediately available to take over

CHAPTER 3 – FIRE MANAGEMENT PROGRAM COMPONENTS

the incident, a Battalion Chief or higher from the Marin County Fire Department, Southern Marin Fire Protection District, North Coast Fire Authority or Cal Fire may assume that position with the FMO and Superintendent's concurrence.

On federal lands in San Mateo County, where Cal Fire has direct protection area responsibility, Cal Fire will provide all qualified incident command.

3.6.1 Initial Attack Priorities and Closest Resources

In the unusual event that there are multiple simultaneous fires within GGNRA, a fire start which has the potential to threaten life or property would have priority for suppression actions.

GGNRA will follow the Closest Forces Concept for initial attack actions on GGNRA lands. Employing the closest forces concept means that regardless of the protecting agency, the fire suppression resource that has the shortest timeframe to be the first to reach the incident location will be the one dispatched. This concept is standard operating procedure for all cooperating fire protection agencies in Marin, San Mateo and San Francisco Counties and is included as part of operating plans with our local fire agencies.

3.6.2 Appropriate Management Response

The AMR will be based on objectives, relative risk, external influences and management boundary defensibility and may include one or some combinations of the following:

- Initial Attack. A planned response to a wildfire given the wildfire's potential fire behavior. The objective of initial attack is to stop the spread of the fire and put it out at least cost. This is an action where an initial response is taken to suppress wildfires consistent with firefighter and public safety and values to be protected.
- Wildfire suppression with multiple strategies. This action categorizes wildfires where a combination of tactics such as direct attack, indirect attack and confinement by natural barriers are used to accomplish protection objectives as directed in the Wildland Fire Situation Analysis (WFSA).
- Control and extinguishment. These actions are taken on a wildfire when the selected WFSA alternative indicates a control strategy. Sufficient resources are assigned so that control of the fire can be achieved with a minimum of acres burned.

3.6.3 Response Time Frames

The GGNRA road system is in relatively good condition with most areas in the park accessible by vehicle and thus, response times to fires by engines would be relatively short.

Cal Fire maintains several fire stations in San Mateo County within close driving range of Sweeney Ridge, Milagra Ridge, the Phleger Estate and Mori Point. The Cal Fire stations can provide rapid response to these areas.

Aerial delivery of firefighters by helicopter is an alternative to walk-in if speed to an incident is necessary.

Cal Fire maintains nearly all aerial tactical firefighting resources in the San Francisco Bay Area. No federal aerial resources are stationed in this part of the state. The closest Cal Fire helicopter capable of delivering and supporting firefighters are:

- Copter 104 (Boggs Mountain) for response to GGNRA lands in Marin and San Francisco Counties.
- Airtanker 85 (Sonoma) for response to GGNRA lands in Marin and San Francisco Counties.
- Copter 106 (Alma) for response to GGNRA lands in San Mateo County.
- Airtankers 82 and 83 (Hollister) for response to GGNRA lands in San Mateo County.

3.6.4 Restrictions and Special Concerns

As a unit of the NPS, there are sensitive resources requiring special protection throughout GGNRA. During the NEPA process which preceded the preparation of this FMP, NPS staff and the public considered the potential impacts to the park and general area resources from wildland fire, fire suppression actions and more routine fire management projects. After reviewing the level of adverse and beneficial effects that could result from implementation of the FMP, staff, regulatory agencies and the public contributed to the development of a series of mitigation measures to be applied to FMP actions in order to minimize or avoid the predicted potential effects. These mitigation measures were adopted by the NPS through the signature of the Record of Decision (ROD) for the FMP Final EIS by the Pacific West Region Deputy Director. Prior to and during suppression actions, appropriate mitigation measures from Appendix D should be implemented to the degree feasible while ensuring the protection of life, property and resources. The following mitigation measures pertain to preparation for suppression and active suppression of wildland fire.

Preparedness

- FMP-2** GGNRA staff will meet with representatives of local fire agencies that could respond to wildfires in GGNRA lands in Marin, San Francisco, and San Mateo counties. The purpose of the meeting will be to provide information to fire agencies on the location and preferred strategies for suppression actions that will minimize damage or afford protection to important park resources in the event of a wildfire. The information exchanged between the NPS and local fire agencies will include notification procedures, new or modified facilities in the park, updated information on cultural and natural resources, low-impact suppression techniques, or potential protection techniques for certain locales in GGNRA.
- FMP-3** GGNRA cultural and natural resources staff will work with the fire management staff in preparing and updating maps and other data sources showing areas of the park with sensitive resources such as National Register properties; archaeological sensitivity; cultural landscapes; plant communities of special management concern (e.g., wetlands, riparian areas, dunes, and

CHAPTER 3 – FIRE MANAGEMENT PROGRAM COMPONENTS

- Special Ecological Areas identified in the park's Natural Resource Management Plan); habitat of federal, state, and locally listed species; and other important natural and cultural resources.
- FMP-6** The superintendent of GGNRA will appoint members of GGNRA staff to act as resource specialists to consult with operations crews in the event of wildland fire and during planning and execution of prescribed fire. The resource specialists will meet with local fire agencies likely to command wildland fire suppression actions on GGNRA lands and develop strategies for implementing flexible suppression to protect important resources.
- AIR-2** The NPS will develop a Smoke Communication Strategy to guide management of smoke events during prescribed fires, managed wildland fires, suppression actions, and fires occurring outside the park.
- SS-24 (And Suppression)** During the information meeting with local fire agencies, the location of mission blue butterfly habitat will be identified. During this meeting and when providing information at an active wildland fire as a resource advisor, natural resources staff will advise the local fire agency of the following guidelines:
1. Avoid staging fire suppression actions in or directly adjacent to mission blue butterfly habitat;
 2. Construct fire lines outside of mission blue butterfly habitat to the greatest extent possible;
 3. Use wet lines wherever feasible, or narrow, hand-constructed fire lines where water is not available to help contain the spread of the fire; and
 4. Avoid using saltwater or retardant on habitat of the mission blue butterfly.
- SS-30 (And Suppression)** During the information meeting with local fire agencies, the location of San Bruno elfin butterfly habitat will be identified. During the meeting and when advisors are called to provide information at an active wildland fire, natural resources staff will advise the local fire agency of the following guidelines:
1. Avoid staging fire suppression actions in or directly adjacent to San Bruno elfin butterfly habitat;
 2. Construct fire lines outside of San Bruno elfin butterfly habitat to the greatest extent possible;
 3. Use wet lines wherever feasible, or narrow, hand-constructed fire lines where water is not available to help contain the spread of the fire; and
 4. Avoid the use of saltwater or retardant drops on San Bruno elfin butterfly habitat.
- SS-32 (And Suppression)** During information meetings with local fire agencies and on the scene of active suppression actions, natural resource advisors will

inform responding fire agencies that Rodeo Lagoon shall not be used for water drafting unless needed to protect life and property and no other feasible water source is available.

Suppression Actions

- FMP-7** Natural and cultural resources staff will be notified of wildland fires as soon as possible so that appropriate staff can advise the lead fire agency on the location of sensitive resources and preferred suppression techniques and begin planning for rehabilitation of the burned area. Natural and cultural resource advisors will be assigned to the incident as needed.
- FMP-8** For any multi-day fire suppression event, a local or regional Burned Area Emergency Response team will be requested to facilitate development, in conjunction with park staff, of the emergency suppression stabilization and rehabilitation proposals.
- SW-1** Planned and unplanned fire actions will include strategies to minimize impacts from erosion, such as avoiding steep slopes and highly erosive soils, timing burns to minimize erosion potential, avoiding scraping or burning to bare mineral soil (layer below duff), or using erosion control techniques during or after burns.
- WET-1** Fires will be allowed to back into, around, or through wetlands and meadows to avoid suppression damage. Wetlands will be avoided to the greatest extent possible while constructing fire lines and breaks during wildfire suppression. Where wetlands are used as a natural boundary to help contain a fire, the control line will be sited outside the wetland area. Trample lines (rather than dug lines) may be used if it is necessary to site the control line in the wetland.
- WET-2** Foams, saltwater or other fire retardants will not be used on or near wetlands to the greatest extent possible.
- VEG-2** Soil disturbance during mechanical treatments, prescribed burns, and suppression fires will be minimized to the greatest extent possible to reduce the potential for introduction or spread of nonnative plant species, to protect topsoil resources, and to reduce available habitat for new nonnative plant species.
- SS-1** When emergency actions must be taken to prevent imminent loss of human life or property and these actions would result in a taking of listed species or adverse modification of critical habitat not covered under existing FMP biological opinion, the NPS will respond to the situation in an expedient manner to protect human health and safety. After the incident is under control, the NPS will initiate emergency consultation procedures with the appropriate agency(ies).
- SS-4** To avoid the spread of highly nonnative animal species (e.g., bullfrogs) and protect the habitat of federally listed threatened or endangered species, GGNRA resource advisors and fire management staff will advise local fire

CHAPTER 3 – FIRE MANAGEMENT PROGRAM COMPONENTS

agencies responding to wildland fires in the park and vicinity of the following guidance:

1. Drawing water from freshwater bodies in GGNRA and Rodeo Lagoon should be avoided unless there are no alternative sources available. If freshwater is drawn or scooped from water bodies in the park, it should be used on wildfires within the same watershed whenever possible.
2. Ocean and bay waters are preferred water sources for fighting wildfires in the park and vicinity. Habitats of sensitive aquatic species and mission blue butterflies should be avoided when saltwater is used.

SS-11 Except in emergency situations, water drafting from park streams and creeks that support salmonids must be halted when water levels drop to a level that could result in disconnected pools of water in the channel. Any water pumping from salmonid streams will require measures to prevent injury to fish, such as using offstream sumps, restricting approach velocities to less than 0.8 foot per second, and screening at intake with openings no greater than 0.25 inch.

SS-19 No heavy equipment will be used off of existing fire roads or developed features in areas of known San Francisco garter snake habitat. If use of heavy equipment and trucks is required during emergency situations or for work that would improve San Francisco garter snake habitat, mitigation measures to avoid mortality will be incorporated into the project schedule.

SS-37 To avoid disturbance of western snowy plovers, aircraft assisting the NPS in the implementation of FMP projects will avoid flying directly over and parallel to the beach to the greatest extent possible.

SS-38 To avoid disturbance to the California brown pelican from late spring to early winter:

1. Avoid operating aircraft below and within 500 feet of Rodeo Lagoon, Bird Island, and Bolinas Lagoon to the greatest extent possible.
2. Avoid drafting water from Rodeo Lagoon, the ocean near Bird Island, or Bolinas Lagoon.

3.6.5 Extended Attack and Large Fire Suppression

The Incident Command System (ICS) provides for a management/organizational structure on incidents that evolve in complexity or increase in size, whether within a few hours or over several days. While the criteria for incident complexity vary by local conditions, a fire that has escaped initial attack is considered in extended attack (Type 3 incident) when it:

1. Has not been contained by the initial attack resources dispatched to the fire.
2. Will not have been contained within management objectives established for that unit or area.

3. Has not been contained within the first operational period and there is no estimate of confinement or control.

When complexity levels exceed initial attack capabilities (Type 4 and 5 incidents), the appropriate ICS positions should be added commensurate with the complexity of the incident. The Incident Complexity Analysis and the WFSA assist the Superintendent in determining the appropriate management structure to provide for safe and efficient fire suppression operations. When an Incident Management Team is ordered to manage a fire, a Superintendent In-Briefing Package and Delegation of Authority as well as a draft WFSA will be prepared and presented to the team upon arrival at GGNRA. A unified command structure will be a requirement in all multi-jurisdictional incidents.

As safety allows, initial attack Incident Commanders will assess the complexity of the fire to determine their capacities to manage the incident. If the initial attack Incident Commander (IC) is unable to initiate action due to the management complexity of the incident, forces will be staged in a safe location or modified tactics will be used until a fully qualified Type 3 Incident Commander arrives on scene. Qualified IC's from those local fire agencies that have a Cooperative Fire Agreement with GGNRA (i.e., Marin County Fire Department, Cal Fire, etc.) may fill the Type 3 Incident Commander role if a qualified federal IC is not available or until federal oversight can be provided.

Qualified local agency personnel may be used to fill ad-hoc Type 3 incident positions. The decision to transition to a Type 2 or 1 complexity incident will be made by the Park Superintendent in consultation with the FMO and the Type 3 Incident Commander.

All wildland fires (with the exception of GGNRA lands under CalFire DPA) that meet Type 2 or 1 complexity levels will require a federal Type 2 or 1 Incident Management Team

A Delegation of Authority will be prepared for all incidents involving federal lands which transition to a federal Type 1 or 2 Incident Management Team. Mendocino NF ECC will be the ordering point for all Type 1 or Type 2 complexity fires and any extended incident beyond one or two operational periods.

A Delegation of Authority will be prepared for the Cal Fire Incident Commander at any complexity level on GGNRA lands in San Mateo County which is within the Cal Fire DPA. Inherent in DPA Agreements, Cal Fire can call upon its Type 1 Incident Management Teams to manage a complex fire incident. Felton ECC will be the ordering point for all incidents on GGNRA managed lands within the Cal Fire DPA.

An Incident Complexity Analysis (NIFC 2006, Chapter 10, Appendices 10-4 or 10-5) will be used as a guide for IC's, fire managers and Agency Administrators to evaluate emerging fires in order to determine the level of management organization required to meet agency objectives. This will assist in identifying resource, safety, and strategic issues that will require mitigation.

The WFSA is a decision-making process in which the Superintendent or representative describes the situation, compares multiple strategic wildland fire management alternatives, establishes objectives and constraints for the management of the fire, selects the preferred alternative, and documents the decision. The format and level of detail required depends on the specific incident and its complexity. When a wildland fire

CHAPTER 3 – FIRE MANAGEMENT PROGRAM COMPONENTS

cannot be controlled during the initial suppression response action or a prescribed fire has exceeded its parameters and been declared both unsuccessful and a wildfire, a WFSA will be initiated and a new strategy selected *Interagency Standards for Fire and Fire Aviation Operations*, Chapter 10-E (NIFC 2006).

3.6.5.1 *The Wildland Fire Situation Analysis (WFSA) Development*

The WFSA is a decision making process in which the Superintendent (or designee) describes the situation, compares strategy alternatives, evaluates expected effects of each alternative, establishes objectives and management constraints, selects the preferred alternative, and documents the decision. It serves as a contingency to undesirable outcomes. If the selected alternative does not accomplish objectives, the WFSA can be amended.

The Superintendent or designee and the FMO and/or Incident Commander prepare the WFSA. Required elements to be addressed in a WFSA are:

- Current Situation
- Evaluation Criteria
- Alternatives
- Analysis of Effects
- Record of Decision
- Review/Evaluation/Update
- Probability of Success
- Consequences of Failure

3.6.5.2 *Complexity Decision Process for Incident Management Transition.*

GGNRA has developed a unit-specific Incident Complexity Analysis for Type 4 and 5 fires and criteria for transitioning to a Type 3 incident command structure. See further information in Section 3.3.4, Extended Attack, and Appendix E, Part 12, GGNRA Incident Complexity Analysis for Type 5, Type 4 and Transition to Type 3 Incidents.

3.6.5.3 *Delegation of Authority for IC*

The Delegation of Authority for IC form permits the Superintendent to delegate the responsibility for all incident suppression efforts to another qualified individual. The newly delegated IC may be from another park unit, another federal agency or a state or local agency. The person has to be qualified for the complexity level of the incident as determined by the previous IC. See further information in Section 3.3.4, Extended Attack, and Appendix E, Part 14, Example of Delegation of Authority Form.

3.6.6 REHABILITATION GUIDELINES AND PROCEDURES

While many wildfires cause only limited damage to the land and pose few threats to fish, wildlife and people downstream, some fires create conditions that require proactive

efforts to prevent further damage from occurring. Loss of vegetation exposes soil to erosion; runoff may increase and cause flooding, sediments may move downstream and damage houses or fill reservoirs, and put endangered species and community water supplies at risk. The Burned Area Emergency Response (BAER) program addresses these situations with the goal of protecting life, property, water quality, and deteriorated ecosystems from further damage after the fire is out.

There are four complementary parts to the BAER Program:

1. Suppression Activity Damage (SAD) are those repairs necessitated by damage resulting from the suppression activity rather than a result of the wildfire. The repairs are planned and implemented primarily by the incident command organization prior to demobilization. Suppression Activity Damage repairs are charged to the incident account.
2. Emergency stabilization (ES) actions are set out in the Burned Area Emergency Response Plan completed within 7 days of the containment of the fire by an interdisciplinary Burned Area Emergency Response Team. The Team surveys the burn area, identifies where repairs are needed and how the repair will be conducted. The goal of ES is to minimize threats to life and property or to stabilize and prevent unacceptable degradation to natural and cultural resources. ES repairs are to be implemented within one year of containment of the wildfire. ES is part of the Emergency Operations appropriation
3. Burned Area Rehabilitation (BAR) requires the preparation of a Rehabilitation Plan identifying projects that are in need of repair or improvement on a landscape scale resulting from direct damage by the wildfire. The goal of the rehabilitation plan is to rehabilitate and establish healthy, stable ecosystems in the burn area, prioritizing relative values to be protected, commensurate with rehabilitation costs. The plan is developed with public participation and describes projects and follow-up actions occurring up to three years after containment. BAR is a separate non-emergency appropriation.
4. Long-term (>3 years) Restoration are those rehabilitation actions occurring beyond the initial three years or after the repair or replacement of major facilities damaged by the fire.

Interior Department Guidance on the BAER program is found in Departmental Manual 620, Chapter 3. An Interagency Burned Area Emergency Response Handbook, Version 4.0 can be found at <http://fire.r9.fws.gov/ifcc/esr/Policy/es%20handbook%202-7-06.pdf>. The Burned Area Rehabilitation Handbook is currently in Draft form and circulating for review. Specific best management practices for implementing ES and BAR actions at GGNRA should consider the following recommendations:

- Burn area seeding may be considered, depending on specific local impacts. All seed applications must be approved by the GGNRA Resource Advisor prior to purchase and application.

CHAPTER 3 – FIRE MANAGEMENT PROGRAM COMPONENTS

- To the greatest extent possible, waterbars shall be hand-placed. No mechanical equipment will be used in wilderness areas unless such action is in response to an immediate threat to watershed stability.
- A post-burn watershed assessment will be made for fires affecting sensitive watersheds.
- Rehabilitation actions may require consultation with the FWS and the NMFS. See Endangered Species Act (ESA) Section 7 Handbook, Chapter 8 for further guidance. Consultation shall be coordinated through the BAER Team in conjunction with local GGNRA staff. If a BAER Team is not assigned to the incident, an ESA Coordinator will be assigned to this duty.
- NHPA compliance may be required prior to implementation of ES or BAR projects. A determination should be made as to whether the actions meet the requirements for NHPA compliance under emergency conditions described in the NHPA regulations, provision 800.12.
- Emergency stabilization funds can be used to control nonnative invasive plants within burned areas when it can be documented that the invasive may spread quickly and can out-compete emergency stabilization relying on seedings or reestablishment of native vegetation. Options for treatment may include chemical, biological or mechanical methods to control aggressive invasives, post-fire detection and monitoring which may be funded for up to one year following containment of the fire.
- If herbicides are prescribed for emergency stabilization actions, they will be applied according to strict specifications using detailed Material Safety Data Sheets. Any application requires the approval of the GGNRA's Integrated Pest Manager and the Washington Office coordinator for herbicide application. No applications would occur in riparian or wetland areas.
- Monitoring intensity should be commensurate with the complexity of the emergency stabilization treatments, level of concern or controversy associated with the emergency stabilization treatment. See Appendix F, Wildland and Prescribed Fire Monitoring and Research Plan. Monitoring of rehabilitation treatments will be coordinated with the GGNRA Fire Ecologist and Bay Area Network Fire Effects Monitoring Program.

3.6.7 Records and Reports

Quality, long-term documentation records for all actions taken on a wildland fire is critical. All decision documents, monitoring data, supporting documentation, and operational documents (Incident Action Plans, maps, unit logs, etc.) will be assembled and organized during and following a wildland fire management action.

Specifically, the fire report and file should contain:

- Any written policies, guidelines or authority statements signed by the Superintendent.

- Copy of the NPS WFSA.
- ICS-209's (Incident Status Report) for fires over 100 acres in Timber or over 300 acres in Grass.
- Copies of purchase orders, personnel request orders, etc. associated with the fire.
- All situation maps.
- Personnel rosters.
- Press releases, clippings, videotapes.
- Accident reports.
- All monitoring data, spot weather forecasts, Internet printouts.
- Documentation of financial charges made against the assigned account number.
- Narratives and unit logs.
- Burned Area Rehabilitation plan.
- DI-1202 Fire Report (completed within 10 working days after fire has been declared out).

It is particularly important to include IC narratives (see above) regarding effectiveness of planned strategies, trigger points, holding actions, and other pertinent factors encountered during the fire.

3.7 PRESCRIBED FIRE

For purposes of the FMP and as defined by federal Wildland Fire Management Policy, prescribed fire is any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan (burn plan) must exist prior to ignition. This burn plan contains a prescription defining goals, weather and fire behavior parameters, monitoring, and treatment methods used to achieve project specific objectives, while prioritizing firefighter and public safety. All prescribed fire projects also require an approved Smoke Management Plan filed with BAAQMD.

For the foreseeable future, the prescribed fire program will be aimed at restoring fire as a natural ecological process and reducing hazard fuels concentrations. Many areas subject to first entry treatment may require subsequent treatment(s) in order to achieve hazard fuels reduction objectives, rather than attempting to meet all objectives on the first treatment and risk costly escape and/or unacceptable resource damage.

The range of possible beneficial outcomes of prescribed burning projects includes an increase in firefighter and public safety, protection of real property and natural and cultural resources, reduced risk of high intensity wildland fires, avoidance of savings property damage costs and the restoration of fire to fire-adapted landscapes.

The late fall wildfire season is one of the primary constraints limiting the number of days available in the project area during which prescribed burns can be conducted each year. Other constraining factors are air quality and disruption of wildlife breeding periods.

3.7.1 Annual Planning, Review and Documentation for Prescribed Burning

Prescribed fire project prioritization for GGNRA is determined as part of the five year implementation plan update that occurs annually in early winter. Project priorities are set for the coming year based on actual accomplishments during the prior year and



target goals of the FMP. Projects scheduled but uncompleted for the prior year and re-evaluated in light of the current years project list and some project rescheduling normally occurs. The effects of rescheduling the current year ripples through the five year plan causing some reshuffling in the project schedule. The following actions and dates structure the planning process:

- Prepare annual program priority list based on projects listed in the multi-year implementation plan.
- Prepare map of archaeological/biological survey before January 15 for anticipated projects to be conducted during the following fiscal year.
- Submit prioritized listing of projects through NFPORS database by March 10.
- Regional fire staff informs GGNRA FMO of the final list of selected projects by mid-summer.

3.7.1.1 *Prioritizing and Review the Annual Implementation Plan*

The five-year fuels treatment plan will be updated annually as target units are burned and fuel reduction projects completed. [The GGNRA Five Year Fuels Treatment Plan will be developed in 2008 for the FMP update.] Fire Management staff at the PWR office have established a process for the annual review of the five year fuels treatment plan *vis-à-vis* ensuring that actions conform to the findings and commitments agreed to in the NEPA process for the FMP. In addition to NEPA conformance, the annual review process provides a framework for ensuring continued conformance with the requirements of the ESA consultations and NHPA programmatic mitigation measures. The review of the five year fuels treatment plan will be undertaken by a multi-disciplinary team representing the range of expertise of the fire staff.

For the specific process to follow for the annual review of the fire management program and FMP, please see FMP Section 4.6.

To update the annual implementation plan for the coming fiscal year, the fire management branch developed priorities based on their professional expertise, input from outside fire agencies, and hazard mapping such as Marin County's Fuel Ranking and Hazard maps and the Park's Wildland Fire Hazard Maps. Sites for prescribed burning are initially proposed based on the risk factors, fuel conditions and resource management issues identified in the GGNRA FMP for each project area.

Project selection and prioritization involve a conglomerate of multi-divisional staff members including but not limited to: Vegetation, Wildlife, Cultural Resources, Fire Ecology, Fire Suppression Operations, Environmental Compliance, and Interpretation and Education.

Based on the relative strength of the justification, projects are further considered for potential effectiveness in addressing critical needs and feasibility of implementation. The FMUs and project areas have goals and objectives, and the development and prioritization of projects must be based on the reasoned expertise of fire staff. Though NPS fire staff is not bound by the strategies in the Marin CWPP or the Cal Fire annual plan, these preventive plans are seriously considered when prioritizing NPS projects as are NPS efforts to coordinate, cooperate, and plan with our local fire agencies and land managers to ensure efficiency, and that overall fire management goals and strategies can be achieved in unison.

All these disciplines gather and are able to bring new ideas to the table and to discuss and provide input for projects that are developed by the FMO office.

New projects for resource enhancement, vegetation management, and urban interface protection are presented to the group. These projects are prioritized based on the likelihood of funding, difficulty of operations, actual benefits from project completion, and the safety of the public and park staff. An additional key ranking criteria is how future projects relate to previous ones. Projects that are a continuation of work begun on long-term fuel reduction zones carry a high ranking. This ensures that previous efforts are maximized.

Another reality facing fuels and prescribed fire management decisions is the lack of funding. This reality must also be included in project decision criteria. Some of the highest ranked priorities based on fuel ranking and hazard maps would also be the most costly based on their proximity to private property. These projects require smaller acres to minimize public impacts and require more resources to ensure protection of property. The likelihood of these projects being funded by the regional office is diminished by the associated high cost per acre.

There is no set formula for determining and prioritizing projects. Park staff needs to remain very flexible to address and react to changing management goals and budget realities. All projects that are approved have the complete involvement and support from the various management disciplines within the park.

CHAPTER 3 – FIRE MANAGEMENT PROGRAM COMPONENTS

Once verified, the annual FMP review can be conducted. The finalized list of projects is presented at the beginning of the fiscal year to the Division Chief and Superintendent for review and comment. At that point, it is appropriate to conduct NEPA project review on the finalized list. As FPA comes on-line, the annual FMP review may be tied to the FPA schedule changing the annual review period to each January.

3.7.1.2 *Review of Projects for NEPA Conformance*

Requirements set forth in RM #18, Chapter 10, Part VIII, Prescribed Fire (revised 9/26/06), will be followed. These revised guidelines conform to the Interagency Prescribed Fire Policy Planning and Implementation Guide (NIFC 2006). The following information should be included in project-level plans involving prescribed fire:

- Develop project objectives and site-specific treatment methods to accomplish objectives into a comprehensive project description for the NEPA assessment.
- Input project information into the Planning, Environment and Public Comment (PEPC) database system, implemented agency-wide for all levels of NEPA review. Burn plans for areas that were sufficiently assessed through the FMP FEIS will be reviewed by the IDT and the conformance with the FEIS documented through a Memo to the File of the FEIS. The project impacts and mitigation measures must conform to the formal consultations conducted as part of the FMP and the findings of the FMP Record of Decision. If a proposed project does not conform, additional consultation may be warranted. Upon completion of annual review process, any additional written documentation will be filed as part of the FMP EIS NEPA process as a Memo to File.
- If, due to proposed burn location or burn intensity, sensitive resources could be directly or indirectly affected in a manner not anticipated and addressed in the FEIS, the burn will require a separate NEPA review and perhaps additional ESA or NHPA consultation. NEPA conformance for these projects will be conducted per DO-12, RM-12 and GGNRA SOP-601 for NEPA Compliance. Conformance would be achieved by an EIS or EA if there is potential for significant adverse effect or exceptional circumstances; projects without potential for significant adverse effect may meet the requirements for a categorical exclusion for prescribed burning (categorical exclusion G.1).
- Following mitigating actions, an original copy of the burn plan will be routed with attached clearances by the FMO/Burn Boss.

3.7.1.3 *Developing Burn Plans*

All NPS prescribed fire programs will adhere to the following requirements for planning, reporting and documenting prescribed burns:

1. All prescribed fire projects will be coordinated in a collaborative process involving adjacent neighbors and local governments.
2. A Delegation of Authority for all off-Park Burn Bosses will be prepared and signed by the Agency Administrator or acting.

3. An Incident Action Plan will be developed for each operational period of a prescribed fire. It is permissible to develop a multishift IAP to cover a period of several days. The 215A (Incident Safety Analysis) process will be utilized in the development of the IAP. Required components of the IAP include:
 - a) Organization Assignment (ICS-203)
 - b) Medical Plan (ICS-206)
 - c) Safety Message (or ICS-215A)
 - d) Division Assignment List (ICS-204)
 - e) Communication Plan (ICS-205)
 - f) Project Map
 - g) Weather Forecast (preferably spot weather)
 - h) Aviation Operations Summary (if applicable) (ICS-220)
4. Resources listed as “contingency” must be available to respond to the incident within a specified timeframe. If the contingency resource becomes unavailable to respond to the prescribed fire, it must be replaced immediately, as the burn is now out of prescription.

Other actions which should be considered by the FMO or assigned Burn Boss in implementing a prescribed fire are the following:

- Reconnaissance (GPS) and burn unit layout and compliance (involve resources staff as needed to identify values to be protected, etc.).
- On-site documentation, fire effects monitoring, Job Hazard Analysis (JHA) elements, logistics, and identified mitigation work; complete complexity rating.
- Analyze potential ignition patterns with prescriptions, weather, fuels, and topography.
- Coordinate all burns w/grazing permit holders, cooperators, and media.
- Smoke management considerations, monitoring, modeling, and consultation with the Bay Area Air Quality Management District.
- Pre-burn notifications.
- Briefings, logistics, contingencies.
- Go/No-Go decision process.
- Organization, implementation plans.
- Follow-up coordination, evaluations, cost summaries, record keeping, reporting requirements (a DI-1202 will be completed for each burn and submitted via input through relevant agency channels within 10 working days after declared out date).
- Submit data for GIS addition to prescribed fire thematic map.

3.7.1.4 *Long-Term Strategy*

The long-term strategy for the prescribed fire program is to employ prescribed fire as a tool to reduce hazardous fuel buildups and restoring fire as a key ecosystem process, while ensuring public safety and protection of property or resource values. Consideration should be made such that prescribed fire treatments should be implemented in a manner that simulates the natural ecosystem function of fire as determined through fire ecology and historic research to restore fire as a keystone natural process.

Goals and Objectives for the GGNRA FMP were developed during the initial stages of the FMP NEPA process. These goals and objectives, along with the principles of federal wildland fire management policy and NPS fire management guidelines, constitute the long-term strategy of the FMP. Goals and objectives are found in FMP Section 2.1. Federal and agency fire management policies are summarized in FMP Chapter 1.

3.7.1.5 *Personnel*

All prescribed fire personnel assigned to prescribed fires will meet all national requirements for training and experience in NWCG 310-1. The Burn Boss assigned to prescribed fires will be certified according to complexity and fuel type of the treatment unit.

3.7.1.6 *Fire Behavior and Fire Effects Monitoring*

Before the burn, fuels characteristics such as live and dead fuel moisture contents will be established to check prescription parameters and fire behavior calculations. Prior to ignition, a Spot Weather Forecast will be submitted and the results analyzed by the Fire Effects Monitor and the Burn Boss as a factor of the Go/No-Go decision making process. During ignition, on a timetable agreed upon by the Fire Effects Monitor and the Burn Boss, but not to exceed one hour, on-site weather, smoke, and fire behavior observations will be recorded on forms found in the Western Region Fire Monitoring Handbook.

The Bay Area Cluster Fire Effects Monitoring Crew has established plots in a representative number of prescribed burn units. After the burns, on a schedule established by monitoring protocols, the crew will record post-fire data and submit annual reports to the Fire Ecologist and resources division for evaluation of burn effectiveness.

3.7.1.7 *Reporting and Documentation*

For NPS, all prescribed fires will be documented with the following information, stored in an individual fire folder and maintained in the Seashore's files:

- Original signed Prescribed Burn Plan.
- Checklist of pre-Burn prescribed fire activities.
- All reviewer comments.

- All maps.
- Notification checklist.
- Permits such as burn, smoke, etc.
- Monitoring data.
- Weather forecasts.
- Superintendent Go/No-Go pre-ignition approval.
- Operational Go/No-Go checklist.
- Incident Action Plans.
- Unit logs, Daily Validation or other unit leader documentation.
- Press releases, public comments, and complaints.
- Smoke dispersal information.
- Post fire analysis.
- Fire Occurrence Report (DI-1202).
- NFPORS entry.

3.7.1.8 *Prescribed Burn Plan Elements*

For NPS, each plan shall include at the minimum, the elements listed below. An example of the outline of a Prescribed Fire Plan is in Appendix E, Part 17 of this FMP. The *Interagency Prescribed Fire Planning and Implementation Guide* lists the elements required for prescribed fire plans and briefly describes how to develop the contents for each element and the implementation policy that goes along with it. Prescribed fire plans must address the following 21 minimum elements and appendices in the following sequence (see the *Interagency Prescribed Fire Planning and Implementation Guide* for description and guidance):

1. Signature page
2. GO/NO-GO Checklists
3. Complexity Analysis
4. Description of the Prescribed Burn Area
5. Goals and Objectives
6. Funding
7. Prescription
8. Scheduling
9. Pre-burn Considerations
10. Briefing
11. Organization and Equipment
12. Communication
13. Public and Personnel Safety
14. Test Fire

CHAPTER 3 – FIRE MANAGEMENT PROGRAM COMPONENTS

15. Ignition Plan
16. Holding Plan
17. Contingency Plan
18. Wildfire Conversion
19. Smoke Management and Air Quality
20. Monitoring
21. Post-burn Activities

Appendices

- Maps
- Technical Review Checklist
- Complexity Analysis
- Job Hazard Analysis
- Fire Behavior Modeling Documentation or Empirical Documentation (unless empirical documentation is included in the fire behavior narrative in the Element 7, Prescription)

Although not required, the following recommendations are offered in RM-18, Chapter 10, Section VIII:

1. An Executive Summary is not required in the burn plan, but highly recommended, especially for high complexity burns and omnibus plans. An informative summary is useful for the Agency Administrator and reviewers of complex burn plans.
2. The Implementation Guide states only three signatures are required (Agency Administrator, Plan Preparer and Technical Reviewer). It is recommended that Resource Management, the Fire Ecologist and the Fire Management Officer are also signatories as reviewers or for concurrence.
3. The *Adequate Holding Worksheet* is an optional tool for determining holding resources in Element 16. If it is not used, provide other rationale for determining holding resources.
4. For Element 20 (Monitoring) of the prescribed burn plan, follow direction in RM-18, Chapter 10 and in RM 18 Chapter 11.

3.7.2 Exceeding Existing Prescribed Burn Plan

If prescription parameters are exceeded during project execution, the Burn Boss will terminate ignition operations at a safe and appropriate location based on fire behavior, fuels, topography and weather conditions. If the project area comes back into prescription based on current and forecasted weather, ignition operations may continue. If not, the project area is put into a mop-up or patrol status. Holding actions will maintain control of the fire until a decision to continue, postpone or extinguish the prescribed fire is made and the Agency Administrator or their designee is notified. This decision making process will be articulated in the prescribed burn plan.

If the prescribed fire exceeds project boundaries and/or slopovers and spot fires are not contained within one burning period, suppression actions will be taken and the entire

prescribed fire project will be declared a wildfire. Once declared a wildfire, suppression is the only option. A wildland fire cannot be converted back to a prescribed fire.

If at any time the prescribed fire poses a threat to life, property, or high value resources, beyond those mitigated in the plan, suppression actions will be taken and the fire will be declared a wildland fire.

Once the prescribed fire is declared a wildland fire, all subsequent actions (i.e. operational needs, notification, strategies, resource orders, etc.) will be defined under a wildland fire transition plan, which is part of the prescribed fire plan until an initial Wildland Fire Situation Analysis (WFSA) is completed.

Parks are required to notify the Regional Fire Management Office within 24 hours of any of the following actions taken on a prescribed fire that has escaped or is a threat to escape:

- a) any prescribed fire converted to a wildfire.
- b) any prescribed fire requiring activation of the contingency plan specified in the burn plan.
- c) any prescribed fire that requires additional resources or operational time not accounted for in the Incident Action Plan.

If the burn is not an escape or a threat to escape, or is not and will not be declared a wildfire, regional notification is not required (RM #18, Chapter 10, Section VIII, A. 5, 9/26/06).

3.7.3 AIR QUALITY AND SMOKE MANAGEMENT

3.7.3.1 Regulatory Compliance and the Approval Process

Visibility and clean air are primary natural resource values in all NPS units. The protection of these resources must be given full consideration in fire management planning and operations.

GGNRA is a Class II air shed under the amendments to the Clean Air Act (CAA) adopted in 1977. Class I areas, such as Yosemite National Park and PRNS, are national parks established before 1977 with a total area greater than 6,000 acres where emissions of particulate matter, sulfur dioxide, and nitrogen dioxide would be restricted to control impacts to visibility at sensitive airsheds. In Class II area, some incremental increase in emission levels would be allowed based on the proximity of the park or monument to a population center.

The Federal Government has ceded responsibility and authority to establish air quality standards and regulations to the states (RM #18, Chapter 14). Therefore, GGNRA complies with the Clean Air Act by adhering to the requirements of the California Air Resources Board (CARB) and the BAAQMD.

The CARB is responsible for disseminating regulations about air quality, including state ambient air quality standards and area designation. Title 17 of the California Code of Regulations, entitled Smoke Management Guidelines for Agricultural and Prescribed

CHAPTER 3 – FIRE MANAGEMENT PROGRAM COMPONENTS

Burning, provides direction to air pollution control and air quality management districts for the regulation and control of agricultural burning and prescribed burning. These guidelines are intended to allow the use of prescribed burning as a tool, while minimizing smoke impacts on the public.

BAAQMD is the air quality management district for GGNRA and has primary responsibility for control of air pollution from prescribed burning. BAAQMD has procedures that must be followed prior to implementation of a prescribed burn plan.

Prescribed burn plans must include a Smoke Management Plan that is to be submitted to BAAQMD a minimum 30 days in advance of the planned burn date. The Smoke Management Plan must include primary information about the proposed burn including smoke emission data. After reviewing and approving the Smoke Management Plan, BAAQMD issues a written approval to conduct the burn with specific conditions. The BAAQMD Application Form for Pile Burning is included as Appendix E, Part 18 to this FMP.

All fire management-ignited fires must be conducted on an “allowable burn day” unless the district has granted a variance in advance. Notice of an allowable burn day is posted by BAAQMD each afternoon for the burns planned for the following day

BAAQMD makes available a 96, 72, 48, and 24 hour burn forecast service to better assist fire agencies in determining their proposed burns dates. Final approval to burn is obtained by contacting BAAQMD the morning on the planned burn day. BAAQMD verifies the total acreage burning allocations in the district and if the fire agency's acres and/or tonnage to be burned that day would not exceed the total allocation for the area, final approval is granted.

Following the burn, the Fuels Management Specialist must submit information to BAAQMD on the fuel types and quantities or acres burned.

3.7.3.2 *Regional Air Quality Considerations for Prescribed Burning*

Marin County

In the winter, proximity to the ocean keeps the coastal regions relatively warm. Temperatures do not vary much over the year at these coastal areas, and are typically in the high 50s in the winter and low 60s in the summer. The warmest months are September and October, with temperatures into the mid- to upper 60s (BAAQMD 1998).

The eastern side of Marin County has warmer weather and less fog. This is due less to the blocking effect of the hilly terrain to the west, but more to the area's distance from the ocean. Although there are a few mountains above 1,500 feet, most of the terrain is only 800 to 1,000 feet high. Much of time, this is not high enough to block the marine layer, which averages 1,700 feet in depth. Because of the wedge shape of the county, areas to the north are farther from the ocean. This extra distance from the ocean allows the marine air mass to be heated before it arrives at eastern Marin County cities. In southern Marin County, the travel distance is short and the elevations lower, so there is a higher incidence of cool, unmodified, maritime air (BAAQMD 1998).

Cities next to the bay have their temperatures somewhat moderated. For example, San Rafael, being near the bay, experiences average maximum winter temperatures in the high 50s to low 60s, and average maximum summer temperatures in the high 70s to low 80s. Inland areas, such as Kentfield, experience average maximum temperatures two degrees cooler in the winter and two degrees warmer in the summer. Average minimum temperatures in San Rafael are in the low 40s in winter and low 50s in summer. Minimum temperatures farther inland in Kentfield are two degrees cooler all year (BAAQMD 1998).

Wind speeds are highest along the western coast of Marin, about 8 to 10 miles per hour. Although most of the terrain throughout central Marin County is not high enough to act as a barrier to the marine airflow, the complex terrain creates sufficient friction to slow the airflow. Downwind, at the former Hamilton Air Force Base in eastern Marin County, the annual average wind speeds are only 5 miles per hour. The prevailing wind directions throughout Marin County show less variation, and are generally from the northwest (BAAQMD 1998).

The mountainous terrain in Marin County has higher rainfall amounts than most parts of the Bay Area with the exception of the southern Santa Cruz Mountains. Areas near Mount Tamalpais have rainfall amounts twice as high as the rest of the Bay Area, with San Rafael reporting an average of 37.5 inches per year and Kentfield reporting 49 inches per year (BAAQMD 1998).

Smoke problems are likeliest on the eastern side of Marin County. This is where the semi-sheltered valleys and largest population centers are located. Most urban development is located along the bay, particularly in southern Marin. In the south, where distances to the ocean are short, the influence of the marine air will keep smoke levels low. Farther north where the valleys are more sheltered from the sea breeze, the potential for greater smoke accumulation is higher (BAAQMD 1998).

San Mateo County

The peninsula region of GGNRA extends from the Golden Gate south to the Phleger Estate in Woodside. The Santa Cruz Mountains extend up the center of the peninsula, with elevations exceeding 2,000 feet at the south end, and gradually decreasing to 500 feet near South San Francisco. Coastal towns such as Half Moon Bay and Pacifica experience a high incidence of cool, foggy weather in the summer. The larger cities on the eastern side of the peninsula experience warmer temperatures and few foggy days, because of the blocking effect of the 2,000-foot ridge to the west. At the north end of the peninsula lies San Francisco, where most elevations are less than 200 feet and the marine layer is able to flow across nearly all of the city, making its climate cool and windy (BAAQMD 1998).

The blocking effect of the Santa Cruz Mountains can be seen in the summertime maximum temperatures. For example, at Half Moon Bay and San Francisco, the maximum daily temperatures in June through August are 62 to 64 degrees Fahrenheit, F, while on the eastern side at Redwood City, the maximum temperatures are in the low 80s for the same period. Daily maximum temperatures throughout the peninsula during

the winter months are in the high 50s. Large temperature gradients are not seen in the minimum temperatures, which range from the 40s to 50s (BAAQMD 1998).

Annual average wind speeds range from 5 to 10 miles per hour throughout the peninsula. The tendency is for the higher wind speeds to be found along the western coast. However, winds on the eastern side of the peninsula can also be high in certain areas because low-lying areas in the mountain range, i.e., San Bruno Gap and Crystal Springs Gap, commonly allow the marine layer to pass across the peninsula (BAAQMD 1998). While prevailing winds are westerly along the peninsula's western coast, individual sites can show significant differences. For example, Fort Funston has a southwest wind pattern, while Pillar Point in San Mateo County has a northwest wind pattern. A rise in elevation of ridgelines by a few hundred feet will induce wind flow around that feature instead of over it during stable atmospheric conditions. This can change the wind pattern by as much as 90 degrees over short distances. On mornings without a strong pressure gradient, areas on the eastern side of the peninsula often experience eastern flow in the surface layer, induced by upslope flow on the east-facing slopes and by the bay breeze. The bay breeze is rarely seen after noon because the stronger sea breeze dominates the flow pattern (BAAQMD 1998).

Rainfall amounts on the eastern side of the peninsula are somewhat lower than on the western side. San Francisco and Redwood City report an average rainfall of 19.5 inches per year, while Half Moon Bay reports 25 inches per year. Areas to the south in the Santa Cruz Mountains have significantly higher rainfall, especially west of the ridgeline, due to elevation-induced condensation, close proximity to a moisture source, and fog drip.

Smoke accumulation potential is highest along the southeastern portion of the peninsula because this area is most protected from the high winds and fog of the marine layer, the emission density is relatively high, and smoke transport from upwind sites is possible. In San Francisco, wind speeds are generally fast enough to carry any smoke away before it can accumulate (BAAQMD 1998).

3.8 NON-FIRE TREATMENT APPLICATIONS

GGNRA uses two primary non-fire treatments to achieve FMP objectives: mechanical treatments and herbicide treatments. Grazing could also be used infrequently under special circumstances. Non-fire treatments allow fire managers to produce a desired change in vegetation based on values to be protected and fuel characteristics without the risks associated with applying fire.

The defensible space zone created around a structure is tactically located to increase the effectiveness of adjoining fuel breaks, prescribed burn control lines or to help alter future fire behavior or the event of a wildfire. Removed vegetation is chipped, piled and burned or moved to another area for reuse.

Mechanical treatments may involve the use of the following equipment: chainsaws , chippers, mowers, weed whackers, and heavy equipment such as bulldozers, front loaders or haul trucks. Based on the type of vegetation to be treated, some projects will require the use of approved herbicides to ensure that plants do not re-sprout. The non-

native, invasive plants most commonly treated with herbicide are eucalyptus, acacia, cotoneaster and broom. Herbicides are typically spot applied to the stump directly after the plants have been cut. All herbicide treatments will be approved through the park's IPM coordinator.

Defensible space around buildings within the park is accomplished annually. All efforts are made to conform to the California Fire Marshal's code pertaining to defensible space.

GGNRA will follow RM-18 and the requirements to prepare a Hazard Fuels Project Plan that includes specified elements for all mechanical treatments and the *Interagency Standards for Fire and Fire Aviation Operations*, Chapter 6. Prescribed fire follow-up treatments may or may not be employed.

Fuel break construction should be identified on an appropriate Geographic Information System (GIS)-compatible project location map (exact locations using GPS).

Fuel break planning will consider the following guidelines (see also mitigation measures below):

- Canopy thinned and feathered (or gradually opened) toward the area being defended, with spacing necessary to prevent crown fire and/or "wind tunnel" effect.
- Retaining a reasonable level of surface forbs and other plants to discourage exotic invasion.
- Fuel-break width is dependent on fuels conditions and other considerations.
- Photo-points installed to monitor vegetative recovery, exotic invasion, etc. Additional monitoring will be carried out as necessary.
- Levels of vegetation reduction will vary for each project based on the vegetation type, fuel loading levels, and surrounding vegetation types.
- All burn preparations involving pre-treatment with mechanical techniques will be reviewed through the park's project review process and described in the burn plan. This may include but is not limited to:
 1. Snag felling, bucking in and around the treatment perimeter.
 2. Reducing tree densities along the treatment perimeter.
 3. Pruning individual trees and brush along the treatment perimeter.
 4. Bucking and removal of logs near the control line only (through bucking into short lengths, piling and burning on site).
- Fuel break siting should take advantage of and expand upon clearings accomplished for defensible space around park buildings.

High priority mechanical fuel treatments will be sited strategically with the objective of meeting the goals and objectives of this FMP. Specific mechanical fuel reduction projects would fall under one of the following broad categories of project types:

1. Creation of Defensible Space Surrounding Park Structures and High Value Resources at Risk. GGNRA has over 700 historic structures and many non-historic structures used for housing and operations. Many of these buildings are located in areas with burnable vegetation and need to be protected. Once any potential negative impacts are mitigated, protection is accomplished by clearing vegetation around these structures to provide the minimum 100-foot radius of defensible space now recommended by the California Fire Code. The predominant fuel to be cleared around most of these structures is grass. The remaining herbaceous cover post treatment will be either low grass or a patchy continuity of taller grasses. The targeted completion date for annual defensible space is August 15th. Some structures need additional work to create adequate defensible space with tactics that might include, but are not limited to, tree trimming and removal, brush removal and herbicide application. The Division of Maintenance and Engineering is responsible for maintaining the defensible space around park structure. The Bay Area Network Hazard Fuels Reduction Crew or GGNRA fire management staff may be available to assist, depending on annual budgets, staffing levels and workloads. The term “defensible space” is typically used in reference to the protection of structures. For the purpose of this document and actions taken under the direction of the fire management office, this term and associated treatments may be applied to the protection of resources that are determined to be culturally, historically or ecologically significant.
2. Maintenance of Required Roadside Fuel Reduction and Overhead Roadway Clearance. Fire roads are maintained to allow for safe access by emergency vehicles in the event of a wildland fire or other emergency. The maintenance and clearing required is based on the minimum standard that would allow for the access requirements of a Type III fire engine. FMP actions may include grading of road surfaces, placement of erosion control measures, and vegetation thinning by mowing or cutting along the road corridor to a specified width based on fuel type, slope, and roadway composition.

Larger, native, roadside trees may be limbed up and smaller trees removed as needed to ensure emergency vehicle clearance is met. Thinning of vegetation will focus on the removal of non-native invasive species or non-native species when ever possible. Where roadside vegetation is predominantly native, natural resource staff will provide guidance on prioritizing plants to remove to achieve the desired result. Grass that grows within the roadway may be cut or mowed. Material that is removed would be cut up and broadcast in the immediate area, piled and burned, or chipped and hauled offsite.

In Marin County, there are approximately 44 miles of fire roads, amounting to 52 acres requiring treatment each year to keep clear and open from debris. In San Mateo County, there are 10 miles of fire roads, amounting to 16 acres of mechanical treatment each year. Roadside mowing may be accomplished by the Division of

Maintenance and Engineering with assistance from the GGNRA fire management staff for limbing or tree removal. A collaborative effort between local cooperating fire agencies and NPS fire management staff will determine the areas in need of treatment.

3. Creation of Fuel Reduction Zones in Areas of the Park Not Accessible by Road. Fuel reduction zones may be approved for areas along the park boundary or other interior locations not accessible by road in an effort to reduce hazardous fuels. An example would be a fuel break that removes dead and down fuels, limbing trees and removing selected trees and shrubs with minimal ground disturbance.



These semi-cleared areas will be

sited to take advantage of topography and naturally occurring areas of low fuels and may not necessarily be adjacent to structures. The Marin County CWPP proposes fuel breaks along much of the southern Marin boundary with GGNRA (see Figure 2 and Table 1 of this FMP). GGNRA will work with Marin County's fire agencies to implement the recommended fuel break system where possible, provided that conformance with the FMP EIS and ROD are assured and park resources or the visitor experience is not unduly impacted.

4. Whole Tree Removal to Reduce Hazardous Fuels and Contain the Spread of Non-Native Trees on NPS Lands. Projects that remove non-native evergreen trees, such as eucalyptus or Monterey cypress and pine, are strategically located to help protect adjacent communities or sensitive resources from wildfire and also to break up the continuity of fuels within a large stand. Projects are often sited to take advantage of similar actions being implemented in the nearby WUI by community organizations. The removal projects focused on containing the spread of existing stands, reducing ladder fuels, and providing breaks in the canopy to help limit the ability of fire to spread from tree crown to tree crown. The projects typically involve the felling of eucalyptus trees with chain saws, which can then be piled, burned onsite, cut into lengths and loaded on haul trucks for removal, or chipped and spread evenly over the project area. Eucalyptus wood removed from the park can be recycled as firewood, landscaping chips, used in stream restoration projects, or possible commercial reuses. The projects are conducted by park staff or private contractors.

3.8.1 Annual Review

The five-year fuels treatment plan will be updated annually as target units are burned and fuel reduction projects completed. [The Five Year Fuels Treatment Plan will be developed in 2008 for the FMP update.] Fire Management staff at the PWR office have established a process for the annual review of the five year fuels treatment plan *vis-à-*

CHAPTER 3 – FIRE MANAGEMENT PROGRAM COMPONENTS

vis ensuring that actions conform to the findings and commitments agreed to in the NEPA process for the FMP. In addition to NEPA conformance, the annual review process provides a framework for ensuring continued conformance with the requirements of the ESA consultations and NHPA programmatic mitigation measures. The update of the five year fuels treatment plan will be undertaken by a multi-disciplinary team representing the range of expertise of the fire staff. More information on the Annual Review process can be found in FMP Section 4.6.

3.8.2 Equipment and Seasonal Use Restrictions

Project equipment will be selected for effectiveness and the potential to avoid or minimize impacts to park resources. The process is the same as described for prescribed burning. Please refer to Section 3.3.3.4.

3.8.3 Effects Monitoring

For non-fire treatments, treatment prescriptions and locations will be documented and photo-monitoring will take place. Monitoring of non-fire treatments will be carried out by the Fire Effects Monitoring Crew according to the protocols found in Appendix F, Wildland and Prescribed Fire Monitoring and Research Plan.

3.8.4 Reporting and Documentation

All mechanical treatment projects will be listed in the GGNRA five year fuels treatment plan and subject to the FMP annual review process. Individual projects will be assessed for potential effect and conformance with federal regulations through the Planning, Environment and Public Comment (PEPC) database system. Site specific projects that have been sufficiently assessed through the FMP FEIS will be reviewed by the IDT and the conformance with the FEIS documented through a Memo to the File of the FEIS.

Projects proposing types of activities or an intensity of impact or type of impact not anticipated in the FEIS will require separate NEPA review. NEPA conformance for these projects will be conducted per D.O 12, RM-12 and GGNRA SOP-601. Conformance may be satisfied with a Memo to File to the FMP FEIS or, if there are new environmental effects not addressed in the FEIS, by a separate NEPA process.

3.8.5 Annual Planned Projects

All fire management projects, including mechanical treatments and prescribed burns, will be scheduled in the GGNRA Five Year Implementation Plan. Where projects will require recurring maintenance on a predictable interval or several initial re-treatments, these actions will also be scheduled in advance on the five year plan.

3.9 FIRE COMMUNICATION AND EDUCATION

Public information and education are essential components of a successful fire management program. Informed and supportive agency staff, local community, visiting public, and partner organizations, will contribute greatly to the effectiveness of the fire program and the resources that it is designed to benefit.

Based on the ecological principles and operational procedures of the Fire Management Plan, the goals for the fire communication and education program are:

Goal 1: Offer year- round educational opportunities focusing on fire ecology, fire history, and fire management, which communicates how fire and fuels management activities meet natural resource management goals, and accomplish the mission of the National Park Service.

Goal 2: Work with local communities, park residents, and park permittees to promote fire safety, fire prevention, defensible space, firewise community planning, and fuels management. Provide fire safety messages with campfire permits.

Goal 3: Develop and maintain interagency, educational, and community partnerships to improve and expand fire education activities.

Goal 4: Provide accurate and timely incident information for local, regional, and national fire operations as needed.

Goal 5: Support regional and national fire management program activities through information and education.

Strategies for the public information and education program include:

- Establish a network of contacts and develop a proactive process that disseminates current and accurate fire information to multiple audiences.
- Incorporate the principles of fire's role in the ecosystem and the importance of fire as a resource management tool into interpretive programs, exhibits, video, interpretive trails through burned areas, publications, and special group presentations.
- Use national and local websites to promote prevention/mitigation and wildland fire education objectives.
- Report wildland fire activity through the NPS Fire News website.
- Forward all fire-related press releases to the respective Agency Administrator or Public Information Officer (PIO) for approval and keep members of the administrative staffs well informed of fire activity.
- Develop public information programs that promote the benefits of firewise community planning, defensible space, mechanical fuel reduction, and fire safe recreation.
- Establish relationships with local media representatives, and accommodate requests for information and access in order to promote the fire program.
- Conduct outreach to owners of adjacent lands and/or groups with traditional cultural concerns in conjunction with planning fire education, and fire management activities.

A detailed Fire Communication and Education Plan is in FMP Appendix G.

3.10 FIRE ECOLOGY AND FIRE EFFECTS MONITORING PROGRAMS

3.10.1 Programmatic and Policy Direction

The NPS is committed to monitoring fire management activities to determine whether management goals and objectives are being met and to facilitate adaptive management. The authority for fire management monitoring in the NPS is found in Director's Order #18, Wildland Fire Management, Section 5.2 Fire Management Plans and Section 5.8 Prescribed Fire Monitoring. The NPS Fire Ecology Strategic Plan: 2004-2008 (http://www.nps.gov/fire/ecology/program_direction/strategic_plan.htm) provides programmatic direction and Reference Manual #18, Chapter 11, provides policy direction for fire management monitoring (http://www.nps.gov/fire/download/fir_wil_rm18_ch11.pdf).

3.10.2 Current Program

GGNRA is served by the San Francisco Bay Area Network Fire Ecologist and the Southern and Central California Fire Effects Monitoring Crew. The Fire Ecologist is stationed at PRNS and serves Pinnacles National Monument and PRNS in addition to GGNRA. The Fire Effects Monitoring Crew is also stationed at PRNS and serves six California parks in addition to GGNRA. The goal of the Fire Ecology and Fire Effects Monitoring program at GGNRA is to determine whether prescribed fire and mechanical fuels treatments objectives are being met and to help refine projects and objectives based on monitoring data.

The primary ecosystems at GGNRA include coastal scrub and chaparral, grassland, Douglas-fir forest, redwood forest, non-native pine/cypress/eucalyptus forest, hardwood forest, riparian woodland, and herbaceous wetlands. However, the fire management program is currently actively managing only the coastal scrub and chaparral, redwood forest, grassland, and non-native eucalyptus forest ecosystems. GGNRA has 117 fire effects monitoring plots in 13 different monitoring types: northern coastal scrub, northern coastal scrub (southern phase), chaparral, non-native annual grassland (*Bromus diandrus* dominated), non-native annual grassland (*Brachypodium distachyon* dominated), non-native annual thistle, eucalyptus, non-native tall perennial grassland (*Festuca arundinacea* dominated), non-native tall perennial grassland (*Phalaris aquatica* dominated), non-native summer mustard, northern coastal prairie, redwood forest, and mixed broadleaf evergreen forest. All of the monitoring types follow the protocols described in the FMH Monitoring Handbook (NPS 2003).

3.10.3 Monitoring Levels

Fire effects monitoring occurs at a variety of levels. The most basic of these, Level 1, is the monitoring of environmental conditions including weather, fuel conditions, fire danger rating, etc. The fire effects program will coordinate with the Bay Area Network Inventory and Monitoring program to coordinate Level 1 monitoring efforts. Both programs will work together to ensure that monitoring efforts are not duplicated and to determine the most efficient way to accomplish Level 1 monitoring.

Monitoring Level 2 is fire observation, including fire behavior, smoke volume and movement, fire location and size, etc. Data will continue to be collected at levels 1 and

2 to satisfy the requirements for a Post-Fire Report for prescribed fires or a Wildland Fire Report for wildfires. Protocols for Level 2 post-wildfire monitoring will be included in Appendix F. Additionally, burn severity assessments will be completed for all fires greater than 500 acres and CBI plots will be installed in association with the burn severity assessment. For mechanical projects, treatment prescriptions and locations will be documented and photo-monitoring will take place. Protocols for monitoring non-fire treatments will be included in Appendix F.

Levels 3 and 4 are the monitoring of short-term (≤ 2 years) and long-term (> 10 years) change. Variables monitored at these levels of change include fuel loading and vegetation composition among others. Level 3 and 4 monitoring will take place in all monitoring types that are being actively managed by the fire management program through either prescribed fire or non-fire treatments. The monitoring effort must be sufficient to evaluate whether fire management objectives are being met.

3.10.4 Data Management and Analysis

Fire effects data will be maintained by the fire ecologist and lead fire effects monitor in both paper and digital form. Data will be analyzed by the fire ecologist on an ongoing basis. Data analysis will be presented to park fire management and resource staff annually as part of the annual review/update process. This analysis will be used to determine whether fire management projects are meeting their objectives, to adjust and refine fire management objectives if necessary, to adjust how and where fire management projects are carried out, and to identify fire research needs.

3.10.5 Wildland and Prescribed Fire Monitoring and Research Plan

The Wildland and Prescribed Fire Monitoring and Research Plan describes in detail how monitoring is to be conducted at GGNRA. The Fire Monitoring and Research Plan presents ecological models for each of the monitoring types within GGNRA and outlines the management and monitoring objectives for each. It also details the methods, locations, and frequency of monitoring. The format for the Plan will follow the guidelines provided by the NPS Fire Ecology Steering Committee. Appendix F will be added to the FMP coincident with the 2009 annual FMP update.

3.11 FIRE RESEARCH

The NPS is committed to supporting fire research to promote sound fire management decisions. The policy direction for fire research within the NPS is found in RM #18, Chapter 15 (http://www.nps.gov/fire/download/fir_wil_rm18_ch11.pdf). It is the goal of the fire program at GGNRA to increase in-park research efforts and to recruit high caliber research from outside organizations.

CHAPTER 3 – FIRE MANAGEMENT PROGRAM COMPONENTS

Several fire-related research projects are currently under way at GGNRA. These include using fire and other methods to enhance habitat for the Mission blue butterfly and examining fire as a potential tool for restoring two rare plant species, Presidio clarkia and Marin dwarf flax.

A fire research plan for GGNRA will be developed and added to Appendix F of this FMP during the first months of 2009. High priority topics for future fire research include fire in redwood forests; the effects of fire on invasive species; the effects of fire on rare chaparral plants; the effects of fire on the spread of Sudden Oak Death; and the reconstruction of historical vegetation patterns.

4. ROLES, FUNDING AND REVIEW

4.1 NPS ORGANIZATIONAL STRUCTURE, ROLES, AND RESPONSIBILITIES

The Organizational Chart for the Golden Gate National Recreation Area Division Resource & Visitor Protection, Branch of Fire Management outlines the current structure for this program (See Figure 20, GGNRA Fire Management Branch Organizational Chart).

The overall fire program responsibility rests with the Bay Area Network Fire Management Officer (Network FMO). The Network FMO oversees the daily operations and reports directly to the Chief Ranger. The Chief Ranger, in turn, reports to the Superintendent, who retains ultimate responsibility for all Park programs.

The Fire Ecologist plays a key role in the overall fire management program by overseeing long-term fire ecology planning for GGNRA and fire ecology strategies for the Bay Area Parks Network.

The Fire Communication and Education Specialist is stationed at PRNS and reports to the Chief of the Division of Interpretation and serves the Bay Area Parks Network.

The Fire Planner primarily serves GGNRA and PRNS, providing compliance guidance and documentation for fire-related projects. Both the Fire Ecologist and Fire Planner report to the Supervisory Plant Ecologist at PRNS in the Division of Resource Management.

4.1.1 GGNRA Positions

4.1.1.1 *Park Superintendent*

1. Ensures safe implementation of wildland fire management program at GGNRA.
2. Ensures program supports Service-wide initiatives.
3. Approves wildland fire management plan and updates, interagency agreements and operating plans, delegations of authority, prescribed burn plans, and management of wildland fire incidents, through daily updates of the WFSA.
4. Ensures compliance of Section 106 of NHPA, NEPA, NPS Organic Act and other relevant laws and policy.
5. Works to maintain Network relationships with PRNS and East Bay Parks.

4.1.1.2 *Chief Ranger*

1. Ensures safe implementation of wildland fire management program at GGNRA.

4.1.1.3 *Bay Area Network Fire Management Officer*

1. Sets goals and objectives for the wildland fire program, including staff supervision.

CHAPTER 4 – ROLES, FUNDING AND REVIEW

2. Ensures GGNRA has the capability and skills to safely implement wildland fire programs as identified in the fire management plan.
3. Establish liaison with cooperating agencies, and coordinates and maintains cooperative agreements.
4. Monitors fire danger and recommends fire restrictions in concert with neighboring agencies.
5. Coordinates with PRNS and PINN staff on fire management actions and issues.
6. Monitors actions taken on wildland fires, and ensures proper and adequate documentation.
7. Approves Fire Report ensuring proper preparation and submission to WFMI.
8. Initiates taskbooks for wildland fire positions and certifies completion.
9. Formulates and directs the budget accountability program for preparedness, hazard fuels operations, emergency fire accounts and approves all FirePro expenditures.
10. Prepares WFSAs as needed.
11. Reviews all burns plans for prescribed fires.
12. Reviews procedures for off-unit dispatches of park personnel.

4.1.1.4 *Fire GIS*

1. Maintains Bay Area Network fire related GIS files.
2. Produces fire- and fuels-related GIS products.
3. Coordinates Network Resource Advisors.

4.1.1.5 *Senior Engine Captain*

1. Ensures personnel and equipment readiness and capability for safe initial response.
2. Ensures fire engines apparatus are maintained in a state of readiness.
3. Leads annual refresher training.
4. Leads GGNRA fire crews in daily readiness activities, including fire safety briefings.
5. Supervises temporary fire technicians.
6. Supervises Assistant Engine Captain.
7. Implements signing and fire prevention activities.
8. Provides recommendations to Network FMO when Step-up Plan needs activation.

4.1.1.6 *Assistant Engine Captain*

1. Acts as assistant to the Senior Engine Captain.
2. Supervises seasonal engine crew.
3. Oversees fire cache inventory.
4. Prepares prescribed burn plan components as requested.
5. Involved in all aspects of wildland fire suppression.
6. Implements signing and fire prevention activities.

4.1.2 **Shared / Consulting Network Positions**

4.1.2.1 *Fire Program Planner*

1. Research and prepare NEPA documents for fire management program projects, participate in planning meetings and site visits, input projects into PEPC, ensure compliance of fire management projects with the respective FMP NEPA documents, and shepherd projects through the review and approval process.
2. Presents projects to GGNRA NEPA and NHPA review committees and ensures project conformance with findings of these committees.
3. Oversees the annual review process for the FMP and the update of the five year fuels treatment plan.
4. Prepares documentation necessary for federal regulatory compliance for entities receiving federal funding through the National Fire Plan.
5. Represent NPS at FireSafe Council meetings.
6. Review and comment on project proposals prepared by others in the San Francisco Bay Network.
7. Oversees contracts and contractors preparing environmental work products for compliance projects.
8. Provide regulatory assistance to regional fire staff.

4.1.2.2 *Fuels/Prescribed Fire Specialist*

1. Prepares prescribed burn plans and fuel reduction plans and inputs information to PEPC for units in the SF Bay Area Network.
2. Provides input into five-year fuels treatment plans for SF Bay Area Network.
3. Implements prescribed burns as Burn Boss.
4. Coordinates prescribed fire and mechanical hazardous fuels reduction operations for the Bay Area Parks Network.
5. Serves as Incident Commander on wildland fires

CHAPTER 4 – ROLES, FUNDING AND REVIEW

6. Manages National Fire Plan Operating and Reporting System (NFPORS) data entries for all Bay Area Parks.
7. Develops and prioritizes projects, submits projects for funding and prepares compliance documentation.
8. Serves as acting FMO and GGNRA Fire Duty Officer as needed.
9. Coordinates, prioritizes and schedules the work of the Bay Area Network Hazardous Fuels Reduction Crew within the SF Bay Area Network and elsewhere as requested.
10. Coordinates project planning in consultation with other park divisions where necessary for resource protection and continuity of operations.

4.1.2.3 *Fire Communication and Education Specialist*

1. Responsible for the development, coordination, and dissemination of internal and external communication of fire management program activities in the Bay Area Network.
2. Works with community stakeholders and various local, state, and federal agencies to provide fire communication and education for the Bay Area Parks and surrounding communities.
3. Supports fire management program activities at the regional and national levels through fire education and information.
4. Responsible for developing and managing partnerships and projects which expand fire education capacity in the Bay Area Network.
5. Serves as Public Information Officer for prescribed fire and wildland fire in the Bay Area Parks and elsewhere as requested.
6. Serves as an interdisciplinary team member to integrate fire management, resource protection, and public education.

4.1.2.4 *Fire Ecologist*

1. Manages and analyzes fire effects data.
2. Manages and refines monitoring program including the communication of measurable objectives, monitoring schedules, protocols and data analysis procedures. Writes the fire monitoring plan.
3. Hires, trains, and supervises fire effects monitors.
4. Assist with writing prescribed fire objectives and prescriptions for burning.
5. Provides expertise on the role of fire in ecosystems and advice on how fire can be used to accomplish management objectives.
6. Oversees long-term fire ecology planning for GGNRA, PRNS and other parks in the Bay Area Network.

7. Identifies research needs, solicits researchers, writes proposals, and applies for funding for research projects.
8. Serves as a liaison between fire managers and resource management at host and cluster parks.
9. Contributes to and reviews compliance and other management documents.

4.1.3 Shared Regional Positions

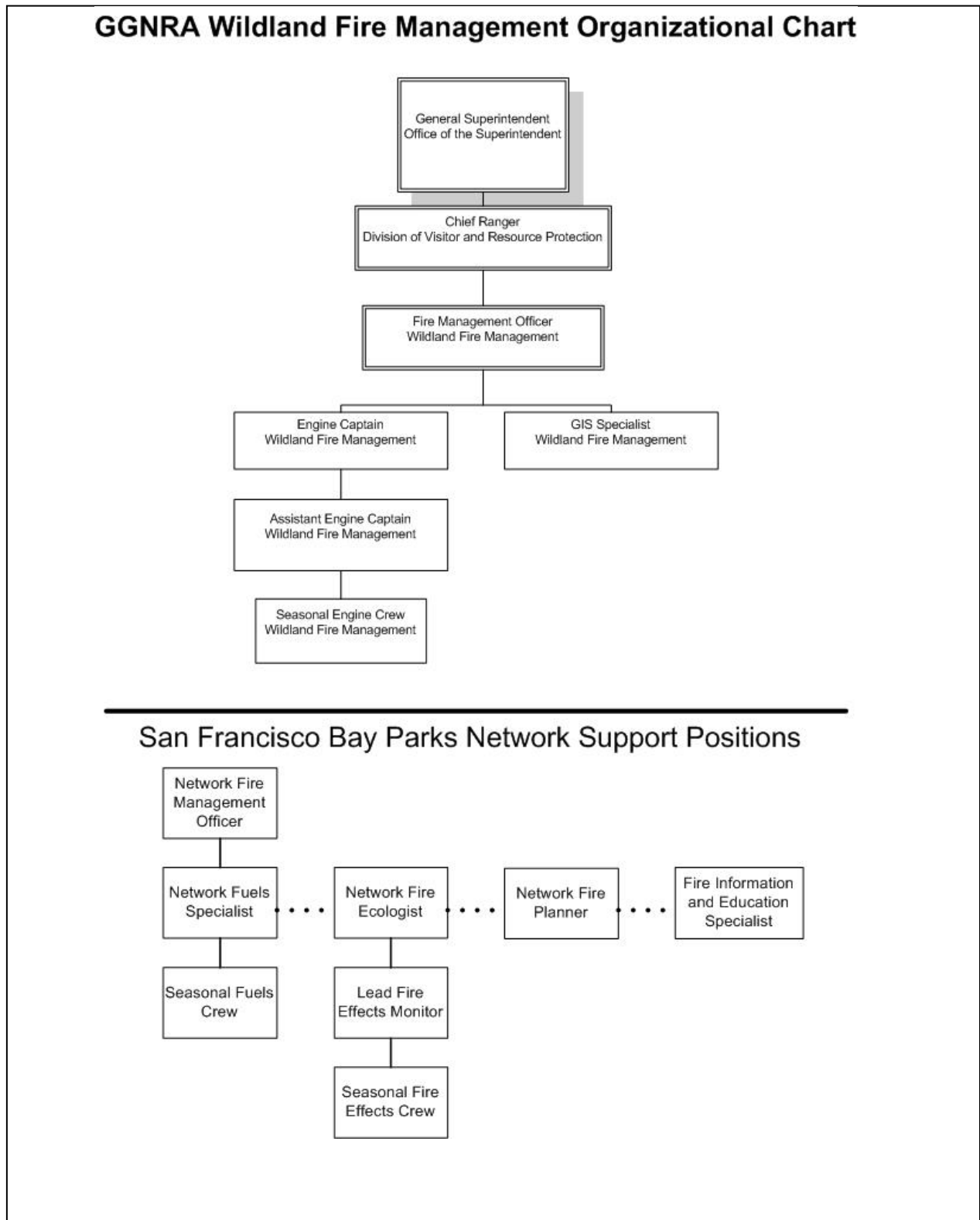
4.1.3.1 Lead Fire Effects Monitor

1. Leads the California Mediterranean Coast and San Francisco Bay Region fire effects monitoring program (PRNS, PINN, GGNRA, SAMO, CHIS, JOTR).
2. Collects scientific data on vegetation monitoring plots in order to determine the effectiveness in meeting prescribed fire objectives.
3. Hires, trains and supervises fire effects monitors.
4. Identifies plants to the species level in a variety of ecosystems.
5. Monitors fire weather and fire behavior during prescribed burns.
6. Manages fire effects database and ensures quality control.
7. Sets monitoring schedule and communicates schedule with host parks.
8. Collaborates with fire ecologist on planning and annual reporting documents.

4.1.3.2 Fire Effects Crew Members (biological science technicians)

1. Collect vegetation and fire effects monitoring data on monitoring plots.
2. Identify plants to the species level in a variety of ecosystems.
3. Enter data into databases.
4. Participate in wildland and prescribed fire operations.

Figure 20 – GGNRA Wildland Fire Management Organization Chart



4.2 FUNDING

The Fire Management Program Center (FMPC), National Interagency Fire Center, will issue an annual budget structure and allocation report to GGNRA. Allocated amounts will be entered in the Federal Finance System (FFS) at the allocation (ALCT) level by the FMPC for the following activities: Preparedness, Burned Area Rehabilitation, Hazardous Fuels Reduction, Wildland Urban Interface, and Rural Fire Assistance. GGNRA will stay within the line item spending authority for each activity until additional funding is requested and approved.

The WASO Budget Office covers Emergency Suppression, Wildland Fire Use and Emergency Stabilization obligations and expenditures at the regional allotment (ALOT) level at year-end. Expenditures in the Emergency Suppression and the Burned Area Rehabilitation Activities are be tracked through unique project accounts using the Fire Code guidelines.

The Fire Program Analysis System (FPA) will replace the existing NPS FIREPRO planning and budgeting program in the next few years. FPA will also replace the fire planning and budgeting systems in use by four other federal land management agencies.

4.3 INTERAGENCY COOPERATION AND CONTACTS

Table 12 – Contacts			
INTRA-AGENCY CONTACTS			
Bay Area Network/Point Reyes National Seashore	FMO Roger Wong 900	415-464-5232	[email address]
John Muir and Eugene O'Neill National Historic Sites	Deputy Supt Rick Smith	925-943-1531 x. 122	[email address]
Pacific West Regional FMO	FMO Sue Husari	510-817-1371	[email address]
INTER-AGENCY CONTACTS			
Marin County FD	Chief Ken Massucco 1500	415-499-6717	[email address]
Southern Marin Fire Department	Acting Chief Denis Walsh	(415) 388-8182	[email address]
Muir Beach Volunteer Fire Department	Chief John Sward 600	415-254-3479	[email address]
Stinson Beach Fire District	Chief Kenny Stevens 800	415-868-0622	unknown

CHAPTER 4 – ROLES, FUNDING AND REVIEW

Inverness Public Utilities District	Chief Jim Fox	415-669-7151	[email address]
Bolinas FD	Chief Anita Brown 200	415-868-1566	[email address]
Nicasio Volunteer FD	Chief Joe Runyon	415-662-2201	[email address]
Marin Municipal Water District	Mike Swezy, Resource Specialist	415-945-1190	[email address]
Marin Open Space District	Brian Sanford Supervising Ranger	415-499-7473	[email address]
Mendocino NF	FMO Dave Sinclair	530-934-7734	[email address]
Northern California Coordination Center	Ed Duncan, DOI Coordinator	530-226-9710	[email address]
California Department of Forestry (Cal Fire) – San Mateo – Santa Cruz Unit	Unit Chief John Ferreira	831-335-5355	[email address]
Cal Fire CZU Felton ECC	Capt. Art Smith	831-335-6749	[email address]
National Weather Service Forecast Office, San Francisco-Monterey Bay.	Ryan Walburn, Fire Weather Forecaster	831-656-1710	[email address]
Bay Area Air Quality Management District	Doug Tolar, Enforcement and Compliance	415-749-5118	[email address]

4.4 INTERAGENCY AGREEMENTS

Table 13 – Interagency Agreements		
FIRE DEPARTMENT OR DISTRICT	AGREEMENT	DATE
Marin County Fire Department	in progress	
Cal Fire Santa Cruz/San Mateo Operational Unit	in progress	
Southern Marin Fire Department	in progress	

4.5 RECORDS AND REPORTS

Table 14 – Records and Reports			
FORM/REPORT	RESPONSIBLE PARTY	DISTRIBUTION	FREQUENCY
DI-1202 Fire Report	NPS Superintendent	Copy (1202 only) to Archives (SACS) within 10 work-days;	Per Incident
Interagency Fire Qualification Form and Card (IQCS card)	Fire Program Assistant Signed by FMO	Affected Personnel	Annually
Fire Weather/Indices (daily; see dates in Section 3.3.2.2)	Engine Foreman/Fire Program Assistant	Staffing levels (BI) to Law Enforcement Rangers and Dispatch	Daily
Daily Cost Accounting	IC/Burn Boss	As agreed	Schedule to be determined
WFSA	Park Superintendent	Agency-specific	Per Incident

4.6. ANNUAL REVIEW OF THE FIVE YEAR FUELS TREATMENT PLAN AND FMP

Annual Review Process of the Operational FMP and Five Year Fuels Treatment Plan (per PWR requirements.)

[The Five Year Fuels Treatment Plan will be developed in 2008 and added for the 2009 FMP update.]

1. Summarize the previous year's actions:

- Wildland fires, prescribed burns, mechanical fuel reduction projects,
- Education and information programs for the public,
- New or renewed agreements with other fire or land management agencies,
- Personnel information (number of positions, network location)

2. Assess Progress.

- Did we achieve what was anticipated in the five year fuels treatment plan?
- If the plan was not implemented as proposed, what were the budget or staffing challenges that kept you from being able to manage effectively?
- Are there unforeseen circumstances that came up which were limited by the program's goals, objectives or mitigations that should be considered for inclusion in the over all strategy to better meet goals and objectives?

3. Update FMP and Five Year Fuels Treatment plan.

- Is new background information available to the park that is relevant to fire management planning (i.e., data gathering, annual fire ecology report findings)? Are there changes to methodologies or procedures that should be incorporated into the FMP (i.e., modeling or analyses, of risk, ecological modeling, or new management policies)?
- Were there “lessons learned” from the past season that are important to note?
- Are there research or field observation results that indicate strategy should be modified?
- Were there outside (non-fire management) disturbance(s) (e.g., volcanic, windstorm, flood) that did or will affect the implementation of the FMP or five year fuels treatment plan?
- Are there modifications to the FMP or the five year fuels treatment plan to suggest? Do any of the issues reviewed support continuation, refinement, or reconsideration of the plan as written.
- Are there changes in DO-18 and RM-18 or other policy documents that require changes to the FMP or five year fuels treatment plan?

4. Identify Issues Raised.

In implementing the FMP, were issues of concern raised by park staff, staff of other agencies, or the public? How were issues resolved? If not yet resolved, how does the review team propose solving these issues?

5. Assess Conformance with NEPA and other Federal Regulations.

- Are there changes in the affected environment of GGNRA or Northern Lands GGNRA that could result in significant effects to the environment (i.e., change in species listing under the ESA, CNPS, etc., new cultural resources identified, change in air pollution emissions status for the air basin, change in water quality status, new water quality projects completed)?
- Were there projects or parts of projects that appear to be out of sync with the range of actions assessed in the FEIS?
- Were there impacts that differed from those anticipated by the EIS assessment?
- Was the NEPA documentation adequate to address the actions undertaken during the past season?
- Does the updated FMP or five year fuels treatment plan include actions that do not conform to the scope of the assessment in the EIS?
- Are modifications needed to the NEPA record to retain the program in conformance?

Determine the needs for further compliance and let the regional fire and compliance office know your intentions.

6. Proposed Changes to the Five Year Fuels Treatment Plan and FMP.

- Use the current version of the Regional Environmental Screening Form to determine if any proposed changes to the FMP need further compliance.
- Initiate changes to the plan using NEPA process if needed, if not, make the changes, and in either scenario send new version to the National Office and to Regional Office.

CHAPTER 4 – ROLES, FUNDING AND REVIEW

APPENDICES

APPENDIX A. REFERENCES AND CONTRIBUTORS	A-1
APPENDIX B. SPECIES OF CONCERN	B-1
APPENDIX C. GGNRA FMP RECORD OF DECISION	C-1
APPENDIX D. FMP MITIGATION MEASURES	D-1
APPENDIX E. SUPPLEMENTAL INFORMATION	
23. GGNRA Run Card	E-1
24. Daily Resource Availability/Officer Duty Call Sheet	E-3
25. Weather Information Management System Walk-through	E-5
26. GGNRA Dispatch Protocol for Wildland Fire.....	E-7
27. NFDRS Indices and Park Visitor Fire Restrictions	E-11
28. Fire Step-up Plan (SOP 37)	E-13
29. Bay Area Network Parks Burn Index Graph.....	E-19
30. Delegation from Superintendent GGNRA to Network FMO	E-21
31. Marin Emergency Radio Authority (MERA) Radio Talk Group Matrix...E-23	
32. MIST Guidelines	E-25
33. Wildland Fire Situation Analysis.....	E-39
34. Incident Complexity Analysis: Types 5, 4 and Transition to Type 3 Incident.....	E-53
35. Redbook Complexity Analysis – Types 1 and 2.....	E-55
36. Minimum Tool Flow Chart.....	E-59
37. Example of Delegation of Authority Form	E-75
38. Briefing Checklist Template	E-77
39. Briefing to the Incident Management Team Template	E-79
40. Prescribed Fire Plan Template	E-87
41. BAAQMD Application for Pile Burning	E-107
42. FMU Maps of Past and Proposed Fire Management Projects.....	E-109
43. Ignition Index and Fuel Hazard Rating.....	E-111
44. GGNRA FMU Vegetation Maps.....	E-115
APPENDIX F. WILDLAND AND PRESCRIBED FIRE MONITORING AND RESEARCH PLAN (<i>in preparation</i>)	
APPENDIX G. FIRE COMMUNICATION AND EDUCATION PLAN (<i>in preparation</i>)	

APPENDIX A. REFERENCES AND CONTRIBUTORS

A.1 REFERENCES CITED

- Adam, D.P. 1975. A late Holocene pollen record from Pearson's Pond, Weeks Creek Landslide, San Francisco Peninsula, California. U.S. Geological Survey Journal of Research 3(6): 721–731.
- Adam, D.P., R. Byrne, and E. Luther. 1981. A late Pleistocene and Holocene pollen record from Laguna de Las Trancas, northern coastal Santa Cruz County, California. *Madroño*. 28(4): 255–272.
- Anderson, R. S. 2005. Contrasting Vegetation and Fire Histories on the Point Reyes Peninsula During the Pre-Settlement and Settlement Periods: 15,000 Years of Change. Northern Arizona University, Flagstaff, AZ.
- Anderson, R.S. 2001. Long-term fire history from sedimentary charcoal analysis: the Wildcat Lake and Glenmire Sites in Point Reyes National Seashore, California. Center for Environmental Science and Education, and Quaternary Science Program, Northern Arizona University, Flagstaff, Arizona. Final Report.
- Anderson, M.K. 1993. The experimental approach to assessment of the potential ecological effects of horticultural practices by indigenous peoples on California wildlands. Unpublished Ph.D. dissertation, Department of Environmental Science, Policy, and Management, University of California, Berkeley.
- Anderson, M.K. and M.J. Moratto. 1996. Native American land-use practices and ecological impacts, Chapter 9 in: SNEP Science Team (eds.), *State of the Sierra Nevada*, Vol. 11, Centers for Water and Wildland Resources, Report No. 36, University of California, Davis.
- Axelrod, D.A. 1988. Outline history of California vegetation. In: Barbour, M.G., and Major, J. (eds.), *Terrestrial Vegetation of California*: New York: Wiley. Expanded edition. Pages 139–194.
- Bay Area Air Quality Management District (BAAQMD). 1998. Particulate Matter Monitoring Network Description for the Bay Area Air Quality Management District Planning Area. Meteorology and Data Analysis Section, Air Monitoring Section Technical Services.
- Bell, Gordon B. 1958. *The Uses of Meteorological Data in Large-Scale Air Pollution Surveys*. Menlo Park, CA: Stanford Research Institute.
- Blackburn, T.C. and M.K. Anderson. 1993. *Before the Wilderness*. Ballena Press, Menlo Park, California.
- Brown, P., M. Kaye, and D. Buckley. 1999. Fire history in Douglas-fir and coast redwood forests at Point Reyes National Seashore. *Northwest Science*, 73:205-216.
- Brown, P. M. and T.W. Swetnam. 1994. A cross-dated fire history from coast redwood near Redwood National Park, California. *Canadian Journal of Forest Research* 24: 21–31.
- Burcham, LT. 1957. *California range land: an historico-ecological study of the range resource of California*. California Division of Forestry, Sacramento.

APPENDIX A – REFERENCES AND CONTRIBUTORS

- Byrne, R., E. Edlund and S. Mensing. 1991. Holocene changes in the distribution and abundance of oaks in California. In: Proceedings of the Symposium on Oak Woodlands and Hardwood Rangeland Management (ed. R.B. Standiford), pages 182–188. USDA Forest Service, General Technical Report PSW-126, Pacific Southwest Forest and Range Experiment Station, Berkeley, California.
- California State Board of Forestry. 1888. Second biennial report of the California State Board of Forestry for 1887–1888. Sacramento (CA): State Printing Office.
- Clark, J. S. 1990. Effect of Climate Change on Fire Regimes in Northwestern Minnesota. *Nature* 334: 233–235.
- California Department of Forestry and Fire Protection (Cal Fire). 2004. Fire Management Plan, San Mateo & Santa Cruz Unit, California Northern Region. July 2004.
- California Native Plant Society (CNPS). 2007. Rare Plant Inventory. 7th Edition. Published online. <http://cnps.web.aplus.net/cgi-bin/inv/inventory.cgi>
- California Office of the State Forester. 1912. Fourth biennial report of the state forester of the state of California. State of California, Sacramento, California.
- Chartkoff, J., and K.K. Chartkoff. 1984. *The Archaeology of California*. Palo Alto (CA): Stanford University Press, Palo Alto, California.
- Collier, M.E.T. and S.B. Thalman, eds. 1996. Revised ed. Interviews with Tom Smith and Maria Copa: Isabel Kelly's ethnographic notes on the Coast Miwok Indians of Marin and southern Sonoma Counties, California. San Rafael (CA): Miwok Archeological Preserve of Marin, MAPOM Occasional Papers, Number 6.
- Cook, S.F. 1976. *The population of the California Indians 1769–1970*. Berkeley (CA): University of California Press, Berkeley, California.
- Duncan, F.L. 1992. Botanical reflections of the *encuentro* and the contact period in southern Marin County, California. Ph.D. dissertation, University of Arizona, Tucson. UMI Dissertation Services, Ann Arbor, Michigan.
- Fagan, B. 2003. *Before California: An Archaeologist Looks at our Earliest Inhabitants*. Rowman and Littlefield, New York.
- Fairley, L. 1987. *Mount Tamalpais: a history*. Scottwall Associates, San Francisco, California.
- Finney, M.A. 1990. Fire history from the redwood forests of Bolinas Ridge and Kent Lake Basin in the Marin Municipal Water District. In: *Vegetation and fire management baseline studies: The Marin Municipal Water District and the Marin County Open Space District (Northridge Lands), Marin County, California*. Leonard Charles and Associates and Wildland Resource Management, unpublished report.
- Finney, M.A., and R.E. Martin. 1992. Short fire intervals recorded by redwoods at Annadel State Park, California. *Madrõño* 39:251–262.
- _____. 1989. Fire history in a *Sequoia sempervirens* forest at Salt Point State Park, California. *Canadian Journal of Forest Research*. 19: 1451–1457.

APPENDIX A – REFERENCES AND CONTRIBUTORS

- Fischer, W.C. and C.E. Hardy. 1976. Fire-weather observers' handbook. Ogden (UT): USDA Forest Service, Intermountain Forest and Range Experiment Station. Agriculture Handbook No 494.
- Flannigan, M.D., and C.E. Van Wagner. 1991. Climate change and wildfire in Canada. *Canadian Journal of Forest Research*, 21.
- Fried, Jeremy S., Margaret S. Torn, and Evan Mills. 2003. The impact of climate change on wildfire severity: A regional forecast for northern California. *Climatic Change* 00: 1–23, 2003.
- Gilliam, H. 2002. 2nd Edition. Weather of the San Francisco Bay Region. Berkeley (CA): Univ. of California Press. California Natural History Guides, No. 63.
- Golden Gate Weather Services. 2002. Climate of San Francisco: Narrative Description. <<http://ggweather.com/sf/narrative.html>>. Accessed March 22, 2004.
- Gordon, B.L. 1977. 2nd ed. Monterey Bay Area, Natural History and Cultural Imprints. Pacific Grove (CA): Boxwood Press.
- Greenlee, J.M., and Jean H. Langenheim. 1990. Historic fire regimes and their relation to vegetation patterns in the Monterey Bay area of California. *The American Midland Naturalist*. 124(2): 239–253.
- Heizer, R.F., and A.B. Elsasser. 1980. The natural world of the California Indians. University of California Press, Berkeley, CA.
- Heusser, L. 1998. Direct correlation of millennial-scale changes in western North American vegetation and climate with changes in the California Current System over the past ~60kyr. *Paleoceanography*: (13) 252–262.
- Holland, V.L. and D.J. Keil. 1995. California Vegetation. Dubuque, Iowa.
- Hynding, A. 1982. From frontier to suburb: the story of the San Mateo Peninsula. Star Publishing Company, Belmont, California.
- Intergovernmental Panel on Climate Change (IPCC). 2001. Climate Change 2001: The Scientific Basis. Cambridge University Press.
- Jacobs, D.F., D.W. Cole, and J.R. McBride. 1985. Fire history and perpetuation of natural coast redwood ecosystems. *Journal of Forestry* 83:494–497.
- Kelly, Isabel. 1978. Coast Miwok. In California, R.F. Heizer (ed.). Handbook of North American Indians. Smithsonian Institution, Washington Vol. 8: 414–425.
- Kroeber, A.L. 1977. Handbook of California Indians New York: Dover Press. (Reprint of the 1925 ed. published by Govt. Print. Office, Washington, which was issued as no. 78 of the bulletin of the Bureau of American Ethnology, Smithsonian Institution.).
- Langenheim, J., J. Greenlee, A. Benson, and P. Ritter. 1983. Vegetation, Fire History, and Fire Potential of Big Basin Redwoods State Park. Final Report for California Department of Parks and Recreation. Contract No. 60-20-010.
- Levy, R. 1978. Costanoan. In California, R.F. Heizer (ed.). Handbook of North American Indians. Smithsonian Institution, Washington Vol. 8: 485–497.

APPENDIX A – REFERENCES AND CONTRIBUTORS

- Lewis, H. T. 1993. Patterns of Indian burning in California: Ecology and ethnohistory. In: Before the wilderness: Native Californians as environmental managers, edited by T. C. Blackburn and M. K. Anderson, 55–116. Ballena Press, Menlo Park, California.
- Marin County. 2005. Marin County Fire Department Community Wildfire Protection Plan.
- Marin Municipal Water District (MMWD). 1995. Mount Tamalpais Area Vegetation Management Plan, February 1995. Prepared by Charles Leonard and Associates. Prepared for the Marin Municipal Water District, Corte Madera, CA and the Marin Open Space District, San Rafael, CA.
- McBride, J. and D. Jacobs. 1978. The history of the vegetation of Muir Woods National Monument. National Park Service, Pacific Western Region, San Francisco, California.
- McCarthy, H. 1993. Managing oaks and the acorn crop. In: Before the wilderness: Native Californians as environmental managers, edited by T. C. Blackburn and M. K. Anderson, 213–28. Ballena Press, Menlo Park, California.
- McClatchie, A.J. 1902. Eucalyptus Cultivated in the United States. USDA Bureau of Forestry, Bulletin No. 35. Washington (D.C.) Government Printing Office.
- Meyer, J. 2001. A Geoarchaeological Study of Portions of Fort Baker, Marin County, California. Report submitted to National Park Service, Golden Gate Recreational Area, San Francisco.
- National Assessment Synthesis Team on Climate Change. 2000. United States Global Change Research Program, 2000.
- National Interagency Fire Center (NIFC). 2006. Interagency Standards for Fire and Fire Aviation Operations. Federal Fire and Aviation Leadership Council. January 1, 2006. <http://www.fire.blm.gov/Standards/redbook.htm>
- _____. 2001. Review and Update of the 1995 Federal Wildland Fire Management Policy, Interagency Federal Wildland Fire Management Policy Review Working Group, National Interagency Fire Center, Boise, ID.
- National Park Service (NPS). 2006. Management Policies, the Guide to Managing the National Park Service. August 31, 2006. pp. 288.
- _____. 2006b. Reference Manual 18, Wildland and Prescribed Fire Management Policy. Published to the Internet and last updated 9/26/06. http://www.nps.gov/fire/fire/fir_wil_pla_reference18.cfm.
- _____. 2006c. Record of Decision on the Golden Gate National Recreation Area, Fire Management Plan, Final Environmental Impact Statement. 2/26/06.
- _____. 2005. Director's Order 18: Wildland Fire Management. Issued 7/31/2005 http://www.nps.gov/fire/download/fir_wil_do18.pdf. Published by the Office of the Director of the National Park Service, Washington, D.C.
- _____. 2005b. Fire Management Plan, Final Environmental Impact Statement, Golden Gate National Recreation Area. November 2005.

APPENDIX A – REFERENCES AND CONTRIBUTORS

- _____. 2004. Final Fire Management Plan, Environmental Impact Statement, Point Reyes National Seashore and North District of Golden Gate National Recreation Area, National Park Service. July 2004.
- _____. 2003. Director's Order #60, Aviation Management. <http://www.nps.gov/policy/DOrders/DO60final.pdf>
- _____. 2003b. Fire Monitoring Handbook. Fire Management Program Center, NIFC, Boise, ID.
- _____. 2001. Vegetation Management Plan for the Presidio and Environmental Assessment. National Park Service and the Presidio Trust.
- _____. 1999. Golden Gate National Recreation Area Natural Resources Management Plan. San Francisco, CA.
- _____. 1998. Golden Gate National Recreation Area Cultural Resources Management Plan. San Francisco, CA.
- _____. 1980. General Management Plan, Environmental Analysis, Golden Gate National Recreation Area and Point Reyes National Seashore, California: Department of the Interior, National Park Service.
- National Wildfire Coordinating Group (NWCG). 2000. Wildland and Prescribed Fire Qualifications System Guide (PMS 310-6). http://www.nwcg.gov/pms/docs/310-1_2006.pdf
- Oswald, D.D. 1968. The timber resources of Humboldt County, CA. USDA Forest Service, Resource Bulletin PNW-26.
- Perry, F.R., Hauer, C.A., Frissell. 2004. Postfire Management on Forested Public Lands of the Western United States. *Conservation Biology*, vol. 18, no. 4, pp. 957-967(11).
- Philpot, C.W. 1977. Vegetative features as determinants of fire frequency and intensity. In: *Proceedings of the Symposium on the Environmental Consequences of Fire and Fuel Management in Mediterranean Ecosystems*. USDA Forest Service General Technical Report WO-3. Pages 12– 16.
- Pickett, S.T.A., J. Kolasa, J.J. Armesto, and S.L. Collins. 1989. The ecological concept of disturbance and its expression at various hierarchical levels. *Oikos* 54: 129–136.
- Reidy, L.M. 1994. Evidence of Environmental Change over the last 2000 years at Mountain Lake, in the northern San Francisco Peninsula, California. MA thesis. University of California, Berkeley, California.
- Reynolds, R.D. 1959. Effects of natural fires and aboriginal burning upon the forests of the central Sierra Nevada. MA thesis. University of California, Berkeley, California.

APPENDIX A – REFERENCES AND CONTRIBUTORS

- Rothermel, Richard C. 1972. A mathematical model for fire spread predictions in wildland fuels. USDA For. Serv. Res. Pap. INT-115, 40 p. Intermt. For. and Range Exp. Stn., Ogden, Utah.
- Ruddiman, W. F. 2003. The anthropogenic greenhouse era began thousands of years ago. *Climatic Change*, 61:261–293.
- Russell, E.W.B. 1983. Pollen analysis of past vegetation at Point Reyes National Seashore, California. *Madroño* 30 (1): 1–11.
- Rypins, S., S.L. Reneau, R. Byrne, and D.R. Montgomery. 1989. Palynologic and Geomorphic Evidence for Environmental Change During the Pleistocene-Holocene Transition at Point Reyes Peninsula, Central Coastal California. *Quaternary Research* 32:72–87.
- San Francisco Public Utilities District. 2002. Peninsula Watershed Management Plan.
- San Francisco Recreation and Park Department. 2006. San Francisco's Significant Natural Resource Areas Management Plan, Final Draft. February 2006.
- San Mateo County Parks and Recreation Department. 2006. Decision-Making Guidelines for Vegetation Management. June 2006.
- _____. 2006b. Huddart and Wunderlich County Parks Draft Master Plan. Prepared by Harris Design, Carol Rice, Wildland Resources Management. May 2006b.
- Sapsis, D.B., and R.E. Martin. 1994. Fire, the landscape, and diversity: A theoretical framework for managing wildlands. In: Proceedings of the 12th Conference on Fire and Forest Meteorology, Oct. 26-28, 1993. Jekyll Island, Georgia. Society of Foresters Publication 94-02, Washington D.C.
- Spitz, B. 1997. Mill Valley: The Early Years. Potrero Meadow Publishing Company, Mill Valley, California.
- Stanger, Frank M. 1967. Sawmills in the Redwoods: Logging on the San Francisco Peninsula, 1849–1967. San Mateo County Historical Society, San Mateo, California.
- Stewart, O.C. 1955. Forest and grass burning in the mountain west. *Southwestern Lore* 21:5-9.
- Stuart, J.D. 1987. Fire history of an old-growth forest of *Sequoia sempervirens* (Taxodiaceae) forest in Humboldt Redwoods State Park, California. *Madroño* 34:128–41.
- Sunget, P.W. and R.E. Martin. 1984. Fire history and post-fire stand dynamics of the Inverness bishop pine population. Unpublished MS. University of California, Berkeley.
- Toogood, A.C. 1980. A civil history of Golden Gate National Recreation Area and Point Reyes National Seashore, California. Denver: Historic Preservation Branch, Pacific Northwest Team, Denver Service Center, National Park Service, United States Dept. of the Interior. 2 v.
- Union of Concerned Scientists. Climate Change in California: Choosing our Future. Summary of Emissions Pathways, Climate Change and Impacts on California in the Proceedings of the National Academy of Sciences.
- U.S. Department of Agriculture, Forest Service (USFS). 2007. Healthy Forests Report, May 2007. Dated 06/19/07. Posted at <http://www.forestsandrangelands.gov/index.shtml>.

_____. 2006. Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide, USDA/USDI. 2006.

_____. 1939-1941. Bibliography of Early California Forestry -Marin and San Mateo Counties. v. 23,48-49. California Forest and Range Experiment Station, Berkeley, CA.

Veirs, S.D. 1980. The role of fire in northern coast redwood forest dynamics. Pages 190–209 in Proceedings, conference on scientific research in the national parks. Vol. 10, Fire ecology, San Francisco, CA. National Park Service, Washington D.C.

Verran, R. 1982. The Fog and San Francisco. Palo Alto (CA): Pacific Books.

A. L. Westerling, H. G. Hidalgo, D. R. Cayan, T. W. Swetnam, *Science* 313, 940 (2006); published online 6 July 2006 (10.1126/science.1128834).

White, P.S., and S.T.A. Pickett. 1985. Natural disturbance and patch dynamics: an introduction. In S.T.A. Pickett and P.S. White (eds.), *The Ecology of Natural Disturbance and Patch Dynamics*, Academic Press, New York. Pages.3–13.

A.2. CONTRIBUTORS

Wendy Poinsot, Fire Program Planner

Roger Wong, Fire Management Officer, Point Reyes National Seashore

Alanna Donahoe, Fire Program Management Assistant

Mark Grupe, Fire GIS

Alison Forrestel, Bay Area Network Fire Ecologist

Jennifer Chapman, Fire Communication and Education Specialist

APPENDIX A – REFERENCES AND CONTRIBUTORS

Appendix B

GGNRA Special Status Species

APPENDIX B
SPECIES OF CONCERN

Scientific Name	Common Name	Legal Status		Noted in GGNRA Records	GGNRA management concern not on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in FEMU/Project Unit			Potential Effect from FMP Actions			County Distribution			Species Distribution / Range	Comments	
		Federal	CNPS						State	Note	WUI	Interior	Beneficial	Negative	Unknown	San Francisco	San Mateo			Marin
PLANTS																				
<i>Abrotia umbellata</i> ssp. <i>brevisiflora</i>	Pink sand-verberna	FSLC	IB			Coastal dunes and coastal strand.	Flowers and internodes with sparse cover. A. Umb. Brevisiflora is usually the plant closest to the ocean. 0-12in.	X				X				X			North Coast, Central Coast (Marin Co.)	Species occurrences are documented in foredune habitat at Crissy Field (Recovery Plan for Coastal Plants of the Northern San Francisco Peninsula, USFWS, 2003). It is anticipated that coastal foredune habitat would be unaffected by FMP actions.
<i>Acanthomintha duttonii</i>	San Mateo thornmint	FE	IB	E	X	Chaparral, valley and foothill grassland, coastal scrub. Serpentine grasslands.	Endemic to San Mateo County extant populations only known from very uncommon serpentine vertisol clays; in relatively open areas. 50-200m.								X			Central Coast, San Francisco Bay Area (San Mateo Co.)	Only occurs in the San Francisco Watershed District. Special Status. Vascular Plant Species Monitoring Report GGNRA 2001.	
<i>Agrostis blanda</i>	Blundale's bentgrass	FSC	IB			Coastal dunes, coastal bluff scrub, coastal prairie.	Includes agrostis blundalei var. Marinensis ssp. blundalei rare sandy or gravelly soil close to rocks; often in nutrient poor soil with sparse vegetation. 5-150m.	X											s North Coast, n Central Coast, n San Francisco Bay Area	Per communication with Marin CNPS (2004) populations exist in GGNRA. CNDDB (2004): Marin occurrence in Pt. Reyes, San Mateo-Franklin Pt. Quad
<i>Allium peninsulare</i> var. <i>franciscanum</i>	Franciscan onion	FSLC	IB			Cismontane woodland, valley and foothill grassland.	Clay soils; often on serpentine. Dry hillside. 100-300m.									X			Central Coast, San Francisco Bay Area	
<i>Alopecurus aequalis</i> var. <i>sonomensis</i>	Sonoma alopecurus	FE	IB			Freshwater marshes and swamps, riparian scrub.	Wet areas, marshes, and riparian banks with other wetland species. 5-360m. Known from a few occurrences in Sonoma and Marin counties.	X											Central Coast	Four occurrences of this species are currently known on the Point Reyes peninsula, all occurring within pastures on agricultural permit lands (Point Reyes FMP, 2004). No populations exist in the GGNRA (CNDDB, 2004)
<i>Amorpha californica</i> var. <i>noveboracensis</i>	Napa false indigo	FSLC	IB			Broadleaved upland forest, chaparral, cismontane woodland.	Openings in forest or woodland or in chaparral. 150-200m												s North Coast Ranges (Solpa, Sonoma Co.), n San Francisco Bay Area (Marin Co.)	
<i>Amsinckia linaris</i>	Beet-flowered fiddleneck	FSLC	IB			Cismontane woodland, valley and foothill grassland.	Disturbed areas, areas with low vegetation cover in grasslands and open-cropped woodlands. 50-500m.										X		Inner North Coast Ranges, west-central Great Central Valley, San Francisco Bay Area. Heterostylous or anthers in upper and lower group. Fl size variable.	
<i>Arabis blepharophylla</i>	Coast rock-eress	FSLC	4		X	Broadleaved upland forest, coastal prairie, coastal scrub.	Prefers rocky coastal bluffs and ridges with thin soils. Often on serpentine soils. 15-500m.										X		Outer North Coast Ranges, San Francisco Bay Area.	Special Status. Vascular Plant Species Monitoring Report GGNRA 2001.
<i>Arctostaphylos andersonii</i>	Santa Cruz manzanita	FSLC	IB			Chaparral, north coast coniferous forest.	Known only from the Santa Cruz Mts. open sites, redwood forest. 180-800m.										X		w San Francisco Bay Area (Santa Cruz Mts)	
<i>Arctostaphylos hookeri</i> ssp. <i>franciscana</i>	San Francisco manzanita	FSC	IA			Chaparral.	Formerly Endemic To San Francisco Area. Now Extinct Only In Cultivation. Coastal Hillside. Serpentine Outcrops in Chaparral. 60-300m.	X									X		Central Coast (San Francisco Peninsula)	Species is extinct in the wild (Recovery Plan for Coastal Plants of the Northern San Francisco Peninsula, USFWS, 2003).
<i>Arctostaphylos hookeri</i> ssp. <i>montana</i>	Tamalpais manzanita	FSC	IB		X	Chaparral, valley and foothill grassland.	Known from fewer than 20 occurrences in the Mt. Tamalpais area, Marin County; serpentine slopes in chaparral and grassland. 160-760m.												Central Coast, nw San Francisco Bay Area (Mount Tamalpais, Marin Co.)	Special Status. Vascular Plant. Species Monitoring Report GGNRA 2001. Population monitored at Mill Valley Air Force Base.

Scientific Name	Common Name	Legal Status			Noted in GGNRA Records	GNRA management concern not on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrences known in FMPU/Project Unit				Potential Effect that Could Result from FMP Actions			County Distribution	Species Distribution / Range	Comments
		Federal	CNPS	State						None	Marl Woods	WUI	Interior	Beneficial	Negative	No affect			
<i>Arctostaphylos hookeri</i> <i>spp. ravenni</i>	Presidio (Raven's) manzanita	FE	IB	E	X		Chaparral, coastal prairie, coastal scrub.	Formerly endemic to s.f. area; only one wild plant plus clones remain, open, rocky serpentine slopes. 20-215m.	X		X		X		X			The USFWS Recovery Plan suggests that seed germination could be stimulated by burns (Kelley, 1987). The limited population would also be enhanced by invasive species control and management (Recovery Plan for Coastal Plants of the Northern San Francisco Peninsula, USFWS, 2005). The fire reduction actions for San Francisco lands may need further USFWS consultation to reduce direct effects during vegetation removal and to maximize long-term benefits.	
<i>Arctostaphylos imbricata</i>	San Bruno Mountain manzanita	? CA	IB	E			Chaparral, coastal scrub.	Known from a handful of occurrences near San Bruno Mtn., San Mateo County; mostly known from a few sandstone outcrops in chaparral. 275-365m.						X				w San Francisco Bay Area (San Bruno Mtn)	
<i>Arctostaphylos montaraensis</i>	Montara manzanita	FSC	IB		X		Chaparral, coastal scrub.	Endemic to San Mateo County; slopes and ridges. 150-500m.										w San Francisco Bay Area (San Bruno, Montara mtns)	Only occurs in the SFWD. Special Status Vascular Plant Species Monitoring Report GGNRA 2001.
<i>Arctostaphylos regismontana</i>	King's Mountain manzanita	FSLC	IB				Broadleaved upland forest, chaparral, north coast coniferous forest.	Endemic to Sacramento and San Mateo counties; granitic or sandstone outcrops. 305-730m.						X				w San Francisco Bay Area (in Santa Cruz Mtns)	
<i>Arctostaphylos virgata</i>	Marin manzanita	FSLC			X		Broadleaved upland forest, closed-cone coniferous forest, chaparral, north coast coniferous forest.	Only known from about 20 sites in Marin County. On sandstone or granitic soil. 60-700m.	X		X								Known populations occur along Bolinas Ridge. Threatened by fire suppression. GGNRA fire managers should be made aware of this potential threat from fire suppressions and include this with any future FMP. Special Status Vascular Plant Species Monitoring Report GGNRA 2001.
<i>Arenaria pallidicola</i>	Marsh sandwort	FE	IB	E			Marshes and swamps.	Hist. From scattered coll. In ca and in wa; now known from one site in slo & appar. Also in mesco growing up through dense mats of typha, juncus, scirpus, etc. In freshwater marsh. 10-170m							X			s. Central Coast (Nipomo Mesa, San Luis Obispo Co.), South Coast (Santa Ana River)	
<i>Astragalus nuttallii</i> var. <i>virgatus</i>	Nuttall's milk-vech	FSLC	4				Coastal bluff scrub, coastal dunes.	3-70m.	X		X				X			e&s Central Coast	Occurs in the Presidio coastal bluffs (pers. comm. Michael Chasse (NPS) 2004)
<i>Astragalus pycnostachyus</i> var. <i>pycnostachyus</i>	Marsh milkvech	FSLC	IB				Coastal dunes, coastal salt marshes.	Mesic sites in dunes or along streams or coastal salt marshes. 0-30m.							X			North Coast, n Central Coast.	
<i>Astragalus tener</i> var. <i>tener</i>	Alkali milk-vech	FSC	IB				Alkali playa, valley and foothill grassland, vernal pools.	Low ground, alkali flats, and flooded lands; in annual grassland, playes, and vernal pools. 1-170m.							X			s. Sacramento Valley, n. San Joaquin Valley, east SF Bay Area	
<i>Atriplex californica</i>	California saltbush	FSLC					Coastal strand, coastal salt marsh, coastal sage scrub, sea bluffs. North of Monterey this species generally occurs on the upper edges of sandy salt marshes and on coastal sandstone bluffs.		X		X				X			s. North Coast, Central Coast, South Coast, Channel Islands	Occurs in the Presidio (pers. comm. Ling He (NPS), 2004). It is anticipated that edges of the coastal salt marsh and sandstone bluff habitat would not be unaffected by FMP actions

APPENDIX B
SPECIES OF CONCERN

Scientific Name	Common Name	Legal Status			Noted in GNRA Records	GNRA management concern not on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in FEMU/Project Unit				Potential Effect that Could Result from EMP Actions ¹				County Distribution	Species Distribution / Range	Comments
		Federal	CNPS	State						None	Muir Woods	WUI	Interior	Beneficial	Negative	No effect	Unknown			
<i>Blennosperma nanum</i> var. <i>robustum</i>	Point Reyes stickseed	FSC	IB	IB			Coastal prairie, coastal scrub.	Endemic to Marin and Mendocino Counties. On open coastal hills in sandy soil. 10-145m.								X	Central North Coast (Fort Bragg, Mendocino Co.), North Central Coast (Point Reyes peninsula, Marin Co.). Fls late spring. Some populations on Point Reyes peninsula are intermediate to var. <i>nanum</i> in fruit length, pollen color.			
<i>Calamagrostis crassiglumis</i>	Thurber's reed grass	FSC	2				Coastal scrub, freshwater marsh.	Usually in marshy swales surrounded by grassland or coastal scrub. 10-45m.								X	Central Coast			
<i>Calochortis tiburonensis</i>	Tiburon mariposa lily	FT	IB	T			Valley and foothill grassland.	Narrowly endemic to riving mountain, Marin County. On open, rocky slopes in serpentine grassland. 50-150m.								X	nw San Francisco Bay Area (Range Mt., Marin Co.)	Per communication with Marin CNPS (2004), no populations occur within GNRA. CNDDDB (2004): Marin occurrence in Pt. Reyes, San Mateo-Franklin Pt. Quad		
<i>Calystegia purpurata</i> ssp. <i>Saxicola</i>	Coastal bluff morning-glory	FSLC	IB				Coastal dunes, coastal scrub.	15-105m.	X							X	n Central Coast (Brooks Island, Contra Costa Co.), n San Francisco Bay Area	Per communication with Marin CNPS, No populations exist within GNRA. CNDDDB: Marin occurrence in Pt. Reyes.		
<i>Campanula californica</i>	Swamp harebell	FSC	IB				Bogs and marshes in a variety of habitats; uncommon where it occurs. 1-405m.									X	s North Coast, n Central Coast			
<i>Castilleja affinis</i> ssp. <i>neglecta</i>	Tiburon paintbrush	FE	IB		X		Valley and foothill grassland.	Known only from Marin, Napa, and Santa Clara Counties. Rocky serpentine sites. 75-400m.								X	s Inner North Coast Ranges (Napa Co.), San Francisco Bay Area (Marin, Santa Clara cos.)	Occurs on Nicajiao Ridge only. Special Status. Vascular Plant Species Monitoring Report (GNRA 2001).		
<i>Castilleja affinis</i> var. <i>affinis</i>	Coast Indian paintbrush	FSLC					Chaparral, coastal scrub.	Sandy soils. <1200m.	X							X	c North Coast (Mendocino Co.), n Outer North Coast Ranges (Humboldt Co.), s Outer North Coast Ranges, n Cascade Range, Foothills, Sierra Nevada Foothills, Central Western California, Southwestern California	Castilleja sp. (weight) or affinis ssp. affinis occur in the Presidio coastal bluffs (pers. comm. Michael Chase (NPS), 2004).		
<i>Castilleja ambigua</i> ssp. <i>ambigua</i>	Salt marsh owl's-clover	FSLC					Coastal bluffs, grassland.	<100m.	X							X	North Coast, s North Coast Ranges, n Central Coast.	Occurred in 2002 at Crissy Field, but has not been observed since (pers. comm. Ling He (NPS) 2004).		
<i>Castilleja ambigua</i> ssp. <i>Humboldtensis</i>	Humboldt Bay owl's-clover	FSC	IB				Coastal salt marsh.	Known only from Humboldt and Marin counties. In coastal saltmarsh with spartina, distichlis, salicornia, jaumea. 0-3m.								X	n North Coast (Humboldt Bay), n Central Coast (Point Reyes)	Species is not documented in GNRA. Special Status. Vascular Plant Species Monitoring Report (GNRA 2001).		
<i>Castilleja exserta</i> ssp. <i>Latifolia</i>	Purple owl's-clover	FSLC					Coastal bluffs, dunes.	<200m.	X							X	North Coast, n Central Coast	Per communication with Marin CNPS (2004), no populations occur within GNRA. In San Francisco, it is apparently either rare, intermittent (emerging only some years), or extirpated in coastal bluffs and dunes (Recovery Plan for Coastal Plants of the Northern San Francisco Peninsula, USFWS 2003).		
<i>Castilleja subnucula</i> ssp. <i>franciscana</i>	Indian paintbrush		4		X		Coastal scrub	<100m.	X								south North Coast (s Mendocino, Sonoma cos.) n Central Coast (for Santa Cruz Co.), w San Francisco Bay Area	Per communication with Marin CNPS (2004), no populations occur within Marin Headlands (including Wolfback Ridge)		

Scientific Name	Common Name	Legal Status			Noted in GGNRA Records	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in FMU/ Project Unit				Potential Effect that Could Result from FMP Actions			County Distribution			Species Distribution / Range	Comments
		Federal	CNPS	State					None	Muir Woods	WUI	Interior	Beneficial	Negative	No affect	Unknown	San Francisco	San Mateo		
<i>Ceanothus gloriosus</i> var. <i>porticus</i>	Mount Vision ceanothus	FSC	IB			Closed some coniferous forest, coastal prairie, coastal scrub, valley and foothill grassland.	Low shrub in a variety of habitats on Pt. Reyes; sandy soils. 25-305m.									X			San Francisco Bay Area (Point Reyes)	
<i>Ceanothus masonii</i>	Mason's ceanothus	FSC	IB	R	X	Chaparral.	Endemic to Marin County. Serpentine Ridges Or Slopes in Chaparral Or Transition Zone. 180-460m.	X		X						X			San Francisco Bay Area (Bolinas Ridge, sw Marin Co.). Closely related to <i>C. gloriosus</i> .	Species is documented on southern Bolinas Ridge (Special Status Vascular Plant Species Monitoring Report, GGNRA 2002).
<i>Chenopodium californicum</i>	California goosefoot	FSLC				Occurs in a wide range of plant communities in relatively dry and open conditions. In San Francisco it typically occurs in stabilized rear dune systems.	Sandy to clay soils. Dryish plains and slopes below 3000'.	X								X			North Coast, Outer North Coast Ranges, eck's Sierra Nevada Foothills Tehachapi Mountain Area, Great Central Valley, Central Western California, Southwestern California, East of Sierra Nevada, w Mojave Desert	Occurs in the Presidio (Area B - interior) (pers. comm. Michael Chase (NFS), 2004)
<i>Chorizanthe cuspidata</i> var. <i>cuspidata</i>	San Francisco Bay spinneflower	FSC	IB		X	Coastal bluff scrub, coastal dunes, coastal prairie, coastal scrub.	Closely related to <i>C. pungens</i> . Coastal strand & coastal scrub communities. Sandy soil on terraces and slopes. 5-550m.	X		X						X			not found in Jepson	Occurs within rear dune systems at the Presidio and Fort Funston. Special Status Vascular Plant Species Monitoring Report, GGNRA 2001. Colonies areas that have been recently disturbed, and spreads in dynamic dune systems.
<i>Chorizanthe cuspidata</i> var. <i>villosa</i>	Woolly-headed spinneflower	FSC	IB			Coastal scrub, coastal dunes, coastal prairie.	Endemic to coastline from Bolinas Bay to Pt. Reyes; sandy places near the beach. 3-60m.												not found in Jepson	
<i>Chorizanthe robusta</i> var. <i>robusta</i>	Robust spinneflower	FE	IB			Cismontane woodland, coastal dunes, coastal scrub.	Sandy terraces and bluffs or in loose sand. 3-120m.								X				Bay region, south to Monterey	
<i>Chorizanthe valida</i>	Sonoma spinneflower	FE	IB	E		Coastal prairie.	Known only from Marin and Sonoma Counties; extinct in Sonoma County; sandy soil. 10-50m.									X			Central Coast (Point Reyes Peninsula, Marin Co.) One extant population known; threatened by cattle. Closely related to <i>C. pungens</i>	
<i>Cirsium andrewsii</i>	Franciscan thistle	FSC	IB		X	Coastal bluff scrub, broad-leaved upland forest, coastal scrub.	Sometimes serpentine seeps. 0-135m.	X		X	X					X			North Coast, n Central Coast	Occurs in the Marin, Headlands, and Fort Funston. Special Status Vascular Plant Species Monitoring Report, GGNRA 2001. It is not affected by FMP actions as populations occur primarily in steep and wetland habitat
<i>Cirsium fontinale</i> var. <i>fontinale</i>	Fountain thistle	FE	IB	E	X	Valley and foothill grassland, chaparral.	Endemic to San Mateo County. Serpentine seeps and grassland. 90-180m.									X			sw San Francisco Bay Area (San Mateo Co.)	Only occurs in the SFWD. Special Status Vascular Plant Species Monitoring Report, GGNRA 2001.
<i>Cirsium hydrophilum</i> var. <i>vaseyi</i>	Mount Tamalpais thistle	FSC	IB			Broadleaved upland forest, chaparral.	Endemic to Marin County. Serpentine seeps and soil in chaparral and woodland. 265-620m.									X			in San Francisco Bay Area (Mount Tamalpais)	
<i>Cirsium occidentale</i> var. <i>compactum</i>	Compact cobweb thistle	FSC	IB			Chaparral, coastal dunes, coastal prairie, coastal scrub.	On dunes and on clay in chaparral; also in grassland. 5-155m.										X		Central Coast (in San Luis Obispo Monterey coast, formerly San Francisco). Some inland plants suggest weak separation from var. <i>occidentale</i>	
<i>Clarkia concinna</i> ssp. <i>ritchii</i>	Tomales clarkia	FSC	IB			Coastal bluff scrub.	Known only from one occurrence near Tomales, Marin County. Highly exposed rocky bluffs with a near-vertical slope. 15m.										X		Central Coast (known only from types locality near Tomales, Marin Co.)	

APPENDIX B
SPECIES OF CONCERN

Scientific Name	Common Name	Legal Status			Needed in GNRA Records	GNRA management concern noted on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in FMU/ Project Unit				Potential Effect that Could Result from FMP Actions*				County Distribution	Species Distribution / Range	Comments
		Federal	CNPS	State						None	WUI	Interior	Beneficial	No Effect	Unknown	San Francisco	San Mateo			
<i>Clarkia davyi</i>	Davey's clarkia						Coastal grassland, bluffs.											North Coast, n Channel Islands (Santa Rosa Island).		
<i>Clarkia franciscana</i>	Presidio clarkia	FSLC		E	X		Coastal scrub, valley and foothill grassland.	X										San Francisco Bay Area (Presidio, San Francisco, Oakland hills)	Occurs in the interior area of the Presidio, not in the FMP Study Area. Special Status Vascular Plant Species Monitoring Report, GGNRA 2001.	
<i>Gallinsia corymbosa</i>	Round-headed Chinese houses	FSC		IB			Coastal dunes, coastal prairie.											North Coast (scattered) formerly in CCo, where transitional to <i>C. bursifolia</i> .		
<i>Cordylanthus maritimus</i> <i>spp. palacaris</i>	North Coast bird's-beak	FSC		IB	X		Coastal salt marsh.	X										North Coast (Humboldt Co.), n Central Coast (Marin, Sonoma cos.)	Occurs at Crissy Field (pers. comm. Ling He (NPS), 2004). Occurs west of Hwy 1 by Hamlet & Nick's Cove. Special Status Vascular Plant Species Monitoring Report, GGNRA 2001. It is anticipated that coastal marsh habitat would be unaffected by FMP actions.	
<i>Cordylanthus mollis</i> ssp. <i>mollis</i>	Soft bird's-beak	FE		R			Coastal salt marsh.											In Central Coast.		
<i>Croton californicus</i>	California croton	FSLC					Coastal sage scrub, chaparral.	X										Central Coast, South Coast, s Channel Islands (Santa Catalina Island), Desert	Occurrences found on the Presidio (NPS 2/04)	
<i>Cupressus abramsiana</i>	Santa Cruz sypress	FE		E			Narrow endemic from Santa Cruz and Santa Clara Cos.; Restricted to the Santa Cruz mountains, on sandstone & granitic derived soils; often w/p. Artemisia.											San Francisco Bay Area (Santa Cruz Mts). Threatened by development, agriculture.		
<i>Cyrtopodium fasciculatum</i>	Clustered lady's-slipper orchid	FSC		4			North coast coniferous forest, lower montane coniferous forest.											Northwestern California, Cascade Range, n Sierra Nevada, sw San Francisco Bay Area		
<i>Delphinium bakeri</i>	Baker's larkspur	FE, PCH		R			Coastal scrub, grasslands.											In San Francisco Bay Area, n Central Coast, (s Sonoma Co.)		
<i>Delphinium luteum</i>	Yellow larkspur	FE, PCH		R			Chaparral, coastal prairie, coastal scrub.											In Central Coast (Marin, Sonoma cos.). Hybridizes with <i>D. decorum</i> . <i>D. nudicaule</i> .		
<i>Dryas occidentalis</i>	Western leatherwood	FSLC		IB	X		Broadleafed upland forest, chaparral, closed-cone coniferous forest, cismontane woodland, north coast coniferous forest, riparian forest, riparian woodland.	X										San Francisco Bay Area	Occurs in the GGNRA along Devils Gulch Rd & in the SFWD. Special Status Vascular Plant Species Monitoring Report, GGNRA 2001.	
<i>Eriogonum supplex</i>	Supple daisy	FSC		IB			Coastal bluff scrub, coastal prairie.											Coastal North Coast - Threatened by coastal development.		
<i>Eriogonum lateolam</i> var. <i>carrizum</i>	Thuron buckwheat	FSLC			X		Known from the greater bay area; serpentine soils. 10-500m.											Inner North Coast Ranges (Colusa Co.), n Central Coast, n San Francisco Bay Area (Marin, formerly Alameda cos.)	Occurs only at MVAFB. Special Status Vascular Plant Species Monitoring Report, GGNRA 2001.	
<i>Eriophyllum latifolium</i>	San Mateo woolly sunflower	FE		E	X		Endemic to San Mateo County; often on roadsides; found on and off of serpentine. 45-150m.											San Francisco Bay Area (San Mateo Co.). Probable derivative of <i>E. lanatum</i> var. <i>arachnoidum</i> X <i>E. confertiflorum</i> . Threatened by development	Occurs only in the SFWD. Special Status Vascular Plant Species Monitoring Report, GGNRA 2001.	

Scientific Name	Common Name	Legal Status			Noted in GGNRA Records	GNRA management concern list on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in FEMU/Project Unit			Potential Effect that Could Result from FMP Actions			County Distribution	Species Distribution / Range	Comments
		Federal	CNPS	State						None	Muir Woods	WUI	Interior	Beneficial	Negative			
<i>Erythronium amurens</i>	Coast wallflower	FSC	IB				Chaparral (maritime), coastal dunes, coastal scrub.	Soils, sandy openings in coastal habitats. 0-130m.							X	Central Coast (Monterey Bay), Channel Islands (Santa Rosa Island). Threatened by development. Plants intermediate to <i>E. capitatum</i> formerly in SCo.		
<i>Erythronium franciscanum</i>	San Francisco wallflower	FSC	4		X		Coastal dunes, coastal scrub, valley and foothill grassland. Occasionally on grassy, rocky slopes. 0-500m.	Endemic to the greater S.F. bay area. Often occurs on serpentine soils or outcrops; sometimes granite. Occasional on grassy, rocky slopes. 0-500m.	X		X				X	North Coast, n.e. Central Coast, San Francisco Bay Area. Fleishy, coastal plants have been called <i>var. crassifolium</i> Rossbach; inland plants approach <i>E. capitatum</i> .	Occurs in the Marin Headlands, Sweeney Ridge, Fort Funston, and the SFWD. Special Status: Vascular Plant Species Monitoring Report, GGNRA 2001.	
<i>Fissidens pauperulus</i>	Fissidens moss	FSLC	IB				North coast coniferous forest.	Moss growing on damp soil along the coast. 10-100m.							X			
<i>Fritillaria agrestis</i>	Stinkbells	FSLC	4				Cismontane woodland, chaparral, valley and foothill grassland.	Sometimes on serpentine; mostly found in nonserpentine grassland or in grassy openings in clay soil. 10-1555m.						X		Outer North Coast Ranges (Mendocino Co.), Sierra Nevada Foothills, Great Central Valley, Central Western California		
<i>Fritillaria biflora var. incana</i>	Hillsborough chocolate lily	FSC	IB				Cismontane woodland, valley and foothill grassland.	Endemic to San Mateo County. Probably on serpentine; most recent site is in serpentine grassland. 90-160m.						X		San Francisco Bay Area (Hillsborough, San Mateo Co.).		
<i>Fritillaria lanceolata var. tristis</i>	Marin checker lily	FSC	IB		X		Coastal bluff scrub, coastal scrub, coastal prairie.	Endemic to Marin County. Occurrences reported from canyons and riparian areas as well as rock outcrops; often on serpentine. 30-300m.	X				X			Endemic to Marin County	** Referenced as <i>Fritillaria affinis var. tristis</i> . One population located in the GGNRA Northern District (Special Status: Vascular Plant Species Monitoring Report, GGNRA 2001).	
<i>Fritillaria liliacea</i>	Fragrant fritillary	FSC	IB		X		Coastal scrub, valley and foothill grassland, coastal prairie.	Often on serpentine; various soils reported though usually clay, in grassland. 3-410m.							X	Sacramento Valley (Solano Co.), Central Western California.	Occurs at Nicasio Ridge and in the SFWD (Special Status: Vascular Plant Species Monitoring Report, GGNRA 2001).	
<i>Gilia capitata ssp. Chamissonis</i>	San Francisco dune gilia	FSC	IB		X		Coastal dunes, coastal scrub.	2-200m.	X						X	Central Coast	Located in rear dune habitat on the Presidio (Special Status: Vascular Plant Species Monitoring Report, GGNRA 2001). Colonies areas that have been recently disturbed, and spreads in dynamic dune systems.	
<i>Gilia capitata ssp. Tomentosa</i>	Woolly-headed gilia	FSC	IB				Coastal bluff scrub.	Rocky outcrops on the coast. 15-155m.							X	North Coast, Intergrades with <i>subsp. capitata</i> in ne Subtribe		
<i>Gilia millefoliata</i>	Yarrow-leaf gilia	FSLC	IB				Coastal dunes.	2-20m.							X	North Coast, n Central Coast		
<i>Grielandia hirsutula</i>	San Francisco gumplant	FSC	IB		X		Coastal scrub, coastal bluff scrub, valley and foothill grassland.	Ocean bluffs and coastal hillsides, sandy or serpentine slopes, sea bluffs. 15-400m.	X						X	North Coast Ranges, n.e. Sierra Nevada Foothills, Sacramento Valley, Central Western California, Western Transverse Ranges, Peninsular Ranges, Sonoran Desert	Occurs on Presidio coastal area. **Special Status: Vascular Plant Species Monitoring Report, GGNRA 2001. Forest Service indicates that <i>G. squarrosa</i> although it may be top-killed by fire, it may resprout and seedlings colonize and increase after a fire (www.fs.fed.us/database/feis)	
<i>Helianthella castanea</i>	Diablo helianthella	FSC					Broadleaved upland forest, chaparral, cismontane woodland, coastal scrub, riparian woodland, valley & foothill grassland.	Usually in chaparral/oak woodland interface in rocky, azonal soils. Often in partial shade. 25-1150m.							X	San Francisco Bay Area		

APPENDIX B
SPECIES OF CONCERN

Scientific Name	Common Name	Legal Status			Noted in GNRA Records	GNRA management concern noted on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence Known in FNU/Project Unit				Potential Effect that Could Result from FMP Actions ¹				County Distribution	Species Distribution / Range	Comments
		Federal	CNPS	State						None	Muir Woods	WUI	Interior	Beneficial	Negative	No Effect	Unknown			
<i>Hesperaloe parviflora</i>	Marin dwarf-flax "Marin Western Flax"	FT	IB	T	X		Chaparral, valley and foothill grassland.	Known only from Marin, S.F., and San Mateo Counties. In serpentine barrens and in serpentine grassland and chaparral. 30-365m.	X				X			X	San Francisco Bay Area, Occurs on Presidio coastal area. *Special Status - Vascular Plant. Species Monitoring Report (GNRA 2001). Requires openings in grassland habitat with limited thatch and vegetation cover and open soil/outcrops.	Its decline is attributable to invasive non-native vegetation; the population would be enhanced by invasive species control and management. The fuel reduction actions for San Francisco lands may need further USFWS consultation to reduce direct effects during vegetation removal and to maximize long-term benefits.		
<i>Holocarpha macradenia</i>	Santa Cruz tarplant	FT	IB	E			Coastal prairie, valley and foothill grassland.	Light, sandy soil or sandy clay; often with nonnatives. 10-260m.								X	Central Coast (n.e. Monterey Bay), sw San Francisco Bay Area. Threatened by development, agriculture.			
<i>Horkelia cinctata</i> var. <i>sericea</i>	Kellogg's horkelia	FSLC	IB		X		Closed-cone coniferous forest, coastal scrub, chaparral.	Old dunes, coastal sandhills; openings. 10-200m.	X				X				Central Coast. Remaining plants less distinct from <i>sericea</i> than those formerly near San Francisco. Threatened by coastal development.	Re-introduced into Presidio dune habitat (pers. comm. Peter Brastow (NPS) 2004)		
<i>Horkelia marinensis</i>	Point Reyes horkelia	FSC	IB				Coastal dunes, coastal prairie, coastal scrub.	Sandy flats and dunes near coast; in grassland or scrub-plant communities. 5-20m.							X		North Coast (Fort Bragg), n Central Coast (Point Reyes to Santa Cruz)			
<i>Horkelia tenuiloba</i>	Thin-lobed horkelia	FSLC	IB				Coastal scrub, chaparral.	Sandy soils; mesic openings. 45-500m.							X		North Coast, c.e.s. Outer North Coast Ranges, nw San Francisco Bay Area			
<i>Lasthenia macrantha</i> ssp. <i>bakeri</i>	Baker's goldfields	FSLC	IB				Closed-cone coniferous forest, coastal scrub.	Grasslands, woods, near coast. Openings in forests and scrublands. 60-520m.							X		c.e.s. North Coast (Mendocino, Sonoma cos.)			
<i>Lasthenia macrantha</i> ssp. <i>macrantha</i>	Perennial goldfields	FSLC	IB				Coastal bluff scrub, coastal dunes, coastal scrub.	Most of distribution restricted to the Sacramento/San Joaquin River Delta. Often found w/ <i>Typha</i> , <i>Aster lentius</i> , <i>Rosa calif.</i> , <i>Juncus</i> spp., <i>Scirpus</i> , etc. Usually on marsh and slough edges.	X						X		North Coast, Central Coast (2 stations)	CNDDDB (2004): Occurrences in Marin are all Pt. Reyes, San Mateo is at Pigeon Point. Per communication with Marin-CNPS (2004) Marin populations located in Point Reyes only		
<i>Lathyrus jepsonii</i> var. <i>jepsonii</i>	Delta tulle-pea	FSC	IB				Freshwater and brackish marshes.	On sparsely vegetated semi-stabilized dunes, usually behind foredunes. 0-75m.									Great Central Valley, especially San Francisco Bay Area.			
<i>Layia canosa</i>	Beach layia	FE	IB	E			Coastal dunes.	Many historical occurrences are extirpated. In beds of vernal pools. 1-880m.	X						X		n North Coast, Central Coast	No occurrences present in GNRA (1 pers. Comm. Ling He (NPS), 2004). Seeds of species was re-introduced to Crissy Field in 1998-99, however did not establish.		
<i>Legeneia limosa</i>	Legeneia	FSC	IB				Vernal pools.								X		s North Coast Ranges, s Sacramento Valley, n San Joaquin Valley, San Francisco Bay Area (Santa Cruz Mtns, Mount Hamilton Range)			
<i>Leptosiphon parviflorus</i> var. <i>rosaceus</i> (<i>Linanthus rosaceus</i>)	Rose linanthus	FSC	IB				Coastal bluff scrub.	0-100m.	X						X		California Floristic Province	Per communication with Marin-CNPS (2004), no populations have been observed outside of PORE & near Dillon Beach.		

Scientific Name	Common Name	Legal Status			Noted in GGNRA Records	GNRA management concern noted on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in FMEU/Project Unit				Potential Effect that Could Result from FMP Actions			County Distribution	Species Distribution / Range	Comments
		Federal	CNPS	State						None	Muir Woods	WUI	Interior	Beneficial	Negative	No affect			
<i>Lesvingia anachnidia</i>	Crystal Springs lessingia	FSC	IB		X		Coastal sage scrub, valley and foothill grassland, clasmontane woodland.	Known only from Santa Clara & Sonoma Counties. Grassy slopes on serpentine; sometimes on roadsides. 60-200m.							X			Occurs only in San Mateo Co. near Crystal Springs Reservoir. Special Status Vascular Plant Species Monitoring Report, GGNRA 2001	
<i>Lesvingia germanorum</i>	San Francisco lessingia	FE	IB	E	X		Coastal scrub.	Known only from San Francisco and San Mateo counties. From remnant dunes. Open sandy soils relatively free of competing plants. 20-125m.	X					X				It is anticipated that the near dune population located at Crissy Field would be unaffected by FMP actions. Species colonizes areas that have been recently disturbed, resulting in the coastal habitat region of possible long-term benefit. The limited population would also be enhanced by the Presidio (Special Status Vascular Plant Species Monitoring Report, GGNRA 2001). The fuel reduction actions for San Francisco lands may need further USFWS consultation to reduce direct effects during vegetation removal and to maximize long-term benefits.	
<i>Lesvingia microledia</i> var: <i>microledia</i>	Tamalpais lessingia	FSC	IB				Chaparral, valley and foothill grassland.	Endemic to Marin County. Usually on serpentine, in serpentine grassland or serpentine chaparral. Often on roadsides. 100-305m.							X			in San Francisco Bay Area (Mount Tamalpais, Marin Co.)	
<i>Lilaeopsis masonii</i>	Mason's lilaeopsis	FSC	IB	R			Freshwater and brackish marshes, riparian scrub.	Tidal zones, in muddy or silty soil formed through river deposition or river bank erosion. 0-10m.										CNDDB (2004) - Closest occurrence in Marin Bay Area. Locally abundant; threatened by development, flood control, agriculture	
<i>Lilium martimum</i>	Coast lily	FSC	IB				Closed-cone coniferous forest, coastal prairie, coastal scrub, broadleaved upland forest, north coast coniferous forest.	Historically in sandy soil, often on raised hummocks or bogs; today mostly in roadside ditches. 10-355m.	X						X				
<i>Limnanthes douglasii</i> ssp. <i>stuppea</i>	Point Reyes meadowfoam		IB	E			Fresh, Marsh, vernal pools, coastal prairie, meadows & seeps, clasmontane woodland.	Only known from San Mateo and Marin Counties. Vernal wet depressions in open rolling coastal prairies & meadows; typically in dark clay soil. 10-120m.							X				
<i>Linanthus grandiflorus</i>	Large-flowered linanthus	FSC					Open, grassy flats, generally in sandy soil.								X				
<i>Lupinus arboreus</i> var: <i>eximius</i>	San Mateo tree lupine	FSLC			X		Coastal bluffs, dunes, or more inland.	<100m.							X			Occurs in the SPWD. Special Status Vascular Plant Species Monitoring Report, GGNRA 2001.	
<i>Lupinus tidestronii</i>	Tideström's lupine	FE	IB	E			Coastal dunes	Includes lupinus tidestronii var tidestronii, state-listed endangered. Partially stabilized dunes, immediately near the ocean. 0-35m.							X				
<i>Malacothamnus arcanus</i>	Arcuate bush mallow	FSLC	IB				Coastal sage scrub, chaparral	Prefers rocky soils, openings in scrub, gravelly alluvium. 80-355m.	X						X			Occurred on Sweeney Ridge more than 10 years ago. Occurs in San Mateo Co. Special Status Vascular Plant Species Monitoring Report, GGNRA 2001. Seeds respond to fire.	
<i>Microseris pallidosa</i> (silverpuff)	Marsh microseris	FSLC	IB				Closed-cone coniferous forest, clasmontane woodland, coastal scrub, valley and foothill grassland.	5-30m.							X			CNDDB: SF occurrence estimated. Several Marin occurrences in San Rafael, Mt. Tamalpais and Point Reyes (communication with Maria-CNPS, 2/04).	

APPENDIX B
SPECIES OF CONCERN

Scientific Name	Common Name	Legal Status			Need in GNRA Records	GNRA management concern noted in USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in EMU/Project Unit			Potential Effect that Could Result from FMP Actions*			County Distribution	Species Distribution / Range	Comments
		Federal	CNPS	State						None	Muir Woods	WUI	Interior	Beneficial	Negative			
<i>Monardella undulata</i>	Curley-leaved monardella	FSC	4				Chaparral, coastal dunes, coastal scrub, lower montane coniferous forest.	Ponderosa pine sandhills, sandy soils. 0-300m.							X	Central Coast, San Francisco Bay Area		
<i>Monardella villosa</i> ssp. <i>globosa</i>	Robust monardella	FSLC	1B				Broadleaved upland forest, chaparral, cismontane woodland, valley and foothill grassland.	Openings. 30-300m.							X	Outer North Coast Ranges, San Francisco Bay Area		
<i>Navarretia leucocephala</i> ssp. <i>bakeri</i>	Baker's navarretia	FSC	1B				Cismontane woodland, meadows and seeps, vernal pools, valley and foothill grassland, lower montane coniferous forest.	Vernal pools and swales; adobe or alkaline soils. 5-950m.							X	Inner North Coast Ranges, w Sacramento Valley. Intermediate between subsp. <i>leucocephala</i> and <i>pleiantha</i>		
<i>Navarretia rosulata</i>	Main County navarretia	FSLC	1B				Closed-cone coniferous forest, chaparral.	Known only from Marin and Napa counties. Dry, open rocky places; can occur on serpentine. 200-650m.							X	Inner North Coast Ranges (Napa Co.), n San Francisco Bay Area (Marin Co.)		
<i>Navarretia squarrosa</i>	Skunkbush	FSLC					Sandy alluvium, roadsides, dryer winter pools, open wet gravelly flats, slopes.	Dunes, sandy soils	X							North Coast Ranges, n Sierra Nevada foothills (Sacramento, Amador cos.)	Rare in San Francisco area, with one site located in the interior of the Presidio (Area B) (Recovery Plan for Coastal Plants of the Northern San Francisco Peninsula, USFWS 2003).	
<i>Orobanchae californica</i> ssp. <i>californica</i>	California broomrape	FSLC					Coastal bluff grassland, and occasionally in dunes.	Numerous forested habitats, californica floristic province sandy or heavy soils, locally on serpentine substrate. Plant is root parasite generally on grindedia species. <150m	X						X	North Coast, ncc Central Coast	Per communication with Marin-CNPS (2004), "not known except on PORE growing in association with Grindelia". NO CNDDB occurrences	
<i>Pedicularis dudleyi</i>	Dudley's lousewort	FSC	1B	R			Chaparral, north coast coniferous forest, valley and foothill grassland, coast redwood forests.	Deep shady woods of older coast redwood forests; also in maritime chaparral. 100-490m.							X	Central Western California (except Outer South Coast Ranges). Widely scattered. Plants from c CCo (Arroyo de la Cruz, San Luis Obispo Co.) warrant further study (smaller, leaves < inflorescence, anthers often exerted with bases somewhat acuminate); also like <i>P. semibarbata</i> but filaments glabrous		
<i>Pentstemon belliflorus</i>	White-rayed pentstemon	FE	1B	E	X		Valley and foothill grassland.	Open dry rocky slopes and grassy areas, often on soils derived from serpentine bedrock. 35-620m							X	San Francisco Bay Area	Occurs in the SPWD. Special Status Vascular Plant Species Monitoring Report GNRA 2001.	
<i>Perideridia gardneri</i> ssp. <i>gardneri</i>	Gardner's yampah	FSC					Broadleaved upland forest, chaparral, coastal prairie, valley and foothill grassland, vernal pools.	Adobe flats or grasslands, wet meadows and vernal pools, under pines radiata along the coast, mesic sites. 0-350m.							X	s North Coast (Sonoma Co.), Central Coast (scarce s of Monterey Co.), South Coast		
<i>Phacelia insularis</i> var. <i>continentis</i>	North Coast phacelia	FSC	1B				Coastal bluff scrub, coastal dunes.	Known only from Mendocino and Marin counties. Open maritime bluffs, sandy soil. 10-160m.	X						X	North Coast	Per communication with Marin-CNPS (2004), Marin populations found in PORE only CNDDB (2004) - Closest occurrence in Marin: Pt. Reyes & Inverness.	
<i>Piperia elegans</i>	Coast rein-orchid	FSLC					Coniferous forests, scrub, coastal bluffs, headlands.	Numerous habitats, prefers moist soils, shade in forested and scrub habitat.	X		X					North Coast, w Klamath Ranges, Outer North Coast Ranges, Central Coast, San Francisco Bay Area	It is uncommon and local on sandy coastal bluff grassland and scrub in the Presidio, and under blue gum eucalyptus groves in remnant dunes near Baker Beach (GNRA unpubl. data)	

Scientific Name	Common Name	Legal Status			Noted in GGNRA Records	GNRA management concern noted on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in EMU/Project Unit				Potential Effect that Could Result from EMP Actions?				County Distribution			Species Distribution / Range	Comments
		Federal	CNPS	State						None	Muir Woods	WUI	Interior	Beneficial	Negative	No affect	Unknown	San Francisco	San Mateo	Marin		
<i>Piperia elegans ssp. Decurdata</i>	Point Reyes rein orchid	FSC	IB				Coastal bluff scrub.	15-185m.									X			known only from two small populations at the tip of the Pt. Reyes peninsula, California, and separated from <i>P. elegans</i> ssp. <i>elegans</i> by only 14 km.		
<i>Platigobothrys chorisianus</i> var. <i>chorisianus</i>	Chorist's popcornflower	FSLC	IB	X		Chaparral, coastal scrub, coastal prairie.	Mesic sites. 15-100m.	X			X									Occurs at Sweeney Ridge and on SFWD Special Status Vascular Plant Species Monitoring Report, GGNRA, 2001. The 2001 draft USFWS recovery plan for rough popcornflower (<i>P. hirtus</i>) states that fire suppression is a threat to the species, resulting in encroaching native oaks and ash trees which shade the popcorn flower.		
<i>Platigobothrys diffusus</i> **	San Francisco popcornflower		IB	E		Valley and foothill grassland, coastal prairie.	Historically from grassy slopes with marine influence. 60-485m.	X												** The treatment of <i>Platigobothrys</i> in the Jepson manual interpreted the endemic San Francisco (Presidio) population of Greene's popcornflower (<i>Platigobothrys diffusus</i>) as a variant with <i>Platigobothrys reticulatus</i> var. <i>rossianorum</i> .		
<i>Platigobothrys glaber</i>	Hairless allocarya	FSC	1A			Meadows and seeps, marshes and swamps.	Coastal salt marshes and alkaline meadows. 5-180m.													Central Coast, s San Francisco Bay Area (especially near Hollister) Perhaps a var. of <i>P. stipitatus</i> .		
<i>Platigobothrys reticulatus</i> var. <i>rossianorum</i>	Greene's popcorn flower	FSC				Forests, grasslands.	gen <300m.	X												Northwestern California. Has been extirpated from San Francisco Bay Area. (Recovery Plan for Coastal Plants of the Northern San Francisco Peninsula, USFWS, 2003)		
<i>Platipogon hooverianus</i>	North Coast semaphore grass	FSC	IB	T		Broadleaved upland forest, meadows and seeps, north coast coniferous forest.	Wet grassy, usually shady areas, sometimes freshwater marsh, associated with forest environments. 10-1150m.													s North Coast, n Central Coast.		
<i>Polygonum marinense</i>	Marin knotweed	FSLC	3			Marshes and swamps.	Coastal salt marshes and brackish marshes. 0-10m.													San Francisco Bay Area (especially Marin Co.) Related to <i>P. aviculare</i> taxonomic status uncertain; possibly = <i>P. robustifolius</i> Lohse.; if so, alien, native to w. Medit. Endangered by salt marsh development. Merits immediate study.		
<i>Potentilla hickmanii</i>	Hickman's potentilla = Hickman's cinquefoil	FE	IB	E		Coastal bluff scrub, closed-cone coniferous forest, meadows and seeps, marshes and swamps.	Freshwater marshes, seeps, and small streams in open or forested areas along the coast. 5-125m.													n&c. Central Coast. Greene's popcornflower is extirpated in San Francisco.		
<i>Rhynchospora californica</i>	California beaked-rush	FSC	IB			Bogs and fens, marshes and swamps, lower montane coniferous forest, meadows and seeps.	Freshwater seeps and open marshy areas. 45-1000m.													s Northwestern California (Sonoma Co.), n&c. Sierra Nevada Foothills (Butte, Mariposa? cos.), n San Francisco Bay Area, Mariposa Co. plants not recently collected, may be undescribed.		
<i>Rosa pitetorum</i>	Pine rose	FSLC				Closed-cone coniferous forest.	2-300m.													west-central California. Possibly hybrids of <i>R. sylvestris</i> , <i>R. gymnocarpa</i> , or others; further study essential		

APPENDIX B
SPECIES OF CONCERN

Scientific Name	Common Name	Legal Status			Need in GGNRA Records	GNRA management concern noted on LSPWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in FEMU/ Project Unit				Potential Effect that Could Result from FMP Actions				County Distribution	Species Distribution / Range	Comments
		Federal	CNPS	State						None	Muir Woods	WUI	Injurious	Beneficial	Negative	No Effect	Unknown			
<i>Sagittaria sanfordii</i>	Valley sagittaria (Sanford's arrowhead)	FSC	1B				Marshes and swamps	In standing or slow-moving freshwater ponds, marshes, and ditches. 0-610m.									X	North Coast (Del Norte Co.), Great Central Valley (where mostly extirpated), n South Coast (Ventura Co.)		
<i>Sarcocolla maritima</i>	Aulobe samble	FSC	1B	R			Meadows and seeps, valley and foothill grassland, chaparral, coastal prairie.	Coastal grassy areas, wet meadows, plays, prefers moist clay or ultramafic soils. 30-240m.								X	SF Bay Area, Central Coast, San Luis Obispo	Per communication with Marin/CNPS, no known Marin pops. CNDDDB-SF occurrence: Pratero Hills, possibly extirpated. Next closest occurrence in Monterey.		
<i>Sidalcea calycosa</i> sp. <i>Rhicomata</i>	Point Reyes checkerbloom	FSLC	1B				Marshes and swamps	Freshwater marshes near the coast. 5-75(245)m.								X	akes North Coast (Mendocino, Sonoma cos.), n Central Coast (Marin Co.)			
<i>Sidalcea hickamii</i> sp. <i>viridis</i>	Marin checkerbloom (checkerbloom)	FSLC	1B				Chaparral	Serpentine Or Volcanic Soils; Sometimes Appears After Burns. 0-430m.							X	s North Coast (Sonoma Co.) n Central Coast (Marin, San Francisco, San Mateo cos.)				
<i>Sidalcea multivflora</i> sp. <i>Purpurea</i>	Purple-stemmed checkerbloom	FSLC	1B				Broadleaved upland forest, coastal prairie.	15-65m.		X					X	e North Coast (n Sonoma, s Mendocino cos.), n Central Coast (San Mateo Co.)				
<i>Stilene verucunda</i> sp. <i>verucunda</i>	Mission Delores (San Francisco) campion	FSC	1B		X		Coastal scrub, valley and foothill grassland, coastal bluff scrub, chaparral, coastal prairie.	Often on mudstone or shale; one site on serpentine. 30-645m.	X						X	n Central Coast, San Francisco Bay Area	Population located on the coastal section Presidio (pers. comm. Peter Brastow (NPS) 2005).			
<i>Spartina foliosa</i>	Pacific cordgrass	FSLC					Coastal salt marsh	Baja to northern California	X		X				X	North Coast, Central Coast, South Coast	It is anticipated that this coastal salt marsh habitat would be unaffected by FMP actions.			
<i>Strobiloseris decipiens</i> (silverpuffs)	Santa Cruz microseris (silverpuffs)	FSC	1B		X		Broadleaved upland forest, closed-coniferous forest, chaparral, coastal prairie, coastal scrub.	Open areas in loose or disturbed soil. Derived from sandstone, shale or serp. on seaward slopes. 10-500m.	X								X	East occurrences found at Suisun - Beach however not found in 2001 survey. Special Status. Vascular. ELEM. Species. Monitoring Report, GGNRA 2001.		
<i>Stellaria littoralis</i>	Seashore starwort	FSC	4				Bogs and fens, coastal bluff scrub, coastal dunes, coastal scrub, marshes and swamps.	5-40m.							X	North Coast, Central Coast				
<i>Streptanthus glandulosus</i>	Tamalpais jewel-flower	FSC	1B		X		Closed-coniferous forest, chaparral.	Endemic to Marin County. Talus serpentine outcrops. 410-650m.	X							X	s North Coast Ranges, San Francisco Bay Area, nke South Coast Range	Occurs at Mill Valley Air Force Base on Mount Tamalpais, and Nicasio Ridge. Special Status. Vascular. Plant Species Monitoring Report, GGNRA 2001.		
<i>Streptanthus glandulosus</i> sp. <i>Patchellii</i>	Mount Tamalpais jewel-flower	FSC	1B				Chaparral, valley and foothill grassland.	Endemic to Marin County. Serpentine slopes. 150-800m.								X	n San Francisco Bay Area (Marin Co.)			
<i>Streptanthus niger</i>	Tiburon jewel-flower	FE	1B	E			Valley and foothill grassland.	Endemic to Marin County. Serpentine outcrops in grassland/shallow, rocky serpentine slopes. 30-150m.								X	n Central Coast (Tiburon Peninsula Marin Co.)			
<i>Suaeda californica</i>	California seabite	FT			X		Coastal salt marshes.											Central Coast.	Species was re-introduced into Grassy Field marsh (1999) however no transplants survived (pers. comm. Ling He (NPS) 2004).	
<i>Tanacetum campoloratum</i>	Dune tansy	FSC			X		Coastal dunes.	Prefers sandy soils, brackish water. Oregon to northern Central Coast of California. <30m	X								X	North Coast, n Central Coast	Occurs at Fort Funston and the Presidio in the GGNRA. Special Status. Vascular. Plant Species Monitoring Report, GGNRA 2001. It is anticipated that this coastal foredune habitat would be unaffected by FMP actions	

Scientific Name	Common Name	Legal Status			Noted in GGNRA Records	GNRA management concern not on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence Known in FMC/ Project Unit				Potential Effect that Could Result from FMP Actions				County Distribution	Species Distribution / Range	Comments
		Federal	CNPS	State						None	Wet	Interior	Beneficial	Negative	No effect	Unknown	San Francisco			
<i>Trifolium amoenum</i>	Showy Indian clover	FE	1B				Valley and foothill grassland, coastal bluff scrub.	Moist heavy soils and disturbed areas sometimes on serpentine soil, open sunny sites, swales. Most recently sited on roadside and eroding cliff face. 5-560m.	X							X	North Coast Ranges, n Central Coast San Francisco Bay Area. Probably belongs to <i>T. altopurpureum</i> complex. Occurrences in Marin, Valley Ford Quad.	Per communication with CNPS-Marín (2004) only Marin population located on private land near Dillon Beach. CNDDB (2004) Occurrences in Marin, Valley Ford Quad.		
<i>Trifolium depauperatum</i> var. <i>hydrophilum</i>	Saline clover	FSC	1B				Mushes and swamps, valley and foothill grassland, vernal pools.	Mesic, alkaline sites. 0-300m.							X	Sacramento Valley, Central Western California				
<i>Triphysaria floribunda</i>	San Francisco owl's-clover	FSC	1B	X			Coastal prairie, valley and foothill grassland.	On serpentine and nonserpentine substrate (such as at Pt. Reyes). 10-160m.	X						X	Central Coast, w San Francisco Bay Area	Populations occur in the Fort Scott and the serpentine bluff/grassland habitat east of Lincoln Blvd (NPS, 2004).			
<i>Triquetrella californica</i>	California triquetrella moss	FSLC	1B				Coastal bluff scrub, coastal scrub.	Known in Calif. From about 10 small occs, and in Oregon from one occurrence. Moss growing on soil. 10-100m.							X	Occurs in San Diego, Contra Costa, San Francisco, Marin, Mendocino, & Del Norte Counties.				
INVERTEBRATES																				
<i>Azela apterella</i>	Opler's longhorn moth	FSC	n/a		X		Coastal grassland and serpentine grasslands.	All but Santa Cruz site is on serpentine grassland. Larvae feed on <i>Platystemon californicus</i> .	X						X	Marin County & the Oakland area on the inner coast ranges south to Santa Clara Co. One record from Santa Cruz Co.	CNDDB.			
<i>Calicina dimina</i>	Marin blind harvestman	FSC	n/a				Serpentine rock outcrops, serpentine grasslands.	Found on the underside of moist serpentine rocks near permanent springs.	X					X	Known only from Bunde Mountain in Marin County					
<i>Calicina minor</i>	Edgewood blind harvestman	FSC	n/a				Open grassland in areas of serpentine bedrock.	The larval host plant for San Bruno elfins is <i>Stelotm spathulifolium</i> , a succulent which grows on rocky, north-facing slopes along the coast.	X	X				X	San Mateo & Santa Clara Counties (occurrences).	CNDDB				
<i>Calophrys mossii boyensis</i>	San Bruno elfin butterfly	FE	n/a		X		Rocky outcrops and cliffs in coastal scrub habitat.	Most specimens collected in deep shade or at the edge of forested clearings.						X	Sonoma County (occurrences).	CNDDB	It is anticipated that this species would be unaffected by FMP actions as habitat will not be affected.			
<i>Carterocephalus palaemon magnus</i>	Sonoma arcite skipper	FSC	n/a				Redwood forest.	Clean, dry, light-colored sand in the upper zone. Subterranean larvae prefer moist sand not affected by wave action.						X	Ventura, Santa Barbara, San Diego, & Los Angeles Counties (occurrences).	CNDDB. It is anticipated that this species would be unaffected by FMP actions as habitat will not be affected.				
<i>Cicindela hirticollis gravida</i>	Sandy beach tiger beetle	FSC	n/a	X			Inhabits areas adjacent to non-brackish water along the coast of California from San Francisco Bay to northern Mexico.	Inhabits forested and sand hummocks; it burrows beneath the sand surface and is most common beneath dense vegetation.						X	Monterey, Santa Cruz, Ventura, Santa Barbara, San Diego, Los Angeles, & Sonoma Counties (occurrences).	CNDDB. It is anticipated that the habitat supporting this species would be unaffected by FMP actions.				
<i>Cicindela ohlome</i>	Oblong tiger beetle	FE	n/a				Coastal terraces supporting remnant patches of native grasslands.	Serpentine soil grasslands that support larval host plants: <i>Orthocarpus densiflorus</i> and <i>Plantago erecta</i> .						X	Known only from San Mateo and Santa Clara counties.	Not observed in GGNRA, not likely to be present in study area (NPS, 2004)				
<i>Coelus globosus</i>	Globose dune beetle	FSC	n/a		X		Inhabits of coastal sand dune habitat, from Bodega Head in Sonoma County south to Ensenada, Mexico.	Inertial to subtidal marine habitat						X	Santa Barbara & Ventura Counties (occurrences).	It is anticipated that the habitat supporting this species would be unaffected by FMP actions.				
<i>Euphydryas editha boyensis</i>	Bay checkerspot butterfly	FT, CH	n/a		X		Serpentine soil grasslands that support larval host plants: <i>Orthocarpus densiflorus</i> , <i>C. Castilleja densiflorus</i> , <i>C. exerta</i> , and erect plantain.							X	Known only from San Mateo and Santa Clara counties.	Not observed in GGNRA, not likely to be present in study area (NPS, 2004)				
<i>Haliotis cracherodii</i>	Black abalone	FC	n/a				Inertial to subtidal marine habitat							X	Santa Barbara & Ventura Counties (occurrences).	It is anticipated that the habitat supporting this species would be unaffected by FMP actions.				

APPENDIX B
SPECIES OF CONCERN

Scientific Name	Common Name	Legal Status			Noted in GGNRA Records	GNRA management concern not on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in EMU/Project Unit				Potential Effect that Could Result from FMP Actions ⁶				County Distribution	Species Distribution / Range	Comments
		Federal	CNPS	State						None	Muir Woods	WUI	Interior	Beneficial	Negative	No affect	Unknown			
<i>Halictus sorsaceni</i>	White abalone	FE	n/a	n/a			Subtidal marine habitat		X	X				X	X	X		Southern California especially near Channel Islands (occurrences). Historic distribution from Point Conception, CA to Baja California, Mexico.	San Mateo and Santa Clara. It is anticipated that the habitat supporting this species would be unaffected by FMP actions.	
<i>Helminthoglypta arrosa williamsi</i>	William's bronze shoulderband snail	FSC	n/a	n/a			Known only from Hog Island, a small islet in Tomales Bay, Marin County.			X								Hog Island, a small islet in Tomales Bay, Marin County (occurrences)	CNDDDB	
<i>Helminthoglypta nickliniana rosalia</i>	Nicklin's Peninsula Coast Range snail	FSC	n/a	n/a			Known only from exposed granitic headlands of the Point Reyes Peninsula, Marin County.	Inhabits coastal scrub habitat & weedy pastures, uniquely adapted to high winds, salt logs, and variable precipitation.	X	X				X				Dorles Bay Quad in Marin County (Point Reyes) (occurrences)	CNDDDB	
<i>Hydrochara rickseckeri</i>	Ricksecker's water scavenger beetle	FSC	n/a	n/a	X		Various water bodies.	Aquatic; known from the San Francisco Bay area.	X					X				Marin, San Mateo, Sonoma & Solano County (occurrences)	CNDDDB. It is anticipated that the habitat supporting this species would be unaffected by FMP actions.	
<i>Hydroponus leechi</i>	Leech's skyline diving beetle	FSC	n/a	n/a			Aquatic.	Known to inhabit permanent ponds in northern San Mateo County.	X	X				X				Known to inhabit permanent ponds in the North end of San Mateo County (occurrences)	CNDDDB. It is anticipated that the habitat supporting this species would be unaffected by FMP actions.	

Scientific Name	Common Name	Legal Status			Noted in GGNRA Records	GNRA management concern not on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in FMU/ Project Unit				Potential Effect that Could Result from FMP Actions ⁶			County Distribution	Species Distribution / Range	Comments
		Federal	CNPS	State						None	Marl Woods	WUI	Interior	Beneficial	Negative	No affect			
<i>Icaricia icarioides sp. missionensis</i>	Mission blue butterfly	FE	n/a		X		Mission blue butterflies are closely tied to three lupine larval host plants— <i>Lupinus albifrons</i> , <i>L. varicolor</i> , and <i>L. formosus</i> . These host plants tend to occur on grasslands on thin, rocky soils within broader coastal- scrub habitats.		X									Found in Tennessee Valley, Marin Headlands, Mt. Diablo, and Sweeney Ridges (NPS, 2004). San Mateo County, San Bruno Mountain, and possibly Twin Peaks in San Francisco	
<i>Icaricia icarioides sp. Parapheres</i>	Point Reyes blue butterfly	FSC	n/a				Coastal Dunes	X				X						Not observed in GGNRA, not likely to be present in study area (NPS, 2004)	
<i>Inaciata mossii marthensis</i>	Marin elfin butterfly	FSC	n/a		X		Coastal grassland, coastal scrub.	X										San Bruno mtn., Mount Diablo, and Alpine lake, Sleep North facing slopes, and coastal mountains of SF Bay Area.	
<i>Lichuanthe ursina</i>	Bumblebee scarab beetle	FSC	n/a		X		Inhabits coastal sand dunes from Sonoma County south to San Mateo County.	X										Not observed in GGNRA, not likely to be present in study area (NPS, 2004)	
<i>Microcina edgewoodensis</i>	Edgewood microblind harvestman	FSC	n/a				Serpentine grassland, serpentine scrub.	X										Usually flies close to sand surface near the crest of the dunes.	
<i>Microcina thurona</i>	Thuron microblind harvestman	FSC	n/a				Open hillside grassland habitat in areas of serpentine bedrock.	X										Found under serpentine rocks.	
<i>Speyeria adrianae adrianae</i>	Unsilvered fritillary butterfly	FSC	n/a				Openings in redwood and coniferous forests, oak woodlands, chaparral.	X										Found on the undersides of serpentine rocks near permanent springs.	
<i>Speyeria calippe sp. calippe</i>	Calippe silverspot butterfly	FE	n/a				Coastal grasslands, opening in coastal scrub.	X										Very local, restricted range in California; San Luis Obispo County north to San Mateo County, east to north Los Angeles County and Kern County.	
<i>Speyeria zerene myrtilae</i>	Myrtle's silverspot butterfly	FE	n/a				Coastal dunes, scrub, and grassland.	X										Native grassland and adjacent habitats that support the larval foodplant, Johnny-jump-up (<i>Viola pedunculata</i>)	
<i>Syncaris pacifica</i>	Californian fresh water shrimp	FE	n/a	SE	X		Streams of 12-36 inches in depth with exposed live roots of trees along under cut banks >6' with over hanging woody debris	X										Closely associated with larval and food plants violet (<i>Viola adunca</i>) in areas sheltered from the wind below 820 feet within 3 miles of the coast.	
FISH <i>Acipenser medirostris</i>	Green sturgeon	FC	n/a		X		Spawn in the Sacramento River and the Klamath River.	X										Spawns in the lower Russian River drainage westward to the Pacific Ocean	
							Spawn at temps between 8-14 c. Preferred spawning substrate is large cobble, but can range from clean sand to bedrock.	X										Found in Lagunitas Creek watershed. Surveys outside watershed have not identified other localities, although potential habitat present (NPS, 2004).	
							Spawn in the Sacramento River and the Klamath River.	X										A mostly marine-estuarine species that is only known to spawn in large CA rivers (Sacramento and Klamath)	

APPENDIX B
SPECIES OF CONCERN

Scientific Name	Common Name	Legal Status			Need in GGNRA Records	GNRA management concern noted on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in FMU/Project Unit				Potential Effect that Could Result from FMP Actions ¹			County Distribution			Species Distribution / Range	Comments
		Federal	CNPS	State						None	Muir Woods	WUI	Interior	Beneficial	Negative	Unknown	San Francisco	San Mateo	Marin		
<i>Encylogobius newberryi</i>	Tidewater goby	FE	n/a		X		Brackish water habitats along the CA coast from Agua Hedionda Lagoon, San Diego Co. to the mouth of the Smith River.	X		X			X						Eastern Pacific: Del Norte County in northern California, USA to Del Mar in southern California.	Found in Rodeo Lagoon. Additional suitable habitat in GGNRA-managed areas unlikely. It is anticipated that this tidewater goby habitat would be unaffected by FMP actions. Potential impacts would be minimized to be insignificant.	
<i>Hypomesus transpacificus</i>	Delta smelt	FT	n/a				Spawning and rearing mostly in Sacramento-San Joaquin Delta.												North America: Sacramento-San Joaquin Delta region in central California, USA.		
<i>Lampetra ayresii</i>	River lamprey	FSC	n/a				Lower Sacramento River, San Joaquin River & Russian River. May occur in coastal streams north of San Francisco Bay.												Eastern Pacific: Tee Harbor, Alaska to California, USA. Freshwater resident population in Morrison Creek, Vancouver Island, British Columbia	Uncertain whether in park	
<i>Lampetra tridentata</i>	Pacific lamprey	FSC	n/a		X		Freshwater streams.	X											Range in California, Oregon, Washington and Idaho with the most precipitous documented declines in the upper Columbia, Snake and North Umpqua River basins.	No occurrences of this anadromous species have been observed in GGNRA-managed streams, however likely exists in Lagunitas Watershed (NPS, 2004)	
<i>Oncorhynchus kisutch</i>	Coho salmon—Central California coast	FT, SE, CH	n/a	SE	X		Coastal streams draining to ocean (including those to S.F. Bay) with spawning, juvenile rearing habitat, and migratory corridor	X		X									Point Hope, Alaska south to Chamale Bay, Baja California, Mexico.	Present in Muir Woods, Redwood Creek (NPS, 2004)	
<i>Oncorhynchus mykiss</i>	Steelhead — Central California Coast	FT	n/a		X		Coastal streams draining to ocean (including those to s.f. bay) with spawning, juvenile rearing habitat, and migratory corridor	X		X									California streams from the Russian River to Aptos Creek, and the drainages of San Francisco and San Pablo Bays eastward to the Napa River (inclusive).	Present in Muir Woods, Redwood Creek (NPS, 2004)	
<i>Oncorhynchus mykiss</i>	Steelhead — Central Valley	FT	n/a		X		Spawning and juvenile rearing habitat in Sacramento and San Joaquin Rivers and their tributaries	X*											Sacramento and San Joaquin Rivers and their tributaries.	* Adult and juvenile migratory corridor along S.F. Bay portion of GGNRA lands. It is anticipated that the habitat supporting this species would be unaffected by FMP actions (Darren Fong (NPS), pers. comm. 2004). Potential temporary impacts would be minimized to be insignificant and long-term effects would be beneficial.	
<i>Oncorhynchus tshawytscha</i>	Chinook salmon — Sacramento River winter run	FE, CH	n/a	SE	X		Spawning and juvenile rearing habitat in Sacramento River and tributaries	X*											Arctic and Pacific: drainages from Point Hope, Alaska to Ventura River, California, USA; occasionally strays south to San Diego in California, USA	* Adult and juvenile migratory corridor along S.F. Bay portion of GGNRA lands. Critical habitat includes Bay waters to the Golden Gate Bridge. It is anticipated that the habitat supporting this species would be unaffected by FMP actions (Darren Fong (NPS), pers. comm. 2004). Potential temporary impacts would be minimized to be insignificant and long-term effects would be beneficial.	
<i>Oncorhynchus tshawytscha</i>	Chinook salmon — California coastal	FT	n/a				Spawning and juvenile rearing in large coastal stream and rivers draining to ocean.												Arctic and Pacific: drainages from Point Hope, Alaska to Ventura River, California, USA; occasionally strays south to San Diego in California, USA	Spawning, juvenile rearing habitat, and migratory corridor only in Lagunitas Creek (managed by PRNS)	

Scientific Name	Common Name	Legal Status			Noted in GGNRA Records	GGNRA management concern (USFWS list)	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in FEMU/ Project Unit				Potential Effect that Could Result from FMP Actions				County Distribution	Species Distribution / Range	Comments
		Federal	CNPS	State						None	Muir Woods	WUI	Interior	Beneficial	Negative	No Effect	Unknown			
<i>Oncorhynchus tshawytscha</i>	Chinook salmon — Central Valley spring run	FT	n/a	ST	X		Adult nos. depend on pool depth & volume, amount of cover, & proximity to gravel. Water temps >27 c lethal to adults	Federal listing refers to perps spawning in Sacramento River & tributaries.	X*				X			X	San Mateo	Aretic and Pacific: drainages from Point Hope, Alaska to Ventura River (PRSS). It is anticipated that the habitat in California, USA; occasionally strays south to San Diego in California, USA by FMP actions (Darren Fong (NPS, pers. comm., 2004). Potential temporary impacts would be minimized to be insignificant and long-term effects would be beneficial.	* Adult and juvenile migratory corridor along S.F. Bay portion of GGNRA lands. Spawning in juvenile rearing habitat, and migratory in juvenile rearing habitat, and migratory in juvenile rearing habitat, and migratory in juvenile rearing habitat (managed by PRSS).	
<i>Oncorhynchus tshawytscha</i>	Chinook salmon — Central Valley fall/late fall run	CH, FC	n/a		X		Populations spawning in the Sacramento & San Joaquin Rivers and their tributaries.						X			X	San Mateo	Aretic and Pacific: drainages from Point Hope, Alaska to Ventura River (managed by PRSS), occasionally strays south to San Diego in California, USA.	Spawning, juvenile rearing habitat, and migratory corridor only in Lagunitas Creek (managed by PRSS)	
<i>Pogonichthys macrolepidotus</i>	Sacramento splittail	FT	n/a				Endemic to the lakes and rivers of the Central Valley, but now confined to the Delta, Suisun Bay & associated marshes.									X	San Francisco	North America: formerly known throughout the Sacramento-San Joaquin River drainage in California, USA; now restricted to San Francisco Bay Delta and lower Sacramento River.		
<i>Spirinchthys flaccidichthys</i>	longfin smelt	FSC	n/a				Euryhaline, nektonic & anadromous. Found in open waters of estuaries, mostly in middle or bottom of water column. Prefer salinities of 15-30 ppt, but can be found in completely freshwater to almost pure seawater.									X	San Francisco	North Pacific: Prince William Sound, Alaska to Monterey Bay, California, USA. Landlocked in Washington and Union Lakes in Washington, USA	found in S.F. Bay and embayments	
REPTILES/AMPHIBIANS																				
<i>Ambystoma californense</i>	California tiger salamander	FPT	n/a				Vernal pool grasslands.	Use stock ponds, vernal pools, & swales for breeding. Upland grasslands (rodent burrows) for estuaries.	X							X	Central Valley and Coast Ranges, Santa Barbara Co. & the Santa Rosa plains in Sonoma Co.			
<i>Caretta caretta</i>	Loggerhead turtle	FT	n/a				Offshore marine	Continental shelves, bays, estuaries, and lagoons in temperate, tropical, and subtropical climates.	X				X			X	Central Valley and Coast Ranges, Santa Barbara Co. & the Santa Rosa plains in Sonoma Co.			Marine migratory species, unlikely to be affected by FMP actions (NPS, 2004)
<i>Chelonia mydas</i>	Green turtle	FT	n/a				Offshore marine	Continental shelves, bays, estuaries, and lagoons in temperate, tropical, and subtropical climates.	X				X			X	Central Valley and Coast Ranges, Santa Barbara Co. & the Santa Rosa plains in Sonoma Co.			Marine migratory species, unlikely to be affected by FMP actions (NPS, 2004)
<i> Clemmys marmorata marmorata</i>	Northwestern pond turtle	FSC	n/a		X		Slow moving waterways, lakes and ponds.	Aquatic turtle: requires ponds, slow-moving waterways, such as creeks and irrigation ditches, where water ponds. Prefers habitats with thick, aquatic vegetation and suitable upland habitats for egg-laying.	X				X			X	Central Valley and Coast Ranges, Santa Barbara Co. & the Santa Rosa plains in Sonoma Co.			Limited numbers found at Rodeo Lake, Temu Valley and Muir Beach (Redwood Creek). It is anticipated that the wetland and riparian habitats supporting populations would be unaffected by FMP actions (NPS, 2004)
<i>Clemmys marmorata pallida</i>	Southwestern pond turtle	FSC	n/a		X		Slow moving waterways, lakes and ponds.	Aquatic turtle: requires ponds, slow-moving waterways, such as creeks and irrigation ditches, where water ponds. Prefers habitats with thick, aquatic vegetation, and suitable upland habitats for egg-laying.	X				X			X	Central Valley and Coast Ranges, Santa Barbara Co. & the Santa Rosa plains in Sonoma Co.			No occurrences have been observed in Project California near of the Sierra Nevada Study Area (Darren Fong, pers. comm., 2004) and in parts of Oregon and Washington.

APPENDIX B
SPECIES OF CONCERN

Scientific Name	Common Name	Legal Status			GNRA management concern not on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in EMU/Project Unit			Potential Effect that Could Result from FMP Actions			County Distribution	Species Distribution / Range	Comments
		Federal	CNPS	State					None	Muir Woods	WUI	Interior	Beneficial	Negative			
<i>Dermochelys coriacea</i>	Leatherback turtle	FE	n/a		GNRA management concern not on USFWS list	Offshore marine		X	X				X	X	Cape Sable Nova Scotia to Puerto Rico. Commonly sighted in Hawaii	Marine migratory species, unlikely to be affected by FMP actions (NPS, 2004)	
<i>Lepidochelys olivacea</i>	Olive ridley sea turtle	FT	n/a			Offshore marine		X	X				X	X	Pacific Coast, nesting concentrated from Mexico to Costa Rica.	Marine migratory species, unlikely to be affected by FMP actions (NPS, 2004)	
<i>Phrynosoma coronatum frontale</i>	California horned lizard	FSC	n/a			Frequents a wide variety of habitats, most common in lowlands along sandy washes with scattered low bushes.		X	X						Shasta County, Southwest along the Sacramento valley south Coast Ranges, San Joaquin Valleys, and Sierra Nevada foothills.		
<i>Rana aurora aurota</i>	Northern red-legged frog	FSC	n/a			Found in humid forests, woodlands, grasslands, and streamside in northwestern California.		X	X					X	Mendocino Co., Oregon, and Washington. Range overlaps with R. a. draytonii in Pt. Arena, Mendocino Co.	Project Study Area outside known range of species	
<i>Rana aurora draytonii</i>	California red-legged frog	FT	n/a			Ponds and other permanent slow-moving waterbodies, lakes, reservoirs, slow streams, marshes, and bogs.		X	X					X	California red-legged frogs are still locally abundant within portions of the San Francisco Bay area (including Marin County) and the central coast Within the remaining distribution of the species, only isolated populations have been documented in the Sierra Nevada, northern Coast, and northern Transverse ranges.	Present at various localities within Marin and San Mateo Counties (NPS, 2004). Potential temporary impacts would be minimized to insignificant and long-term effects would be beneficial.	
<i>Rana boylei</i>	Foothill yellow-legged frog	FSC	n/a			Egg clusters attached to downstream sides of submerged rocks. Need at least some cobble-sized substrate for egg-laying. Need at least 15 weeks to attain metamorphosis.		X	X					X	West of crest of Cascade mts., Ore. south in coastal mts. Of CA to San Gabriel River, Los Angeles County-Sierra Nevada foothills to about 6000' Baja California.	Historic occurrence in Redwood Creek (Darren Fong, pers. comm., 2004).	
<i>Spea hammondi</i>	Western spadefoot toad	FSC	n/a			Occurs primarily in grassland habitats, but can be found in valley-foothill hardwood woodlands.		X	X					X	North-central California, Central Valley, and foothills south to Baja, S.P. Bay coastal areas.	Distribution maps do not show presence in S.P. Bay coastal areas.	
<i>Thamnophis sirtalis tarrataenia</i>	San Francisco garter snake	FE	n/a	SE		Freshwater habitats are primary foraging sites. Adjacent uplands for basking and hibernaculae.		X	X					X	Historically San Francisco peninsula currently known from South San Francisco near shore and Mori Point near Pacific. Known occurrence at Mori Pt.	Potential temporary impacts would be minimized to insignificant and long-term effects would be beneficial.	
BIRDS																	
<i>Agelaius tricolor</i>	Tricolored blackbird	FSC	n/a			(Nesting colony) highly colonial species, most numerous in Central Valley & vicinity. Largely endemic to California.		X	X					X	Gregarious; found year-round in large flocks in open country and dairy farms; nests in large colonies in marshes.	Mechanical removal and other FMP actions would occur outside of nesting season, and limited number of acres burned each year therefore it is anticipated that the effects on populations of these species would be minor, with potential beneficial impacts from in-waste species control and restoration of ecosystem processes.	

Scientific Name	Common Name	Legal Status			Noted in GGNRA Records	GNRA management concern listed on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in FMC/Project Unit				Potential Effect from FMP Actions			County Distribution	Species Distribution / Range	Comments
		Federal	CNPS	State						None	Muir Woods	WUI	Interior	Beneficial	Negative	No effect			
<i>Amphispiza belli belli</i>	Bell's sage sparrow	FSC	n/a	n/a	X		(Nesting) nests in chaparral dominated by fairly dense stands of chamise. Found in coastal sage scrub in south of range.	Nest located on the ground beneath a shrub or in a shrub 6-18 inches above ground. Territories about 50 yds apart.	X				X					Western U.S. to n. Mexico	Mechanical removal and other FMP actions would occur outside of nesting season, and limited number of acres burned each year therefore it is anticipated that the effects on populations of these species would be minor, with potential beneficial impacts from invasive species control and restoration of ecosystem processes.
<i>Arenaria melanocephala</i>	Black turnstone	FSC	n/a	n/a			Breeds in coastal Alaska. Winters on rocky coasts.	Strictly coastal species.	X				X					Breeds in western Alaska and winters along the entire stretch of Pacific Coast from southern Alaska to Baja California.	It is anticipated that the coastal habitat supporting this species would not be affected by FMP actions
<i>Athene cucularia hypugaea</i>	Western burrowing owl	FSC	n/a	n/a	X		(Burrow sites) open, dry annual or perennial grasslands, deserts, & scrublands characterized by low-growing vegetation.	Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel.	X				X					Western U.S. into northern Mexico. In (burrowing, western screech) have been shown to increase in numbers after fires (USDA, 2000), and could be beneficially affected because raptors in general are unaffected or respond favorably to burned habitat (Smith, 2000).	
<i>Butorides lentiginosus</i>	American bittern	FSC	n/a	n/a	X		Freshwater and slightly brackish marshes. Also in coastal saltmarshes.	Dense reed beds.	X				X					Breeds from southeastern Alaska, Manitoba, and Newfoundland south to California, New Mexico, Arkansas, and Carolinas.	It is anticipated that the coastal habitat supporting this species would not be affected by FMP actions
<i>Brachyramphus marmoratus marmoratus</i>	Marbled murrelet	FT, CH	n/a	SE	X		Old growth forest for breeding and sheltered waters/open coast for foraging.		X				X					Nests inland, usually in trees. Fairly common in breeding range; rare in Southern California.	Habitat present in Muir Woods, but no detections in 2 years of surveys (NPS, 2004). Potential temporary habitat impacts would be minimized to be insignificant and long-term effects would be beneficial to habitat.
<i>Buteo regalis</i>	Ferruginous hawk	FSC	n/a	n/a	X		(Wintering) open grasslands, sagebrush flats, desert scrub, low foothills & fringes of piñon-juniper habitats.	Mostly eats lagomorphs, ground squirrels, and mice. Population trends may follow lagomorph population cycles.	X				X					Sw. Canada, Western U.S., Winters SW. U.S., N. Mexico	Species such as raptors and some owl species (burrowing, western screech) have been shown to increase in numbers after fires (USDA, 2000), and could be beneficially affected because raptors in general are unaffected or respond favorably to burned habitat (Smith, 2000).
<i>Callidris canutus</i>	Red knot	FSC	n/a	n/a			Breeds on tundra, during migration, on tidal flats, rocky shores, and sandy beaches.	Often breeds with dowitchers.	X				X					Breeds on islands in High Arctic of Canada. Winters along coasts from California and Massachusetts southward to southern South America. Also in Eurasia.	It is anticipated that the coastal habitat supporting this species would not be affected by FMP actions

APPENDIX B
SPECIES OF CONCERN

Scientific Name	Common Name	Legal Status			Noted in GGNRA Records	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in FMU/Project Unit			Potential Effect that could result from FMP Actions			County Distribution	Species Distribution / Range	Comments
		Federal	CNPS	State					None	Mt Woods	WUI	Interior	Beneficial	Negative			
<i>Calypte costae</i>	Costa's hummingbird	FSC	n/a	n/a	GNRA management concern not on USFWS list	Fairly common in desert washes, dry chaparral, and successional scrub.		X					X			Occurs mainly in Southern California, Arizona, Baja California, and western Mexico, but also extends into Nevada and southeastern Utah, and populations of these species would be minor, with potential beneficial impacts from invasive species control and restoration of ecosystem processes.	
<i>Carduelis lawrencei</i>	Lawrence's goldfinch	FSC	n/a	n/a		(Nesting) nests in open oak or other arid woodland & chaparral, near water. Nearby herbaceous habitats used for feeding	Closely associated with oaks.	X					X			Mechanical removal and other FMP actions would occur outside of nesting season, and limited number of acres burned each year therefore it is anticipated that the effects on populations of these species would be minor, with potential beneficial impacts from invasive species control and restoration of ecosystem processes.	
<i>Chaetura vauxi</i>	Vaux's swift	FSC	n/a	n/a		(Nesting) redwood, douglas fir, & other coniferous forests. Nests in large hollow trees & snags. Often nests in flocks.	Forages over most terrains & habitats but shows a preference for foraging over rivers and lakes.	X					X			Per comm. With PRBO (Tom Gardali), potential habitat exists in Marin County Breeds in Bolinas. Does not occur in MUWO.	
<i>Charadrius alexandrinus hirosus</i>	Western snowy plover	FT, CH	n/a	n/a	X	Coastal beaches, sand spits, dune-backed beaches, beaches at river mouths, salt pans at lagoons and estuaries, mud flats, and man-made salt ponds.		X		X			X			Overwintering population on Ocean Beach. Periodically sighted at other beaches. It is anticipated that foredune and beach habitat supporting this species would be unaffected by actions defined under the FMP. Potential temporary impacts from suppression activities would be minimized to be insignificant; other activities are not anticipated in plover habitat.	
<i>Coccyzus americanus occidentalis</i>	Western yellow-billed cuckoo	FC	n/a	SE		(Nesting) riparian forest nester, along the broad, lower flood-bottoms of larger river systems.	Nests in riparian jungles of willow, often mixed with cottonwoods, w/ lower story of blackberry, nettles, or wild grape.	X								S. Canada to Mexico, W. Indies Winters in Argentina	
<i>Contopus cooperi</i>	Olive-sided flycatcher	FSC	n/a	n/a		(Nesting) nesting habitats are mixed conifer, mature hardwood-conifer, douglas-fir, redwood, red fir & lodgepole pine.	Most numerous in montane conifer forests where tall trees overlook canyons, meadows, lakes or other open terrain.	X					X			Per comm. with PRBO, species does not occur in the GGNRA & does not breed on coast.	
<i>Cypseloides niger</i>	Black swift	FSC	n/a	n/a		(Nesting) coastal belt of Santa Cruz & Monterey Co; central & southern Sierra Nevada; San Bernardino & San Jacinto Mtns.	Breeds in small colonies on cliffs behind or ad to waterfalls in deep canyons and sea-huffs above surf; forages widely	X					X			The olive-sided flycatcher and Pacific-slope flycatcher could be beneficially affected because studies have shown flycatchers (Wirtz, 1977) increased the first year after a burn.	

APPENDIX B
SPECIES OF CONCERN

Scientific Name	Common Name	Legal Status			Noted in GGNRA Records	GNRA management concern not on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in EMU/Project Unit				Potential Effect that Could Result from FMP Actions			County Distribution	Species Distribution / Range	Comments
		Federal	CNPS	State						None	Muir Woods	WUI	Inlet	Beneficial	Negative	No effect			
<i>Diomedea albatrus</i>	Short-tailed albatross	FE	n/a				Marine and near shore habitats for foraging. Breeds in south Pacific		X	X								Breeds on Bonin Island off Japan. Formerly ranged from Bering Sea to Baja California, may again do so.	It is anticipated that the coastal habitat supporting this species would not be affected by FMP actions. Near extinction in 1966, now over 250 birds. Per comm. With PRBO species needs to be monitored.
<i>Diomedea nigripes</i>	Black-footed albatross	FSC	n/a				Seen year-round off west coast; most common in spring-summer. Chiefly breeds on Hawaiian Islands											Ranges west offshore from Bering Sea and Aleutians to Baja California.	It is anticipated that the coastal habitat supporting this species would not be affected by FMP actions. Per comm. with PRBO (Tom Gardali), species rarely comes on shore.
<i>Elanus leucurus</i>	White-tailed kite	FSC	n/a		X		(Nesting) rolling foothills/valley margins w/scattered oaks & river bottomlands or marshes next to deciduous woodland		X			X						Resident in coastal and southern California, Arizona and southern Texas. Also in American tropics	White-tailed kites could be beneficially affected because raptors in general are unaffected or respond favorably to burned habitat (Smith, 2000). However, white-tailed kites, and other canopy nesters could be subject to short-term negatives affects as a result of crown fires.
<i>Empidonax traillii brewsteri</i>	Little willow flycatcher	n/a	SE		X		Breeds in shrubby vegetation in meadow and riparian woodlands, typically where there are mature, dense stands of willows, cottonwoods, or alders.		X									Breeds in wet meadows & montane riparian habitats from 2,000 -8,000 feet in elevation.	It is anticipated that the riparian and other habitat supporting this species would not be affected by FMP actions
<i>Falco peregrinus anatum</i>	American peregrine falcon	DM	n/a	SE			(Nesting) near wetlands, lakes, rivers, or other water; on cliffs, banks, dunes, mounds; also, human-made structures.		X		X							breeds from non-Arctic portions of Alaska and Canada south to Baja California (except on the coast of southern Alaska and in British Columbia), central Arizona and Mexico (locally)	The endangered American peregrine falcon (<i>Falco peregrinus anatum</i>) has historically nested at three sites in GGNRA (Walton pers. comm. 1991). It has been released from hatcheries at Muir Beach from 1983 to 1987 and in 1998. (GGNRA, RMP 1999). It is anticipated that the wetland coastal habitat supporting this species would not be affected by FMP actions
<i>Geothlypis trichas sinuosa</i>	Saltmarsh common yellowthroat	FSC	n/a		X		Resident of the San Francisco Bay region, in fresh and salt water marshes.		X									Canada to s. Mexico. Winters s. U.S. to W. Indies, Panama.	It is anticipated that the salt marsh and coastal habitat supporting this species would not be affected by FMP actions
<i>Haematopus bachmani</i>	Black oystercatcher	FSC	n/a		X		Resident on rocky shores and islands along the Pacific Coast from the Aleutians to Baja California		X									Resident from w. Aleutians - east and south along coast to Morro Bay, CA. GGNRA, species occurs in the Presidio along on offshore islands to Baja California	It is anticipated that the coastal habitat supporting this species would not be affected by FMP actions. Per comm. with PRBO, Tom Gardali, species occurs in the Presidio along rocky beaches. A few pairs breed on Alcatraz Island each year.
<i>Haliaeetus leucocephalus</i>	Bald eagle	FT	n/a	SE	X		Large trees near lakes, rivers, or estuaries for foraging. Disturbance intolerant.		X									Alaska, Canada, to s. U.S.	Has been observed to over-winter in the San Francisco Watershed. An occasional bald eagle is observed during the fall migration by the Golden Gate Region Observatory. It is anticipated that the coastal habitat supporting this species would not be affected by FMP actions
<i>Histrionicus histrionicus</i>	Harlequin duck	FSC	n/a		X		(Nesting) breeds on west slope of the Sierra Nevada, nesting along shores of swift, shallow rivers.		X									Ne. Asia, Alaska, Canada, w. U.S., Greenland, Iceland	It is anticipated that the wetland habitat supporting this species would not be affected by FMP actions

APPENDIX B
SPECIES OF CONCERN

Scientific Name	Common Name	Legal Status			Noted in GGNRA Records	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrences known in EMU/Project Unit				Potential Effect that Could Result from FMP Actions ¹				Species Distribution / Range	Comments
		Federal	CNPS	State					None	Muir Woods	WLU	Interior	Beneficial	Negative	No Effect	Unknown		
<i>Lanius ludovicianus</i>	Loggerhead shrike	FSC	n/a	n/a	X	(Nesting) broken woodlands, savannah, piñon-juniper, Joshua tree, & riparian woodlands, desert oases, scrub & washes.	Prefers open country for hunting, with perches for scanning, and fairly dense shrubs and brush for nesting.	X				X	X	X			Per comm. with PRBO, species occurs within the GGNRA.	
<i>Lanius ludovicianus excubitorides</i>	Black rail		n/a	ST	X	Mainly inhabits salt-marshes bordering larger bays.	Occurs in tidal salt marsh heavily grown to pickleweed; also in fresh-water and brackish marshes, all at low elevation.	X					X	X			It is anticipated that the salt marsh and coastal habitat supporting this species would be relatively unaffected by FMP actions.	
<i>Limosa fedoa</i>	Marbled godwit	FSC	n/a			Common on west coast in winter, fairly common on Texas Gulf coast and in Florida; rare but regular in the east.		X					X	X			It is anticipated that the salt marsh and coastal habitat supporting this species would be relatively unaffected by FMP actions. Per comm. with PRBO, species occurs at Crissy Field in the GGNRA. Fairly common on annual GGNRA beaches during winter.	
<i>Melospiza melodia pusilla</i>	Alameda (South Bay) song sparrow	FSC	n/a			Resident of salt marshes bordering south arm of San Francisco Bay.	Inhabits salt-marshes; nests low in graminoid bushes (high enough to escape high tides) and in salicornia.	X						X			It is anticipated that the salt marsh habitat supporting this species would be relatively unaffected by FMP actions. Per comm. with PRBO, species is only specific to the localized Alameda/South Bay area.	
<i>Melospiza melodia samuelis</i>	San Pablo song sparrow	FSC	n/a			Resident of salt marshes along the north side of San Francisco and San Pablo Bays.	Inhabits tidal sloughs in the salt-marshes; nests in graminoid bordering slough channels.	X						X			It is anticipated that the salt marsh habitat supporting this species would be relatively unaffected by FMP actions. Per comm. with PRBO, species only occurs in the localized San Pablo Bay area.	
<i>Namnetus americanus</i>	Long-billed curlew	FSC	n/a		X	(Nesting) breeds in upland shrub-grass prairies & wet meadows in northeastern California.	Habitats on gravelly soils and gently rolling terrain are favored over others.	X					X	X			It is anticipated that the salt marsh habitat supporting this species would be relatively unaffected by FMP actions. Per comm. with PRBO, species occurs in the GGNRA particularly Crissy Field.	
<i>Namnetus phaeopus</i>	Whimbrel	FSC	n/a			Breeds on arctic tundra, especially near coasts; coastal salt meadows, mudflats, and grassy shoreline slopes during migration.		X					X	X			It is anticipated that the salt marsh habitat supporting this species would be relatively unaffected by FMP actions. Per comm. with PRBO, species occurs at Crissy Field in the GGNRA.	
<i>Oenanthe himalayensis</i>	Ashy storm-petrel	FSC	n/a			(Roosting site) colonial nester on offshore islands. Usually nests on dunes part of islands. Forages over open ocean.	Nest sites on islands are in crevices beneath loosely piled rocks or driftwood, or in caves.	X						X			It is anticipated that the coastal habitat supporting this species would not be affected by FMP actions.	
<i>Otus flammeolus</i>	Flammulated owl	FSC	n/a			Common in oak and pine woodlands, especially ponderosa. Sometimes nests in loose colonies. Highly migratory. Accidental east to Louisiana and Florida.		X					X				Mechanical removal and other FMP actions would occur outside much of nesting season and limited number of acres burned each year therefore it is anticipated that the effects on populations of these species would be minor, with potential for local loss of some individuals.	

Scientific Name	Common Name	Legal Status			Noted in GGNRA Records	GNRA management concern noted on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in EMU/Project Unit				Potential Effect that Could Result from EMP Actions ¹			County Distribution	Species Distribution / Range	Comments
		Federal	CNPS	State						None	Muir Woods	WUI	Interior	Beneficial	Negative	No affect			
<i>Pelecanus occidentalis californicus</i>	California Brown pelican	FE	n/a	SE	X		Forage over near shore marine areas including open coast, San Francisco Bay, and radeo lagoon. Utilize islands, rocks, cliffs, and some protected beach areas for roosting.		X				X	X	X			The endangered California brown pelican has significant roost areas in GGNRA (NPS 1982). Pelicans have been observed roosting at Seal Rocks, Alcatraz Island, the Hyde Street Pier, Bird Island, and Kent Island in Bolinas Lagoon (GGNRA, RMP, 1999). This species does not breed within the Study Area and it is anticipated that coastal habitats used for roosting would not be affected by EMP actions. Potential impacts would be either be discountable or minimized to be insignificant.	
<i>Psychoromphus aleuticus</i>	Cassin's auklet	FSC	n/a				Nests in colonies on islands and not isolated coastal cliffs and headlands.		X				X	X	X			It is anticipated that the coastal habitat supporting this species would not be affected by EMP actions.	
<i>Rallus longirostris obsolatus</i>	California clapper rail	FE	n/a	SE			Salt marsh with tidal channels.		X				X	X	X			It is anticipated that the salt marsh supporting this species would not be affected by EMP actions.	
<i>Alphea riparia</i>	Bank swallow	CA	n/a		X		(Nesting) colonial nester; nests primarily in riparian and other lowland habitats west of the desert.		X				X	X	X			Species nest in the Fort Funston cliffs. It is anticipated that this bluff habitat would not be affected by EMP actions.	
<i>Bonaparte niger</i>	Black skimmer	FSC	n/a				(Nesting colony) nests along the north & south ends of the salton Sea; also, on salt pond dikes of south San Diego Bay.		X				X	X	X			It is anticipated that the habitats supporting this species would not be affected by EMP actions.	
<i>Selasphorus rufus</i>	Rufous hummingbird	FSC	n/a		X		(Nesting) breeds in transition life zone of northwest coastal area from Oregon border to southern Sonoma County.		X				X	X	X			Per communication with PRBO, species passes through the GGNRA during migration.	
<i>Selasphorus sasin</i>	Allen's hummingbird	FSC	n/a		X		Mixed evergreen, riparian woodlands, eucalyptus and cypress groves, oak woodlands, and coastal scrub areas in breeding season.		X				X	X	X			Per communication with PRBO, species may be affected by	
<i>Sphyrapicus ruber</i>	Red-breasted sapsucker	FSC	n/a				Common in coniferous or mixed forests in coastal ranges, usually at lower elevations and in moister forests than Williamson's sapsucker. Most migrate south or move to lower elevations in winter.		X				X	X	X			Mechanical removal and other EMP actions would occur outside much of nesting season and limited number of acres burned each year therefore it is anticipated that the effects on populations of these species would be minor with potential beneficial impacts from invasive species control and restoration of ecosystem processes.	

APPENDIX B
SPECIES OF CONCERN

Scientific Name	Common Name	Legal Status			Need in GGNRA Records	GNRA management concern on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in FMU/ Project Unit				Potential Effect that Could Result from FMP Actions			County Distribution	Species Distribution / Range	Comments
		Federal	CNPS	State						None	Marl Woods	WUI	Interior	Beneficial	Negative	No affect			
<i>Sterna antillarum brownii</i>	California least tern	FE	n/a	SE	X		Diked ponds or ditches along shorelines.		X	X	X	X	X				Temperate and tropical oceans Winters south of U.S.	The endangered California least tern does not nest in the park, but uses abandoned terns for roosting and nearshore waters for foraging (GENRA RMP, 1999). It is anticipated that shoreline habitat supporting this species would not be affected by FMP actions.	
<i>Sterna elegans</i>	Elegant tern	FSC	n/a		X		(Nesting colony) only known breeding colony in n.s. located in the salt work dikes at the south end of San Diego Bay.		X								Breeds on islands off Baja California, Winters, Peru to Chile. Wanders irregularly (Aug-Oct.) north to San Francisco Bay; recently even to Washington. Breeds near San Diego.	Per communication with PRBO, species exists in estuaries throughout the GGNRA. Habitat unlikely to be affected by FMP actions.	
<i>Strix occidentalis caurina</i>	Northern spotted owl	FT	n/a		X		Utilizes coniferous and mixed-hardwood forest areas for breeding in the project area, often in drainages.		X	X							The range encompasses an area from southwestern British Columbia south through the coastal mountains and Cascade Range (both west and east sides) of Washington and Oregon, south into southwestern Oregon and northwestern California north of San Francisco	Potential temporary impacts would be minimized to be insignificant and long-term effects would be beneficial.	
<i>Synalibis hypoleucis</i>	Xantú's murrelet	FSC	n/a	ST			Forages over most terrains & habitats but shows a preference for foraging over rivers and lakes.		X								Breeds s. California (Anacapa and Santa Barbara Is.) to central Baja California. Some winter north to Monterey, usually to Washington.	It is anticipated that the habitats supporting this species would not be affected by FMP actions.	
<i>Taxostoma redivivum</i>	California thrasher	FSC	n/a		X		The thrasher breeds from sea level to the higher parts of the montane chaparral. It will breed in adjacent oak woodlands and pine-juniper scrub as well as occasionally in parks and gardens, but only if dense cover is available. Its dispersal is very limited.		X								California, n. Baja California	Per communication with PRBO, species may be affected by the FMP plan. It is known to breed in Marin County, including the GGNRA.	
MAMMALS																			
<i>Aplodontia rufa phaea</i>	Point Reyes Mountain Beaver	FSC	n/a				Coastal area of Point Reyes in areas of springs or seepages.		X								110 square miles in the Point Reyes area of Marin County		
<i>Arctocephalus townsendi</i>	Guadalupe fur seal	FT	n/a	ST			Protected haul out sites.		X								Breeds along the eastern coast of Guadalupe Island, approximately 200 km west of Baja California. In addition, individuals have been sighted in the southern California Channel Islands, including two males who established territories on San Nicolas Island.	Offshore marine species (e.g. whales, pelagic birds) are expected to receive little to no impact from fire management activities	

Scientific Name	Common Name	Legal Status			Needed in GGNRA Records	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area				Occurrence known in EMU/ Project Unit			Potential Effect that Could Result from FMP Actions ⁵			County Distribution				Species Distribution / Range	Comments
		Federal	CNPS	State				None	Muir Woods	WUI	Interior	Beneficial	Negative	No affect	Unknown	San Francisco	San Mateo	Marin	Worldwide, but favors warm waters.	Offshore marine species (e.g., whales, pelagic birds) are expected to receive little to no impact from fire management activities			
<i>Balaenoptera borealis</i>	Sei whale	FE	n/a			Offshore marine							X	X	X	X	X	X	X	Worldwide, but favors warm waters.	Offshore marine species (e.g., whales, pelagic birds) are expected to receive little to no impact from fire management activities		
<i>Balaenoptera musculus</i>	Blue whale	FE	n/a			Offshore marine							X	X	X	X	X	X	X	Worldwide and highly migratory. Summers in North Pacific. Not common in coastal waters when in our latitudes.	Offshore marine species (e.g., whales, pelagic birds) are expected to receive little to no impact from fire management activities		
<i>Balaenoptera physalus</i>	Finback whale	FE	n/a			Offshore marine							X	X	X	X	X	X	X	Worldwide. Migrates to Bering Sea in summer and winters south to the Gulf of California.	Offshore marine species (e.g., whales, pelagic birds) are expected to receive little to no impact from fire management activities		
<i>Corynorhinus townsendii townsendii</i>	Pacific western big-eared bat	FSC	n/a		X	Humid coastal regions of northern & central California. Roost in limestone caves, lava tubes, mines, buildings etc.	Will only roost in the open, hanging from walls & ceilings. Roosting sites limiting. Extremely sensitive to disturbance	X				X								Washington, Oregon, California, Nevada, Idaho, and possibly southwestern Montana and northwestern Utah	Minor short-term impacts could be both beneficial (creates food sources) and adverse (some mortality may occur in roosting sites).		
<i>Enhydra lutris nereis</i>	Southern sea otter	FT	n/a		X	Near shore marine													Central Californian coast from Pigeon Point near Santa Cruz in San Mateo County, south to Purisima Point north of Point Año. Observed at Fitzgerald Marine Reserve in Santa Barbara County. Individuals sometimes observed farther north (e.g. Tomales Bay).	No large kelp forest present in Project Study Area. Observed at Fitzgerald Marine Reserve. Marine habitat unlikely to be affected by FMP actions.			
<i>Eschrichtius robustus</i>	Gray whale	DM	n/a			Offshore marine														North Pacific: summers far north to Bering Sea and Arctic Ocean, breeds in winter in Gulf of California, Baja.	Offshore marine species (e.g., whales, pelagic birds) are expected to receive little to no impact from fire management activities		
<i>Eubalaena glacialis</i>	Right whale	FE	n/a			Offshore marine														Summers in Gulf of Alaska and Aleutians. Winter ranges not well known, but observations in Baja and Hawaiian Islands. Right whales prefer coastlines and sometimes large bays, but may spend a lot of time on the open sea. Northern and Southern hemisphere right whale sub-species are separated by the "tropical belt" roughly between the latitudes of 20°N and 20°S.	Offshore marine species (e.g., whales, pelagic birds) are expected to receive little to no impact from fire management activities		
<i>Eumetopias jubatus</i>	Steller sea lion	FT, CH	n/a		X	Protected haul out sites.														Breeds from northern Chumel Islands. It is anticipated that FMP actions would not affect habitat supporting Steller's sea-lions, as breeding colony on Ano Nuevo Island, they are more likely to use rocky shorelines as haul outs.	Historic haul-out at Seal Rock, San Francisco north to Aleutians and Pribilofs. FMP actions would not affect habitat supporting Steller's sea-lions, as breeding colony on Ano Nuevo Island, they are more likely to use rocky shorelines as haul outs.		

APPENDIX B
SPECIES OF CONCERN

Scientific Name	Common Name	Legal Status		Noted in GNRA Records	GNRA management concern noted on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in FMU/ Project Unit			Potential Effect that Could Result from FMP Actions			County Distribution	Species Distribution / Range	Comments
		Federal	State						None	Muir Woods	WUI	Interior	Beneficial	Negative			
<i>Eumops perotis californicus</i>	Greater western mastiff-bat	FSC	n/a	X		Many open, semi-arid to arid habitats, including conifer & deciduous woodlands, coastal scrub, grasslands, chaparral etc	Roosts in crevices in cliff faces, high buildings, trees & tunnels.	X				X				central California, southward to central Mexico. In California, they have been recorded from Butte County southward in the western lowlands through the southern California coastal basins and the western portions of the southeastern desert region	Available records indicate that Mastiff Bats were widespread in the San Joaquin Valley, Salinas Valley, and Coastal lowlands from the San Francisco Bay area southward to San Diego
<i>Megaptera novaeangliae</i>	Humpback whale	FE	n/a	X		Offshore marine		X				X				Worldwide. Migrates to Bering Sea and Gulf of Alaska in summer and winters south to California and Hawaii.	Offshore marine species (e.g., whales, pelagic birds) are expected to receive little to no impact from fire management activities
<i>Myotis evotis</i>	Long-eared myotis	FSC	n/a	X		Found in all brush, woodland & forest habitats from sea level to about 9000 ft. Prefers coniferous woodlands & forests.	Nursery colonies in buildings, crevices, species under bark, & snags. Caves used primarily as night roosts.	X				X				Southwestern Canada, south through California into Baja, eastward through northern Arizona and New Mexico and north into the Dakotas.	Minor short-term impacts could be both beneficial (creates food sources) and adverse (some mortality may occur in roosting sites).
<i>Myotis thysanodes</i>	Fringed myotis bat	FSC	n/a	X		In a wide variety of habitats, optimal habitats are riparian-jumper, valley foothill hardwood & hardwood-conifer.	Uses caves, mines, buildings or crevices for maternity colonies and roosts.	X				X				western North America from southern British Columbia, Canada, south to Chiapas, Mexico and from Santa Cruz Island in California, east to the Black Hills of South Dakota.	Minor short-term impacts could be both beneficial (creates food sources) and adverse (some mortality may occur in roosting sites).
<i>Myotis volans</i>	Long-legged myotis bat	FSC	n/a	X		Most common in woodland & forest habitats above 4000 ft. Trees are important day roosts, caves, & mines are night roosts.	Nursery colonies usually under bark or in hollow trees, but occasionally in crevices or buildings.	X				X				found from the Tongass National Forest in Alaska, south, through all of the western U.S., and into the Baja peninsula, and also along the Sierra Madre Occidental in Mexico.	Minor short-term impacts could be both beneficial (creates food sources) and adverse (some mortality may occur in roosting sites).
<i>Myotis yumanensis</i>	Yuma myotis bat	FSC	n/a	X		Optimal habitats are open forests and woodlands with sources of water over which to feed.	Distribution is closely tied to bodies of water. Maternity colonies in caves, mines, buildings or crevices.	X				X				Throughout western North America, from British Columbia through Washington, Idaho, and western Montana, southern Wyoming, Colorado, New Mexico, West Texas and into Mexico.	
<i>Neotoma fasciipes annexens</i>	San Francisco dusky-footed woodrat	FSC	n/a	X		Forest habitats of moderate canopy & moderate to dense understory. Also in chaparral habitats.	Constructs nests of shredded grass, leaves & other material. May be limited by availability of nest-building materials.	X				X				Inhabits forest and chaparral throughout the S.F. Bay Area. Prefers a moderate canopy and bushy understory.	
<i>Physeter catodon</i>	Sperm whale	FE	n/a			Offshore marine										Worldwide, but favors warm waters. Females avoid polar waters.	Offshore marine species (e.g., whales, pelagic birds) are expected to receive little to no impact from fire management activities
<i>Reithrodontomys raviventris</i>	Salt marsh harvest mouse	FE	n/a	X		Salt marsh, wetland.		X				X				There are two known subspecies divided in two ranges: Northern: found in Marin, Sonoma, Napa, Solano and northern Contra Costa counties; Southern: Found in San Mateo, Alameda and Santa Clara counties. Some isolated populations occur in Marin and Contra Costa.	Found in inventory at Rodeo Lagoon (USGS) although this identification is in question. Not captured in Big Lagoon Study Area (NPS 2004). It is anticipated that the salt marsh habitat supporting this species would not be affected by FMP actions. Potential impacts would be discountable or minimized to be insignificant; some activities would not occur in harvest mouse habitat.

APPENDIX B
SPECIES OF CONCERN

Scientific Name	Common Name	Legal Status			Noted in GGNRA Records	GNRA management concern not on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in EMU/Project Unit				Potential Effect that Could Result from FMP Actions ¹				County Distribution	Species Distribution / Range	Comments		
		Federal	CNPS	State						None	Mud Woods	WUI	Interior	Beneficial	Negative	No affect	Unknown				San Francisco	San Mateo
<i>Sorex vagrans halictoides</i>	Salt marsh vagrant shrew	FSC	n/a	n/a			Salt marshes of the south arm of San Francisco Bay.	Medium high marsh 6-8 ft above sea level where abundant driftwood is scattered among salicornia.	X					X						Limited to the salt marshes of the south arm of San Francisco Bay	It is anticipated that the salt marsh habitat supporting this species would be relatively unaffected by FMP actions.	
<i>Zapus trinotatus orarius</i>	Point Reyes Jumping Mouse	FSC	n/a		X		Bunch grass marshes on the uplands of Point Reyes in areas safe from continuous inundation.	Eats mainly grass seeds w/ some insects & fruit taken. Builds grassy nests on ground under vegetation, burrows in winter.	X						X				X		Confined to a small area on the Point Reyes Peninsula.	
<p>KEY: FF (federally endangered), FT (federally threatened), FC (federal candidate), FSC (federal species of concern), CH (designated critical habitat)</p> <p>¹ "Potential Affect" was determined considering the full implementation of all proposed conservation measures. Although habitat may be present in vicinity of project actions for certain species, marine and estuarine species were considered to have "No effect" from fire management activities as the proposed activities are not planned adjacent to coastal resources.</p> <p>² For bird and mammal species found within the GGNRA, EMU/Project Unit Occurrence were not notated. Birds and mammals occurring in the GGNRA are assumed to migrate throughout the EMU/Project Units.</p>																						

APPENDIX B
SPECIES OF CONCERN

Scientific Name	Common Name	Legal Status			Noted in GGNRA Records	GGNRA management concern noted on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in FMU/Project Unit			Potential Effect that Could Result from FMP Actions ¹			County Distribution	Species Distribution / Range	Comments
		Federal	CNPS	State						None	Muir Woods	WUI	Interior	Beneficial	Negative			
GGNRA (not FWS)																		
BIRDS																		
<i>Accipiter cooperi</i>	Cooper's hawk		n/a	SC	X	X	(Nesting) Woodland, Chiefly of oak, riparian deciduous, mixed conifer & Jeffrey pine habitats. Prefers riparian areas.	Nest site mainly in riparian growths of deciduous trees, as in canyon bottoms on river flood-plains; also, live oaks.	X		X	X	X				All California	Species such as raptors and some owl species (burrowing, western screech) have been shown to increase in numbers after fires (USDA, 2000), and could be beneficially affected because raptors in general are unaffected or respond favorably to burned habitat (Smith, 2000). However, canopy nesters such as great egrets, red-tailed hawks, white-tailed kites, sparrow hawks, and ravens could be subject to short-term negative effects as a result of crown fires.
<i>Accipiter striatus</i>	Sharp-shinned hawk			SC	X	X	(Nesting) ponderosa pine, black oak, riparian deciduous, mixed conifer & Jeffrey pine habitats. Prefers riparian areas.	North-facing slopes, with plucking perches are critical requirements. Nests usually within 275 ft of water.	X		X	X					All California	Species such as raptors and some owl species (burrowing, western screech) have been shown to increase in numbers after fires (USDA, 2000), and could be beneficially affected because raptors in general are unaffected or respond favorably to burned habitat (Smith, 2000). However, canopy nesters such as great egrets, red-tailed hawks, white-tailed kites, sparrow hawks, and ravens could be subject to short-term negative effects as a result of crown fires.
<i>Aquila chrysaetos</i>	Golden Eagle		n/a	SC	X	X	(Nesting & wintering) Rolling foothills, mountain areas, sage-juniper flats, desert.	Cliff-walled canyons provide nesting habitat in most parts of range. Also, large trees in open areas.	X				X				All California	Canopy-nesters such as great egrets, red-tailed hawks, white-tailed kites, sparrow hawks, and ravens - could be subject to short-term negative effects as a result of crown fires.
<i>Ardea alba</i>	Great egret (rookery)		n/a		X	X	(Rookery) Colonial nester in large trees.	Rookery sites located near marshes, tide-flats, irrigated pastures, and margins of rivers and lakes.					X				Western half of California including Mexico.	Canopy-nesters such as great egrets, red-tailed hawks, white-tailed kites, sparrow hawks, and ravens - could be subject to short-term negative effects as a result of crown fires.
<i>Buteo swainsoni</i>	Swainson's hawk			T	X	X	Breeds in riparian systems adjacent to suitable foraging habitats, mainly open grasslands and agricultural fields. Swainson's hawks require large, open grasslands with abundant prey in association with suitable nest trees. Suitable foraging areas include native grasslands or lightly grazed pastures, alfalfa and other hay crops, and certain grain and row croplands. Winters in Mexico and South America.		X								Currently, Swainson's hawks in California are restricted to portions of the Central Valley and Great Basin regions where suitable nesting and foraging habitat is still available. Central Valley populations are centered in Sacramento, San Joaquin, and Yolo counties.	Current breeding range is outside of FMP project area.

Scientific Name	Common Name	Legal Status			Noted in GGNRA Records	GNRA management concern based on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in FMU/ Project Unit				Potential Effect that Could Result from FMP Actions*				County Distribution	Species Distribution / Range	Comments
		Federal	CNPS	State						None	Muir Woods	WUI	Interior	Beneficial	Negative	No Effect	Unknown			
<i>Callipepla californica</i>	California quail				X	X	Primarily inhabits chaparral, coastal scrub, and grassland oak habitats; however, adaptable to riparian, woodland, and some agricultural lands. Often forage on open or disturbed lands.		X	X	X	X						Much of California.	A common breeder in Marin and San Mateo Counties that will be protected by breeding season restrictions on FMP actions. The Presidio supports the largest known remaining breeding population in San Francisco County; currently estimated to be 20 or so individuals.	
<i>Cathartes ustulatus</i>	Swainson's thrush		n/a		X	X	In western mountains and along Pacific coast, often in dense riparian willows or alders. They may be found in both undisturbed or disturbed woodlands with dense understory, often near canopy gaps produced by fallen trees or other disturbances.		X	X	X	X						Breeding range is from Alaska through central Canada and portions of the northern U.S. Breeding range extends south into the Rocky Mountains into Utah, Colorado, and New Mexico. Distinct population on Pacific slope from British Columbia to southern California. Neotropical migrant.	Some species, such as California quail and Swainson's thrush are known to decline in the first few years after shrubland and forest fires (Lawrence, 1966; Lyon and Marzluff, 1985).	
<i>Chamaea fasciata</i>	Wren-tit		n/a		X	X	Varied habitat types in California that provide low, dense cover.	X	X	X	X							Pacific coast from Oregon through California to northern Baja California. Birds in the northern part of the range (Oregon) were recently described as defining a distinct subspecies.	Definite concern about this species in San Francisco County, where remaining birds in Golden Gate Park are thought to be declining or extirpated.	
<i>Chondestes grammacus</i>	Lark Sparrow		n/a		X	X	Grasslands.											Grasslands and sagebrush areas in western U.S.		
<i>Circus cyaneus</i>	Northern harrier		SC		X	X	(Nesting) coastal salt & fresh-water marsh; Nest & forage in grasslands, from salt grass in desert sink to mini estuaries.	X						X				All California	It is not anticipated that the habitat utilized by this species would be affected by FMP actions	
<i>Columba fasciata</i>	Band-tailed pigeon		n/a		X	X	Hardwood and coniferous forests.	X		X	X							Forested habitat in California.		
<i>Contopus borealis</i>	Olive-sided flycatcher		n/a		X	X	Hardwood and coniferous forests.			X	X							Forested habitat in California.	The olive-sided flycatcher and Pacific-slope flycatcher could be beneficially affected because studies have shown flycatchers (Witz, 1977) increased the first year after a burn.	
<i>Dendroica nigrescens</i>	Black-throated gray warbler		n/a		X	X	Forested habitat.			X	X							Forested habitat in California.	It is anticipated that riparian habitats supporting this species would be relatively unaffected by FMP actions, therefore it is anticipated that the effects on populations of these species would be minor, with potential beneficial impacts from invasive species control and restoration of ecosystem processes.	
<i>Dendroica occidentalis</i>	Hermits Warbler		n/a		X	X	(Nesting) coast redwood forests & interior mixed deciduous & coniferous forests farther inland.	X		X	X							Forested areas of California.	It is anticipated that riparian habitats supporting this species would be relatively unaffected by FMP actions, therefore it is anticipated that the effects on populations of these species would be minor, with potential beneficial impacts from invasive species control and restoration of ecosystem processes.	

APPENDIX B
SPECIES OF CONCERN

Scientific Name	Common Name	Legal Status			Noted in GGNRA Records	GNRA management concern based on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrences Known in FNU/Project Unit			Potential Effect that Could Result from FMP Actions			County Distribution	Species Distribution / Range	Comments
		Federal	CNPS	State						None	Muir Woods	WLU	Interior	Beneficial	Negative			
<i>Dendroica petechia brewsteri</i>	Yellow warbler		n/a	SC	X	X	(Nesting) riparian plant associations. Prefers willows, cottonwoods, aspens, sycamores, & alders for nesting & foraging.	Also nests in montane shrubbery in open conifer forests.	X				X			Neotropical migrant. Breeds in riparian habitat and wet meadows in California.	It is anticipated that riparian habitats supporting this species would be relatively unaffected by FMP actions, therefore it is anticipated that the effects on populations of these species would be minor, with potential beneficial impacts from invasive species control and restoration of ecosystem processes.	
<i>Empidonax difficilis</i>	Pacific-slope flycatcher		n/a		X	X	Coniferous and hardwood forests.				X						The olive-sided flycatcher and Pacific-slope flycatcher could be beneficially affected because studies have shown flycatchers (Witzel, 1977) increased the first year after a burn.	
<i>Eremophila alpestris actia</i>	California horned lark			SC	X	X	Coastal regions, chiefly from Sonoma Co. to San Diego co. Also mountain meadows, open coastal plains, main part of San Joaquin valley & fallow grain fields, alkali flats.		X				X				Mechanical removal and other FMP actions would occur outside much of nesting season, and limited number of acres burned each year, therefore it is anticipated that the effects on populations of	
<i>Falco columbarius</i>	Merlin			SC	X	X	(Wintering) seacoast, tidal estuaries, open woodlands, savannahs, edges of grasslands & deserts, farms & ranches.	Clumps of trees or windbreaks are required for roosting in open country.	X								Mechanical removal and other FMP actions would occur outside much of nesting season, and limited number of acres burned each year, therefore it is anticipated that the effects on populations of	
<i>Larus occidentalis</i>	Western Gull		n/a		X	X	Nests on rocky cliffs and nearshore and offshore islands.		X								Offshore marine species (e.g. whales, pelagic birds) are expected to receive little to no impact from fire management activities.	
<i>Oporornis tolmiei</i>	MacGillivray's warbler		n/a		X	X	Riparian habitats and wet meadows.		X								It is anticipated that riparian habitats supporting this species would be relatively unaffected by FMP actions, therefore it is anticipated that the effects on populations of these species would be minor, with potential beneficial impacts from invasive species control and restoration of ecosystem processes.	
<i>Otus kennicottii</i>	Western screech owl				X	X	Hardwood and coniferous forests.		X								Species such as raptors and some owl species (burrowing, western screech) have been shown to increase in numbers after fires (USDA, 2000), and could be beneficially affected because raptors in general are unaffected or respond favorably to burned habitat (Smith, 2000).	
<i>Pandion haliaetus</i>	Osprey			SC	X	X	(Nesting) ocean stone, bays, fresh-water lakes, and larger streams.	Large nests built in tree-tops within 15 miles of good fish-producing body of water.	X								Species such as raptors and some owl species (burrowing, western screech) have been shown to increase in numbers after fires (USDA, 2000), and could be beneficially affected because raptors in general are unaffected or respond favorably to burned habitat (Smith, 2000).	
<i>Phalacrocorax penicillatus</i>	Brandt's cormorant		n/a		X	X	Rocky cliffs on outer coast and into S.F. Bay.		X								Offshore marine species (e.g. whales, pelagic birds) are expected to receive little to no impact from fire management activities.	

Scientific Name	Common Name	Legal Status			Noted in GGNRA Records	GNRA management concern not on USFWS list	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in EMU/Project Unit				Potential Effect that Could Result from FMP Actions ⁵				County Distribution	Species Distribution / Range	Comments
		Federal	CNPS	State						None	Muir Woods	WUI	Interior	Beneficial	Negative	No affect	Unknown			
<i>Phainopepla melanoccephalus</i>	Black-headed grosbeak		n/a		X	X	Riparian habitat and some forests.		X						X	X	X	Riparian and forested areas of California.	Mechanical removal and other FMP actions would occur outside much of nesting season, and limited number of acres burned each year.	
<i>Picoides nuttalli</i>	Nuttall's woodpecker		n/a		X	X	Forested habitat.		X									Forested areas of California.	Mechanical removal and other FMP actions would occur outside much of nesting season, and limited number of acres burned each year, therefore it is anticipated that the effects on populations of these species would be minor, with potential beneficial impacts from invasive species control and restoration of ecosystem processes. Rare in San Francisco.	
<i>Poecetes griffithii</i>	Chestnut-backed chickadee		n/a		X	X	Forested habitat.		X									Forests habitats in northwestern portion of California, up into Northwest U.S.	Mechanical removal and other FMP actions would occur outside much of nesting season, and limited number of acres burned each year, therefore it is anticipated that the effects on populations of these species would be minor, with potential beneficial impacts from invasive species control and restoration of ecosystem processes. Rare in San Francisco.	
<i>Progne subis</i>	Purple martin		n/a	SC	X	X	(Nesting) inhabits woodlands, low elevation coniferous forest of Douglas fir, ponderosa pine, & Monterey pine.		X									Low elevation forested habitat in California.	Mechanical removal and other FMP actions would occur outside much of nesting season, and limited number of acres burned each year, therefore it is anticipated that the effects on populations of these species would be minor, with potential beneficial impacts from invasive species control and restoration of ecosystem processes.	
<i>Vireo gilvus</i>	Warbling vireo		n/a		X	X	Shows a strong association with mature mixed deciduous woodlands especially along riparian corridors throughout range. Found at edges or openings (both natural and human-made) as well as forest interiors. In general, overall habitat structure consists of large trees with a semi-open canopy; apparently indifferent to density of undergrowth. Other habitats include urban parks and gardens; orchards; farm fences; campgrounds; deciduous patches in pine forests; mixed hardwood forests; and, rarely, pure coniferous forests.		X										Currently, the breeding range extends from the Canadian border south to the Santa Ana mountains (Orange County), San Bernardino mountains (San Bernardino County), Tehachapi mountains (Kern County), and east-central White and Inyo mountains (Inyo County), exclusive of the entire Central Valley.	Mechanical removal and other FMP actions would occur outside much of nesting season, and limited number of acres burned each year, therefore it is anticipated that the effects on populations of these species would be minor, with potential beneficial impacts from invasive species control and restoration of ecosystem processes.

APPENDIX B
SPECIES OF CONCERN

Scientific Name	Common Name	Legal Status			Need in GNRA Records	GNRA management concern noted on USFWS lists	Habitat requirement and/or association	Micro habitat	Habitat Present in Planning Area	Occurrence known in EMU/ Project Unit				Potential Effect that Could Result from FMP Actions*			County Distribution			Species Distribution / Range	Comments	
		Federal	CNPS	State						None	Muir Woods	WUI	Interior	Beneficial	Negative	Unknown	San Francisco	San Mateo	Marin			
MAMMALS																						
<i>Antrozous pallidus</i>	Pallid bat				X	X	Pallid bats roost in rock crevices, buildings, and bridges in arid regions. The pallid bat is known for its unique habit of feeding almost entirely from the ground. Its most common prey include crickets, beetles, grasshoppers, and even scorpions		X					X							They are found from Mexico and the southwestern United States north through Oregon, Washington, and western Canada. Minor short-term impacts could be both beneficial (creates food sources) and adverse (some mortality may occur in roosting sites).	
FISH																						
<i>Lavinia symmetricus</i> ssp. 2	Tomales roach				X	X		X						X								
INVERTEBRATES																						
<i>Anodonta californiensis</i>	California floater (musssel)		n/a		X	X	Freshwater lakes and slow moving streams and rivers.	X													It is anticipated that the habitat supporting this species would be unaffected by FMP actions as habitat	
<i>Caecidotea tomalensis</i>	Tomales asellid		n/a		X	X	Inhabits localized freshwater ponds or streams with still or near-still water in several bay area counties.	X													It is anticipated that the habitat supporting this species would be unaffected by FMP actions as habitat	
<i>Danaus plexippus</i>	Monarch butterfly				X	X	Utilize eucalyptus and Monterey cypress and pine trees for clustering sites during winter.															Mitigations would reduce impacts to monarchs to less than significant.
PLANTS																						
<i>Catalochorus umbellatus</i>	Oakland star tulip		4		X	X	Chaparral, lower montane coniferous forest, broadleafed upland forest, valley and foothill grassland.															Occurs in the SFWD, MVAFB, & Nicolside Ridge. Special Status Vascular Plant Species Monitoring Report GNRA 2001. Recently discovered in the vicinity of Muir Woods in non-serpentine grasslands (NPS, 2004)
<i>Ceanothus gloriosus</i> var. <i>exaltatus</i>	Glory Bush		4		X	X	Chaparral.	X														Occurs on south Bolinas Ridge only. Special Status Vascular Plant Species Monitoring Report GNRA 2002.
<i>Ceanothus gloriosus</i> var. <i>gloriosus</i>	Point Reyes ceanothus		4		X	X	Closed-zone coniferous forest, coastal dunes, coastal scrub, coastal bluff scrub.	X														Occurs in the SFWD, MVAFB, & Nicolside Ridge. Special Status Vascular Plant Species Monitoring Report GNRA 2001. Recently discovered in the vicinity of Muir Woods in non-serpentine grasslands (NPS, 2004)
<i>Elymus californicus</i>	California bottle-brush grass		4		X	X	North coast coniferous forest, cismontane woodland, riparian woodland.	X														Occurs in the SFWD, MVAFB, & Nicolside Ridge. Special Status Vascular Plant Species Monitoring Report GNRA 2001. Recently discovered in the vicinity of Muir Woods in non-serpentine grasslands (NPS, 2004)
<i>Malacothamnus fasciculatus</i> var. <i>nevadensis</i>	Santa Cruz island bush mallow		IB	SE	X	X	Coastal scrub, chaparral.	X														Occurs in SFWD, no occurrences in Project Outer Coast Ranges Study Area. Special Status Vascular Plant Species Monitoring Report GNRA 2001 Mojave Desert

U. S. DEPARTMENT OF THE INTERIOR**National Park Service****Final Environmental Impact Statement / Fire Management Plan****Golden Gate National Recreation Area****Marin, San Francisco and San Mateo Counties, California*****RECORD OF DECISION***

The Department of Interior, National Park Service has prepared this Record of Decision on the *Fire Management Plan/Final Environmental Impact Statement* (FMP FEIS) for Golden Gate National Recreation Area (GGNRA), Muir Woods National Monument, and Fort Point National Historic Site (collectively known as “the park” for purposes of this document). This document includes a description of the background for the project, a statement of the decision made, synopses of other alternatives considered, a description of the environmentally preferable alternative, the basis for the decision, findings on impairment of park resources and values, an appendix detailing measures to minimize environmental harm, and an overview of public involvement and agency consultation in the decision-making process.

Background of the Project

The legislated boundary of GGNRA consists of 74,816 acres in San Mateo, San Francisco, and Marin counties in California within which 15,700 acres are directly managed by GGNRA and comprise the planning area for the FMP FEIS. The planning area does not include the northern lands of GGNRA (approximately 18,000 acres) which are managed by Point Reyes National Seashore, or lands within the jurisdictional boundary of GGNRA that are not directly managed by the NPS.

The National Park Service (NPS) managed lands of GGNRA contain more than 1.7 million square feet of building space in both historic and non-historic structures. The park has roughly 59 miles of Pacific coast and San Francisco Bay shoreline and an estimated 40-mile long interface with developed lands, primarily residential communities. The parklands, part of the Golden Gate Biosphere Reserve, support 19 separate ecosystems and 12 distinct plant communities which together provide habitat for 25 federally-listed endangered or threatened plant and animal species and 52 additional species of concern. Within GGNRA are five National Historic Landmark Districts, 667 historic structures, and more than 350 known archeological sites. Each year, more than 16 million visitors come to the park from all over the world.

Fire management is an essential component of NPS operations and the GGNRA has been operating under a 1993 Fire Management Plan (FMP). Concerns about fire management in GGNRA are due to the fire hazards created from fuel buildup within parklands as a result of fire suppression efforts over the past century, the extension of residential development along much of the park boundary, and the spread of more flammable, non-native invasive plants within park lands, particularly along the boundary.

This revision of the GGNRA FMP was initiated in August 2003 in response to recent changes to NPS and federal fire management policies and the need to update the existing plan. The 1993 FMP focused primarily on fire ecology and natural resource management issues. The Federal Wildland Fire Management Policy (1995, 2000) reflects lessons learned from a catastrophic fire season in 2000.

Updated policies stress the need for land managers to reintroduce the role of fire into fire adaptive natural

systems, to use fire management principals to protect sensitive park resources, and to reduce fire risk along the wildland urban interface through the implementation of cooperative fuel reduction strategies with neighboring communities and agencies.

The purpose of this FMP FEIS is to provide a framework for fire management activities in a manner that helps achieve resource management objectives consistent with the park's cultural and natural resources, and land management plans; reduces risks to developed facilities and adjacent communities; and addresses safety considerations for park visitors, employees, and resources. The specific purposes of this FMP FEIS are:

- To prepare a new FMP that is consistent with Federal Wildland Fire Management Policy and conforms to agency guidelines for fire management plans and programs; and
- To help achieve resource management objectives consistent with the park's cultural, natural resource, and land management plans and be responsive to safety considerations for park visitors, employees, and resources.

A set of goals were developed by NPS staff during this FMP EIS planning process. The goals were derived from federal wildland fire management policy, NPS management policies, the 1980 GGNRA General Management Plan (GMP), and comments and concerns expressed by the public and agencies during the scoping period. Management objectives, detailed in section 1.4 Purpose and Need for Action of the FMP FEIS, were developed for each goal and describe what must be accomplished in order for the fire management program to be considered successful. The goals were then used in the formulation of the alternatives analyzed in the FEIS.

In addition to the FMP goals, the planning area's topography, hydrology, the results of fire hazard modeling, analysis of current development patterns, and the locations and types of significant park resources served to inform NPS staff as they developed Fire Management Units (FMU's) for the FMP. The FMU's were then used as a means to evaluate and analyze management alternatives. An FMU is any land management area that can be defined by management goals and constraints, topographic features, access corridors, values at risk or values to be protected, political boundaries, fuel types, or major fire regime groups that set it apart from management characteristics of an adjacent unit.

The 1993 FMP FMU's were based upon vegetation communities and are used in the current FMP FEIS in *Alternative A – 1993 FMP, No Action*. The FMU's used in the action alternatives (Alternative B and Alternative C) were based upon different inputs to conform to current federal wildland fire management policy. The new FMU's consist of the Wildland Urban Interface FMU for areas of the park adjacent to relatively dense suburban neighborhoods; the Park Interior FMU comprised of open, largely undisturbed lands that are relatively remote from developed areas whether on the park perimeter or interior; and the Muir Woods FMU for Muir Woods National Monument, reflecting the important natural resources combined with high visitor use in this special park unit.

Three alternatives are analyzed in the FMP FEIS. The alternatives meet the park's goals and objectives to an acceptably large degree, and are within constraints imposed by regulations and policies, by risks associated with the wildland urban interface, and by technical and funding limitations. The three alternatives involve different combinations of prescribed burning and mechanical treatments for achieving fire risk reduction and resource protection and rehabilitation objectives. In each alternative, an upper limit

has been set on the number of acres that would be treated in any one year. Then, the alternatives are differentiated by the annual maximum acreages allowed for each treatment type (mechanical treatment or prescribed burning) within the FMU's in the three counties. The variations in annual, permissible acreages are one means of distinguishing differences among the alternatives. Potential impacts and appropriate mitigation measures are assessed for each of the alternatives.

Decision (Selected Action)

The selected action, *Alternative C - Hazard Reduction and Resource Enhancement through Multiple Treatments*, is the preferred alternative from the FMP FEIS. Alternative C will allow for the greatest number of acres to be treated annually to achieve fire management and resource objectives through the use of a broad range of fire management strategies. As documented in the FEIS, Alternative C is also deemed to be the "Environmentally Preferred" Alternative.

Given favorable weather conditions and adequate project funding, Alternative C would permit up to 595 acres be treated per year using mechanical treatments and prescribed fire. If project funding is not optimum, the park would seek other funding from other divisions such as maintenance and natural resources for projects that would result in benefit meeting the objectives of those divisions as well as fire management. Approved projects that lack funding would roll over to the next fiscal year. Low funding for prescribed burning projects can be supplemented in Marin County by sharing staff and equipment resources with other fire and land management agencies. The acreage limit for annual treatments of 275 acres by mechanical treatment and 320 acres of prescribed burning were developed as reasonable targets that could be achieved annually rather than absolutes that must be achieved. The plan acknowledges that the level of funding available for fire management projects has varied from year to year; in addition, heavy fogs in late summer/early fall can shift the park's focus to achieving the mechanical treatment acreages and away from prescribed burning.

Under Alternative C, mechanical treatment and prescribed burning will be used to reduce fuel loading near developed areas and achieve resource enhancement goals. Mechanical treatments, complemented by prescribed fire, will be employed to assist with the restoration and maintenance of the park's natural and cultural resources. An expanded research program will examine the role of fire and mechanical treatments in enhancing natural resources and the specific impacts of fire on these resources. Research will also be used to adaptively guide the fire management program and help maximize the benefits to park resources. Natural and cultural resource goals and objectives will be integrated into the design and implementation of fuel reduction projects.

Several actions that are part of the current GGNRA fire management program will continue under Alternative C. Some of these current activities are considered "best management practices" and are used by many land management agencies and fire districts. These actions include roadside fuel reduction; maintenance of defensible space around structures; the provision of fire education materials and public outreach; the continued implementation of successful fire management programs such as the Wildland Urban Interface Initiative coordinated with neighboring fire departments and homeowners' associations; fire effects monitoring; suppression of all wildland fires; centralizing the park's fire cache in a new structure; fire management actions for GGNRA lands within the City and County of San Francisco; and the fire management approach for Muir Woods National Monument. The NPS has been implementing the 1993 FMP strategy for Muir Woods National Monument for over a decade and would continue to do

so. The strategy uses prescribed fire and mechanical fuel treatments to reduce invasive species and fuel loading, and to restore the role of fire in the old growth coast redwood forest.

Based on the FMP, an implementation plan will be developed by the park's fire and resource management staff. The implementation plan will outline fire management actions that would occur over a 5-year planning period. This plan would be updated and reviewed annually for consistency with the FMP.

Other Alternatives Considered

In addition to the Selected Action, the FMP FEIS analyzes two alternatives for managing fire in the park, including a No Action Alternative. Similar to Alternative C (Selected Action), these alternatives are based upon park values, effective fire management strategies, NPS policy, and applicable law. Two other alternatives which focused on fuel reduction rather than a combination of resource and fuel reduction benefits were considered but dismissed.

Alternative A (No Action) – 1993 FMP, No Action

This alternative would be an update to the park's 1993 FMP only to reflect changes to the park's boundary (e.g., addition of new lands since 1993) and current national fire management policies. The focus of the 1993 FMP program is on ecosystem management through the application of prescribed fire to perpetuate fire-adaptive natural systems. This alternative would rely on the continued implementation of the 1993 FMP and recent emphasis on mechanical fuel reduction along with prescribed fire.

The six FMU's for Alternative A, derived from the 1993 FMP, are based upon vegetation communities. As shown in Table 1 below, a total of 210 acres could be treated by mechanical means and prescribed fire each year under this alternative. Nearly all of the projects would be in Marin County and account for 175 of the total 210 acres. An annual maximum of 110 acres for prescribed burning would be allowed; this total reflects what had been accomplished while the 1993 FMP was in full implementation in the 1990's. In practice, many fire management actions approved in recent years for GGNRA have been mechanical fuel reduction projects (e.g., mowing, cutting to remove nonnative shrubs and trees, and selective thinning in forested stands) as a result of the establishment of the Wildland Urban Interface Initiative. A combination of staff shortages, the requirement to develop a new FMP, and a year-long moratorium on prescribed burning has resulted in limited prescribed burning over the past five years.

Current research projects would continue and would focus on the role of fire to enhance natural resources and the effects of fire on key natural resources to determine the effectiveness of various fuel treatments. Prescribed burning would focus on resource management and research objectives with half of the annual acreage accounted for in projects within Muir Woods National Monument. Mechanical fuel reduction projects would focus on the park interface area in Marin County, consistent with projects funded in the past five years.

Alternative B – Hazard Reduction and Restricted Fire Use for Research and Resource Enhancement.

Under Alternative B, fire management actions would emphasize the use of mechanical methods to reduce fire hazards and fuel loads in areas with the highest risks. A total of 350 acres could be treated each year under this alternative – a maximum of 230 acres by mechanical means and a maximum of 120 acres through prescribed fire. Compared to Alternative A, Alternative B represents an increase in the number of acres mechanically treated each year. There would be a focus on the reduction of high fuel loads in the

Wildland Urban Interface FMU. Alternative B would permit the treatment of 50% fewer acres annually by mechanical treatment than the Selected Alternative. Limited use of prescribed fire could occur for research purposes within the park interior. Under Alternative B, prescribed burning is restricted to the Park Interior FMU in Marin County and Muir Woods FMU. No prescribed burning would occur in the San Mateo parklands. Research projects in Marin and San Mateo counties would examine the role of fire to enhance natural resources and the effects of fire on key natural resources to determine the effectiveness of various fuel treatments.

Table 1: Summary of Alternatives by Fire Management Unit (FMU) and Treatment Type

Treatment Type	County	Alternative A		Alternative B				Alternative C			
		All Fmu's ¹	Total	WUI FMU	Park Interior FMU	Muir Woods FMU	Total	WUI FMU	Park Interior FMU	Muir Woods FMU	Total
Mechanical Treatment (acres/yr)	Marin	75	100	130	45	5	230	130	90	5	275
	San Francisco	5		10	0	0		10	0	0	
	San Mateo	20		30	10	0		30	10	0	
	Total Acres	100		170	55	5		170	100	5	
Prescribed Burning (acres/yr)	Marin	100 ²	110	0	70	50	120	50	185	50	320
	San Francisco	<1		<1	NA	NA		<1	NA	NA	
	San Mateo	10		0	0	0		5	30	0	
	Total Acres	110		0	70	50		55	215	50	

Source: GGNRA Fire Management Office Data 2004.

Notes:

¹ Since 1993 FMP did not give number of acres per year for treatments by FMU, and since FMU's are by vegetation type and dispersed throughout park, total acreage is given by county only based upon projects cited in 1993 FMP and current practice.

² Includes 50 acres of prescribed burning in Muir Woods National Monument annually.

WUI = Wildland Urban Interface

NA = not applicable

Alternatives Considered for Inclusion in the EIS But Rejected

Two additional alternatives were considered for the GGNRA FMP but rejected as not meeting the purpose and need of the FMP. Developed in response to a suggestion during scoping, of the two alternatives proposed, one included no use of fire as a management tool and the second permitted fire to be used only in pile burning. Both alternatives focused on mechanical treatments to reduce fuels and fire hazard. The strategy for fire management at Muir Woods, which involves the reintroduction of fire into the ecosystem, could not be implemented under these alternatives. The first alternative, which did not permit pile burning, removed a very sustainable solution for disposing of cut vegetation. Often only part, and sometimes none, of the vegetation cut at a site can be chipped and broadcast in place; under this alternative all debris which could be chipped would have to be trucked to a legal disposal site. Chipping and broadcasting debris at a project site may be prohibited because it could alter favorable conditions for sensitive plant or animal species, involve the spread of invasive plant seeds or viable parts, suppress the native seed bank, or increase fire risk when if deposited overly thick. Pile burning is an important solution for vegetation harboring SOD, pitch pine canker, or other infectious diseases or pests that should neither be left onsite nor moved to another location.

After consideration, the alternatives were rejected as so many important FMP goals could not be achieved without some level of prescribed burning. Without the option of prescribed burning, there would be less opportunity to contribute to the enhancement and rehabilitation of cultural and natural resources through the use of prescribed burning. The park fire ecology and monitoring staff would not be able to build upon research and data derived first hand experience in the actual environment of GGNRA. The park fire staff would not expand their experience by planning and executing prescribed burns and the preferred strategy for reducing the potential for a high intensity wildland fire at Muir Woods could not be implemented being based on the reintroduction of fire into the Muir Woods ecosystem.

Environmentally Preferred Alternative

The analysis in the Final EIS determined that Alternative C is the environmentally preferred alternative. As described in the Final EIS, NPS and Section 101 NEPA criteria were used to make this determination. A summary of this analysis is as follows:

Alternative C will best achieve the purposes and goals of the plan by allowing for the use of a variety of management tools in order to achieve resource goals in balance with protection of visitors, life, and property. In comparison to Alternatives A and B, Alternative C's fire management treatment options provide the park with the flexibility to achieve, in a timely manner, a reduction in fire hazards that aid in the protection of human health, life, and property while also maximizing opportunities for restoring and maintaining ecological integrity, and protecting and enhancing the park's natural and cultural resources. Under Alternative C, the park's expedited implementation of fuel reduction projects in the urban interface areas would afford the greatest protection for park neighbors as well as the most sustainable approach to fire management. Alternative C presents the greatest potential for the control of stands of non-native evergreen forests within all of the FMU's which, once controlled, will require limited maintenance to discourage resprouting. With active restoration efforts from park staff and volunteer stewards, the areas that support stands of non-native evergreens should convert to native vegetation and require little maintenance in the long-term to maintain low fuel loading.

Alternatives A and B conform to FMP goals but would accrue benefits at much lower rates than Alternative C. Alternative A would achieve only one third the number of acreage for both prescribed burning and mechanical treatment than Alternative C. Alternative A, which continues the current resource-based FMP, would have a natural resource focus park-wide split into FMUs defined by vegetation type. Alternative A is not as closely allied to the life safety goal that is primary to current federal wildland fire policy. With the exception of specific WUI projects funding by the National Fire Plan, all project planning would continue to be natural resource based. Alternative B permits mechanical treatment at nearly the same level as Alternative C and would be nearly as effective in reducing excessive fuel loading as Alternative C. However, the amount of acreage of prescribed burning permitted annually is a third of that allowed in Alternative C and then only within the Interior FMU. No prescribed burning would occur in San Mateo County and no burns would be within the WUI FMU which often has the larger concentrations of escaped, invasive, non-native plants. Alternative B and C would permit similar annual achievements for mechanical treatment projects and both allow the greatest range of techniques to be used to treat cut vegetation based on environmental conditions. However, the higher annual acreage limits in Alternative C (at least 45 acres more annually of mechanical treatment and an additional 200 acres more of prescribed burning), with the ability to use prescribed burning throughout the park where warranted, results in a more proactive program that has the greatest potential to effectively reduce high fuel loading that currently threatens natural and built resources and public safety on both sides of the wildland urban interface.

Basis for Decision

After careful consideration of the alternatives presented, their environmental impacts, planning goals, and public comments received throughout the planning process, including comments on the Draft Fire Management Plan/Environmental Impact Statement, Alternative C has been selected for implementation. This alternative best accomplishes NPS and federal fire management policies, the legislated purpose of GGNRA, and the statutory mission of the NPS to provide long-term protection of park resources. The selected action best accomplishes the stated purposes of the Fire Management Plan as described in section 1.4, Purpose and Need for Action of the FMP FEIS. Alternative C offers the best combination of benefits with a high level of protection of life and property, and greater long- and short-term natural and cultural resource benefits than either Alternatives A or B.

A set of goals, developed and used in this planning process, were derived from guidance of the NPS Management Policies 2001 (NPS 2000) and NPS Director's Order and Resource Handbook 18, Wildland Fire Management (NPS 1999), in addition to federal policy and scoping input. The goals and subsequent management objectives describe what must be accomplished in order for the fire management program to be successful and were used to formulate the alternatives analyzed in this FMP FEIS. Of these goals, the first four are the criteria that were predominantly used to select Alternative C for implementation. Alternative C is the alternative which most successfully fulfills these goals, though each of the alternatives achieves the goals to a varying degree.

- 1. Ensure that firefighter and public safety is the highest priority for all fire management activities.*

This alternative would permit the broadest use of fire management strategies throughout the park (mechanical treatment, pile burns, and prescribed burning) to reduce fuel loading near developed areas

and resources. Alternative C permits a larger number of acres to be treated annually than the other alternatives considered and it will thus accelerate the reduction of fuels in areas that present wildland fire hazards to adjacent communities and to sensitive park resources. Under Alternative C, a greater amount of fuel reduction (total 595 acres) could be achieved by both mechanical treatment and prescribed burning in the planning area than either under Alternative A (total 210 acres) or Alternative B (total 350 acres).

Under Alternative C, a maximum of 320 acres of prescribed burns and 275 acres of mechanical treatments could occur annually. This acreage cap grants the park the flexibility to take advantage of years with favorable weather conditions and funding availability. Though all of the alternatives depend on a range of variables for success, risks to firefighters and the public would be reduced at a more rapid rate under Alternative C.

The flexibility in treatment options provided under Alternative C, particularly in the Park Interior FMU, will allow the park to link together areas treated by prescribed burning or mowing with other areas of naturally-occurring light fuels. These linked zones of reduced fuels will then serve to slow the rate of fire spread in the event of a wildland fire, resulting in additional time for evacuation and response, and will provide relatively safe areas from which to stage firefighting efforts.

2. Reduce wildland fire risk to private and public property.

Full implementation of this alternative would allow for the greatest number of acres to be treated annually to achieve fire management objectives. Compared to Alternative A, Alternative C permits nearly three times as much mechanical fuel reduction and prescribed burning each year. The higher amount of acreage allowed to be treated annually produces the most accelerated progress towards reducing fuels in critical areas around the park; almost 1,375 acres could be mechanically treated over a five year implementation plan based on the annual allowable acreages. The greater acreage and full range of fuel management techniques permitted in the WUI FMU under Alternative C provides more opportunities to plan and annually implement joint projects with other agencies to strategically reduce fuels across jurisdictional boundaries. Similar to the other alternatives, the objective of fuel reduction projects under Alternative C would be to establish areas of reduced fuels to slow the rate of fire spread and facilitate fire suppression. However, given the flexibility in management tactics and the number of acres that could be treated annually, more could be accomplished in a shorter amount of time to reduce fire risk to private and public property under Alternative C.

3. Protect natural resources from adverse effects of fire and fire management activities, and use fire management wherever appropriate to sustain and restore natural resources.

Alternative C is the least constrained alternative in terms of the types of treatments that can be applied in individual areas. Treatments under Alternative C would pursue the enhancement of natural resources (e.g., increasing abundance or distribution of habitat for threatened and endangered species; reducing infestations of nonnative plants; increasing native plant cover; managing the rate of vegetation conversion, etc.) in addition to other management goals. The focus for prescribed burns under Alternative C would be in areas where NPS ecologists believe ecosystem health would be enhanced by burning and in areas where fuel accumulations create fire hazards. To the extent possible, prescribed burns would be conducted to approximate natural fire intensity and fire intervals. The intent would be to allow the process of fire to act on the landscape as it has for thousands of years, to the greatest extent possible, while

ensuring human safety and protecting property. Prescribed fire would be used to reduce infestations of highly nonnative plant species, restore native habitat, and rehabilitate cultural landscape settings. Only Alternative C would permit prescribed burning to be used in conjunction with mechanical treatments in the Wildland Urban Interface FMU, thus providing a range of strategies to effectively control infestations of invasive, non-native plants. In addition, only Alternative C permits mechanical treatment in combination with prescribed burning to be used in the Park Interior FMU's of both Marin and San Mateo counties. As such, Alternative C will provide more opportunities for vegetation management projects which focus on native plant community rehabilitation and the control of isolated, invasive plant populations in areas where fuel reduction may be a low priority.

4. Preserve historic structures, landscapes, and archeological resources from adverse effects of fire and fire management activities, and use fire management wherever appropriate to rehabilitate or restore these cultural resources.

Alternative C proposes use of a broad range of fire management strategies throughout the park – mechanical treatment, pile burning, and prescribed burning – as a means to reduce fuel loading near developed areas and achieve resource enhancement goals. Projects would focus on the protection and/or enhancement of cultural resource elements and values (e.g., burning would be used to reduce vegetation in areas that are identified as important historic viewsapes). Fire management activities, especially carefully applied prescribed fire and mechanical fuel reduction treatments, will be used to stabilize, preserve, maintain, and restore cultural resources. For example, mechanical thinning can effectively remove hazardous fuels from cultural resources and their vicinity, as well as restore, enhance, or maintain ethnographic resources and cultural landscapes in cases where the risk of direct effect from the application of fire is too high. Fire management activities will help to maintain and protect historic buildings by reducing fuels around these structures, both through prescribed burns and mechanical treatment. Historic field patterns may be restored in pastoral ranching landscapes where former grassland is being succeeded by scrub. In addition, the removal of dense ground cover may lead to the revelation of previously unknown archeological sites. Since this alternative allows for the greatest number of acres to be treated on an annual basis to achieve fire management objectives, it will therefore afford the greatest level of protection and enhancement of cultural resources.

Findings on Impairment of Park Resources and Values

The NPS has determined that implementation of Alternative C (Selected Action) will not constitute impairment to park resources and values. This conclusion is based on a thorough analysis of the environmental impacts described in the FEIS, the public comments received, relevant scientific studies, and the professional judgment of the decision-maker guided by the direction in NPS Management Policy. While the plan has some negative impacts, in all cases these adverse impacts are the result of actions to preserve and restore park resources and values. Overall, the Selected Action results in major benefits to park resources and values and it does not result in their impairment.

In determining whether impairment may occur, park managers consider the duration, severity, and magnitude of the impact; the resources and values affected; and direct, indirect, and cumulative effects of the action. According to NPS policy, “An impact would be more likely to constitute an impairment to the extent that it affects a resource or value whose conservation is: necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural integrity

of the park or to opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents" (NPS Management Policies, 2001).

The non-impairment policy does not prohibit impacts to park resources and values. The NPS has the discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of the park, so long as the impacts do not constitute impairment. Moreover, an impact is less likely to constitute impairment if it is an unavoidable result of an action necessary to preserve or restore the integrity of park resources or values.

The actions comprising Alternative C will achieve the goals of the Fire Management Plan in a comprehensive, integrated manner that reduces fire-related risks while also allowing fire to be used to achieve resource management objectives. The potential for high-intensity catastrophic fire that would put high-value resources at risk would be greatly reduced under the Selected Alternative. The combined use of mechanical treatment and prescribed burning throughout the park would allow NPS to reduce fuel loading and also achieve resource enhancement goals in a more timely and efficient manner than the other alternatives. Under Alternative C, the FMP goals would be achieved in a productive, effective, and sustainable manner through a broad scope of treatments and treatment areas. Strategic areas of high fuel loading on the park's urban interface would be treated and maintained over a shorter period of time than under Alternatives A and B. Likewise, areas of nonnative plants would be treated earlier in the implementation of Alternative C and would therefore be treated before populations of nonnative species could expand to affect larger areas.

In conclusion, the NPS has determined that the implementation of Alternative C will not result in impairment of resources and values in GGNRA. This conclusion is documented in the FMP FEIS.

Measures to Minimize Environmental Harm

The NPS has investigated all practical means to avoid or minimize environmental impacts that could result from implementation of the selected action. The measures have been incorporated into Alternative C and are presented in detail in the FMP FEIS. A set of mitigation measures will be applied consistently to actions to implement this plan through the park's internal compliance processes. (See Attachment 1 – Mitigation Measures). Fire effects monitoring by the fire management staff and the GGNRA cultural and natural resource management programs will be implemented to detect deleterious results. The results from this program will guide and assure compliance monitoring, biological and cultural resource protection, noxious weed control, visitor safety and fire education, endangered, threatened and special status species protection, and other mitigation. In addition, the NPS will prepare appropriate compliance reviews under the NEPA, the National Historic Preservation Act, and other relevant legislation for future actions not covered by this EIS.

Public and Interagency Involvement

Scoping for EIS

Public scoping for the FMP EIS was formally initiated on August 8, 2003, with publication in the Federal Register of the Notice of Intent to Prepare an Environmental Impact Statement for the GGNRA FMP. In addition to the Federal Register notice, the scoping period was publicized through a mailing to the public that included background information on the FMP and a notice of scoping workshops. Scoping

comments were solicited from August 8, 2003, to December 5, 2003. Three open house meetings were held for the scoping of the GGNRA FMP. These meetings featured displays and offered attendees the opportunity to discuss the planning process with staff. In addition, internal NPS scoping sessions were conducted to identify staff issues and concerns.

Among the major issues raised during the scoping meetings were the need for monitoring fire management activities and the use of wildland fire and pesticides as fire management tools. In addition, the development of an education component for fire hazard reduction in adjacent communities was mentioned. Other concerns raised at the meetings included ongoing changes in land use as they relate to fire; the potential for changes in wind patterns and wind strength due to tree removal; public access limitations; use of native plant species to restore habitat; potential changes to visitor experience and aesthetics; increased fire risk and life safety; and effects on cultural resources, vegetation, wildlife, hydrology, water quality, soils, and air quality.

Review of EIS

A Notice of Availability for the Draft EIS (FMP DEIS) was published by the NPS in the Federal Register on March 21, 2005. The NPS also provided the notice of availability of the FMP DEIS through a direct mailing and posting on the park's web site. The FMP DEIS was made available for review at park headquarters, park visitor centers, local and regional libraries, and on the park's website. The EPA's Federal Register March 18 notice of filing initiated a 60-day public comment period ending on May 17, 2005 which was extended to May 27, 2005 to ensure adequate review time. The NPS conducted two public presentations and workshops on the FMP DEIS. The first workshop was held in San Mateo County as part of a regularly scheduled Pacifica City Council meeting on April 11, 2005. The second workshop was on April 19, 2005 in Marin County at the San Francisco Bay Model in Sausalito and was part of the regularly-scheduled, GGNRA bi-monthly public meeting. The public was encouraged to submit comments on the DEIS via email, fax, or regular mail.

Twelve comment letters were received (see Appendix H of the FEIS). Agencies commenting were the US Environmental Protection Agency, the State Clearinghouse, the State Department of Forestry and Fire Protection, the Marin County Community Development Agency, the San Mateo County Department Parks and Recreation, the Land and the Resources Division of the San Francisco PUC. Two members of the Pacifica City Council submitted comments as well as 3 members of the public. The EPA provided comments as required in their role of statutory administrator of NEPA, the Council on Environmental Quality implementing regulations and the Clean Air Act.

All comment letters are reprinted in Appendix H to the FMP FEIS and each letter is followed by the NPS response to the letter's comments. The major issues raised during the public comment period included: smoke management, clarification of the text on conformance with air quality regulations and the State Implementation Plan, herbicide use, protection of riparian and wetland areas, range of alternatives considered, effects on Monarch butterfly habitat, and the need and benefits from interagency cooperation. On February 10, 2006 the EPA published their notice that the FEIS is "complete and fully adequate" in the Federal Register.

The NPS's Notice of Availability for the FMP FEIS was published in the Federal Register on December 28, 2005. Following the EPA's notice of filing published in the FR on December 23, 2005 the waiting period for preparation of the Record of Decision ended on January 23, 2006. The FMP FEIS was posted on the NPS park planning website and a postcard notification of its availability was mailed to 1,400 interested parties, including agencies and organizations which had requested information on the FMP FEIS or were on the park's planning office mailing list. Forty-seven individuals, organizations, and agencies that had received a copy of the FMP DEIS in either printed or CD format or had since requested a copy were sent the FMP FEIS in the format requested. The FMP FEIS was distributed to the GGNRA Visitor Centers and twenty-four libraries in Marin, San Francisco, San Mateo and Alameda counties.

Following distribution of the FEIS, the park received several requests from the public and agencies for copies of the document, and a private citizen request for additional information on the use of herbicides and fire retardant chemicals in the Muir Beach and Redwood Creek vicinity. The park responded that the park's preference is to use no retardants for suppression wherever possible and particularly in the vicinity of Redwood Creek, which provides habitat for listed salmonids. The Marin County Fire Department, as a CDF contract agency, has agreed to consult with the NPS before using retardants in the Redwood Creek drainage. It is mutually agreed that the protection of life and safety is the number one priority in any fire suppression effort and the use of retardants may be necessary where these threats are present. No herbicides have been used at the Golden Gate Dairy in conjunction with eucalyptus removal nor is any planned for this area or for work along Muir Woods Road. In conformance with the Endangered Species Act consultations undertaken for the FMP, direct applications to the cut stumps of eucalyptus, acacias or other readily resprouting non-native trees, is allowed in riparian or wetland habitats supporting special status species during the dry season (roughly July 1 through November 15), never within the wetted channel of the drainage and only when conditions meet the requirements of mitigation measures VEG-8 to prevent wind drift of herbicide.

Agency Consultation and Coordination

Advisory Council on Historic Preservation. The National Historic Preservation Act (NHPA) requires agencies to take into account the effects of their actions on properties listed in or eligible for listing in the National Register of Historic Places. The Advisory Council on Historic Preservation has developed implementing regulations (36 CFR 800) that allow agencies to develop agreements for consideration of these historic properties. The NPS, in consultation with the California State Historic Preservation Officer (SHPO), developed a Programmatic Agreement for the FMP based upon an existing draft Department of the Interior Fire Management Plan Programmatic Agreement. The NPS invited the participation of the Advisory Council, affected American Indian tribes, and the public in this consultation process. This Programmatic Agreement provides a process for compliance with the NHPA and includes stipulations for identification, evaluation, treatment, and mitigation of adverse effects for actions affecting historic properties. The NPS initiated consultation on the GGNRA FMP by letter to the SHPO dated May 23, 2003. Consultation was completed with the signing of the Programmatic Agreement on September 30, 2005. The Programmatic Agreement for Fire Management Activities is included as Appendix J in the FMP FEIS.

U.S. Fish and Wildlife Service and National Marine Fisheries Service (NMFS). The Endangered Species Act (ESA) protects threatened and endangered species, as listed by the U.S. Fish and Wildlife Service (USFWS), from unauthorized take, and directs federal agencies to ensure that their actions do not

jeopardize the continued existence of listed species. Section 7 of the ESA defines federal agency responsibilities for consultation with the USFWS and National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS) and requires preparation of a Biological Assessment to identify any threatened or endangered species that are likely to be affected by the proposed action.

The NPS initiated informal consultation with the USFWS on June 18, 2003. Upon request, the USFWS sent the NPS a species list for the GGNRA FMP EIS covering Marin, San Francisco, and San Mateo counties, as well as for the specific United States Geological Survey (USGS) quads within those counties in which NPS fire management activities will take place.

The NPS sent a biological assessment to the USFWS on March 16, 2005 to determine if formal consultation under Section 7 of the Endangered Species Act would be required for the GGNRA FMP. The NPS requested formal consultation with NMFS Fisheries Service on potential effects on listed salmonids and Essential Fish Habitat in a letter dated March 21, 2005.

USFWS issued a Final Biological Opinion on the GGNRA FMP EIS on October 7, 2005 (see Appendix K of the FMP FEIS). The Final Biological Opinion lays out the USFWS conclusions regarding the numerous listed wildlife and plant species within the FMP FEIS planning area and proposes several mitigation measures to assure protection of the species. All recommendations of the USFWS have been incorporated into the listing of mitigation measures included in Chapter 2 of the FMP FEIS and Attachment 1 to this ROD. The USFWS conclusions regarding implementation of Alternative C, the Preferred Alternative are:

1. Implementation of the FMP is not likely to jeopardize the continued existence of the mission blue butterfly, California red-legged frog, the San Francisco garter snake, Raven's manzanita, San Francisco lessingia, Presidio clarkia, and the Marin dwarf flax nor is it likely to destroy or adversely modify proposed California red-legged frog critical habitat. Critical habitat has not been designated or proposed for mission blue butterfly, San Francisco garter snake, Raven's manzanita, San Francisco lessingia, Presidio clarkia, and the Marin dwarf flax, therefore, none will be affected.
2. Implementation of the FMP is anticipated to result in incidental take of the mission blue butterfly, California red-legged frog, and the San Francisco garter snake. The nondiscretionary conservation measures proposed by the NPS and described in the FEIS and ROD will substantially reduce but do not eliminate the potential for incidental taking of these listed species. The USFWS has determined that the level of anticipated take is not likely to result in jeopardy to the three listed wildlife species and proposed critical habitat of the red-legged frog.
3. Implementation of the FMP is not likely to adversely affect the San Bruno elfin butterfly, the salt marsh harvest mouse, tidewater goby, California brown pelican and the Pacific Coast population of the western snowy plover because of the avoidance measures included in the proposed project, actions proposed are either outside the range of the listed species or the action area does not contain suitable habitat for the taxa.
4. The USFWS concurs that Alternative C is not likely to adversely affect the northern spotted owl because of the specific measures for owl protection that will be implemented with the FMP regarding the siting and timing of project actions in relation to owl activity sites, limits on tree

and understory canopy modification near owl activity sites, avoiding disturbance of woodrat nests, limiting removal of larger diameter trees, and conducting post-project monitoring.

5. The USFWS concurs with the determination that the proposed project is not likely to adversely affect the marbled murrelet because of specific avoidance measures that will be implemented with the FMP regarding timing and siting of project actions, and avoidance the felling trees of larger diameter trees.

NMFS issued a Biological Opinion on the FMP FEIS on February 8, 2006 addressing potential effects of the FMP on the Central California Coast coho salmon (*Oncorhynchus kisutch*), an Evolutionary Significant Unit (ESU) and the Central California Coast steelhead (*Oncorhynchus mykiss*), designated a Distinct Population Segment.

The Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (PL 104-267), requires all federal agencies to consult with NMFS Fisheries on all actions or proposed actions permitted, funded, or undertaken by the agency that may adversely affect Essential Fish Habitat (EFH). NMFS provides recommendations to agencies through the Section 7 Consultation process to conserve EFH when agency activities may adversely affect EFH. Critical habitat has been designated for coho salmon and steelhead and includes streams and riparian areas within the FMP action area, triggering conformance with the Magnuson-Stevens Act.

After review of the biological assessment, best available scientific and commercial information, current status of the listed species, information on the environmental baseline of the action area, the anticipated effects of implementation of the FMP and cumulative actions, NMFS concluded that the FMP is unlikely to jeopardize the continued existence of the Central California Coast coho salmon or steelhead and unlikely to adversely modify their designated critical habitats. After review of the mitigation measures proposed for the control of erosion and protection of salmonids, NMFS recommended an additional conservation measure, taken directly from wording within the FEIS, be included to protect salmonid habitat from effects of herbicide use (see VEG-8 in Attachment 1). Modifications to two FMP mitigation measures (SS-12 and SS-13) were also requested. The issuance of an incidental take statement for the programmatic FMP was not required by NMFS.

As a condition supporting the issuance of their findings on the FMP, NMFS requires that the NPS provide them annually with information on the proposed implementation efforts for the upcoming fiscal year. Information will include a map of the project area, a project description and an assessment of potential effect on coho salmon and steelhead. NMFS will respond to the annual project report in writing within set time periods and inform the park whether the proposals may be appended or tiered from the programmatic biological opinion or whether project modifications, additional information or a separate consultation will be required.

California Coastal Commission. The Coastal Zone Management Act protects coastal environments. While the act transferred regulatory authority to the states and excluded federal installations from the definition of the "coastal zone," it requires that federal actions be consistent with state coastal management plans. Activities taking place within the coastal zone under the definition established by the California Coastal Management Plan (CCMP) require a federal consistency determination. The FMP FEIS was submitted to the California Coastal Commission for federal consistency determination. In a letter dated February 10, 2006, the Coastal Commission determined that the programmatic FEIS would

not adversely impact coastal resources and would meet the requirements for a negative determination with the adoption of a requirement for the NPS to provide the CCC Executive Director annually with an implementation plan. The Executive Director requested that NPS staff meeting annually with CCC staff to discuss how implementation of the annual work plan and mitigation measures will ensure protection of sensitive coastal resources. The NPS will submit additional consistency and/or negative determinations to the Commission for any future FMP projects within GGNRA that hold the potential to adversely affect resources within the coastal zone.

Changes Made for the Final EIS

A number of minor changes were made in the FEIS based on public comment received during the review period for the DEIS.

- A tenth FMP goal, accompanied by two objectives, to address smoke management and protection of air quality was added to the list of FMP goals in Chapter 1
- Figures 2-7, Fire Roads North Lands, and 2-8, Fire Roads South Lands were removed from the document and text edits were made to clarify which road-related functions at GGNRA are the responsibility of fire management staff (and are within the scope of the FMP FEIS) and which are the responsibility of other NPS divisions.
- Additional information was provided on herbicide use in conjunction with mechanical fuel removal as requested by the U.S. Environmental Protection Agency (EPA). This includes information on the park's common herbicide used, the review and approval process, regulatory conformance, protections for sensitive resources, the public and firefighters.
- Changes were made to the Mitigation Measures for Air Quality and Special Status Species in response to a comment from the EPA. As a result of the consultation between the NPS and the U.S. Fish and Wildlife Service (USFWS), two new Special Status Species mitigation measures were added. NMFS requested that a paragraph from FEIS Chapter 4 regarding herbicide application be added to the list of mitigation measures and that text modifications be made to two Special Status Species mitigation measures addressing protection of salmonids.
- On the recommendation of the EPA, changes were made to the Impacts on Air Quality section to clarify the relationship between BAAQMD's smoke management plan (SMP) and the State Implementation Plan (SIP). Text was added to address whether the three FMP alternatives would trigger a conformity analysis with the SIP; new text and a new table were also added to explain and state the *de minimus* levels for criteria pollutants with which the Air Basin is in nonattainment or maintenance status; and Table 3-4 was updated to reflect the current attainment status of criteria pollutants for the Bay Area Air Basin.
- In response to the EPA's request for more information regarding smoke management practice, a new appendix was added that lists smoke management techniques and non-burning alternatives that GGNRA could incorporate into a smoke management plan and/or that BAAQMD could require as part of the smoke management plan approval process. The referenced appendix is Appendix I – Non-burning Alternatives and Air Emissions Reduction Techniques for Fuel Reduction and Resource Benefiting Prescribed Burns in GGNRA.

Conclusion

Alternative C provides the most comprehensive and effective method among the alternatives considered for meeting the NPS purposes, goals, and objectives for managing fire and fire risks in GGNRA and for meeting national environmental and fire policy goals. The selection of Alternative C, as reflected in the *Final Fire Management Plan/Environmental Impact Statement* would not result in the impairment of park resources and would allow the NPS to conserve park resources and provide for their enjoyment by visitors.

Approved:

[Signed by Jon Jarvis on 2/23/06]

Jonathan B. Jarvis, Regional Director

Date

Pacific West Region, National Park Service

Attachment 1 – FMP Mitigation Measures

The NPS will implement the following mitigation measures in implementing the Selected Alternative of the FMP FEIS. The measures are designed to minimize or avoid the potential environmental impacts of the actions to be implemented under the FMP FEIS or to create a beneficial effect. These measures would not be fully applicable in the event of a catastrophic fire. The NPS will regularly evaluate and monitor the mitigation measures during implementation to determine their continued effectiveness in reducing impacts. The NPS, as Lead Agency, will have primary and full responsibility for coordinating the specific elements of each mitigation measure and will be responsible for ensuring that each mitigation measure has been implemented as specified in this document.

General FMP Mitigation Measures

- FMP-1(a)** To ensure that GGNRA fire management actions are in conformance with NEPA, the Record of Decision on the Final EIS, and NPS policy, individual fire management projects and modifications to the GGNRA five-year implementation plan will be subject to the GGNRA project review. Through the project review process, an interdisciplinary team will evaluate whether the potential effects of a proposed action or five-year plan, including appropriate mitigation measures, are adequately addressed by the Final EIS and reflect NPS management policies. If it is determined that the project has the potential for new environmental effects not addressed in this EIS or effects greater than those described in this EIS, a separate environmental process will be conducted.
- FMP-1(b)** To ensure compliance with 36 CFR 800, the regulations for implementing the NHPA, the Programmatic Agreement that will be developed specific to this park's fire management program will stipulate that each five-year implementation plan will be made available to the State Historic Preservation Officer, the Advisory Council on Historic Preservation, and the public for comment.
- FMP-2** GGNRA staff will meet with representatives of local fire agencies that could respond to wildfires in GGNRA lands in Marin, San Francisco, and San Mateo counties. The purpose of the meeting will be to provide information to fire agencies on the location and preferred strategies for suppression actions that will minimize damage or afford protection to important park resources in the event of a wildfire. The information exchanged between the NPS and local fire agencies will include notification procedures, new or modified facilities in the park, updated information on cultural and natural resources, low-impact suppression techniques, or potential protection techniques for certain locales in GGNRA.
- FMP-3** GGNRA cultural and natural resources staff will work with the fire management staff in preparing and updating maps and other data sources showing areas of the park with sensitive resources such as National Register properties; archaeological sensitivity; cultural landscapes; plant communities of special management concern (e.g., wetlands, riparian areas, dunes, and Special Ecological Areas identified in the park's Natural Resource Management Plan); habitat of federal, state, and locally listed species; and other important natural and cultural resources.

- FMP-4** GGNRA staff will conduct a training session for all contractor crews at the beginning of new fuel reduction projects to familiarize the crews with sensitive resources at the project site and review project conditions. Training sessions may include identification of NPS staff resource contacts; special status plants, wildlife, or other sensitive resources in the work area; identification and specific removal techniques to protect cultural resources from disturbance or prevent resprouting of nonnative plants; markings for the limit line of disturbance; thresholds that trigger a change in implementation techniques or require a halt in project implementation; proper disposal of food waste and garbage to discourage feeding by vectors and corvids; daily close-up of the project site to assure public safety; and information for public contacts during project implementation.
- FMP-5** An education program for field personnel involved with implementation of FMP projects will be conducted prior to the initiation of field activities. The program may include a brief presentation on any listed species at the work area, including a description of the species and its ecology, habitat needs, legal status, and protection afforded to the species. Cultural resource issues may include the type of artifacts or soils that could indicate the presence of subsurface cultural resources, the presence of known resources at the site, and important elements of the cultural landscape that must be left undisturbed, among other issues.
- FMP-6** The superintendent of GGNRA will appoint members of GGNRA staff to act as resource specialists to consult with operations crews in the event of wildland fire and during planning and execution of prescribed fire. The resource specialists will meet with local fire agencies likely to command wildland fire suppression actions on GGNRA lands and develop strategies for implementing flexible suppression to protect important resources.
- FMP-7** Natural and cultural resources staff will be notified of wildland fires as soon as possible so that appropriate staff can advise the lead fire agency on the location of sensitive resources and preferred suppression techniques and begin planning for rehabilitation of the burned area. Natural and cultural resource advisors will be assigned to the incident as needed.
- FMP-8** For any multi-day fire suppression event, a local or regional Burned Area Emergency Response team will be requested to facilitate development, in conjunction with park staff, of the emergency suppression stabilization and rehabilitation proposals.

Air Quality Mitigation Measures

- AIR-1** If recommended by BAAQMD, smoke management plans submitted by the NPS for BAAQMD review can be modified to reduce production of pollutants by reducing the amount of fuels available for burning. Options for reducing the amount of fuels available and emissions produced include reducing the area to be burned, reducing fuel loading (e.g., mowing and understory thinning), managing the rate of fuel consumption, and redistributing the emissions. Treatments to reduce overall air emissions from prescribed burns will be based on current smoke management techniques such as those listed in the Western Regional Air Partnership publication "Non-burning Alternatives to Prescribed Fire on Wildlands" (Jones and Stokes, 2004) and those listed in Appendix I of this FEIS.

- AIR-2** The NPS will develop a Smoke Communication Strategy to guide management of smoke events during prescribed fires, managed wildland fires, suppression actions, and fires occurring outside the park. Notification of proposed burns will be disseminated locally to provide adequate advance notice to persons with sensitivities to smoke.
- AIR-3** To reduce smoke and pollutant generation during the prescribed burning season, efforts will be made to burn fuel concentrations, piles, landings, and jackpots at other times of the year.
- AIR-4** To reduce impacts on visibility in the national park, burning will be avoided on holidays or other periods when recreational visitation is typically high.
- AIR-5** To avoid public health and nuisance impacts on neighboring communities, information about upcoming prescribed burns, including guidance for those who are sensitive to smoke, will be provided to park visitors, park employees, and park partners. Prescribed burns will be conducted under meteorological conditions that best avoid smoke drift into nearby residential areas and roadways.
- AIR-6** The NPS will arrange in advance with other parks that routinely monitor air quality (i.e., Yosemite National Park or Sequoia National Park) to monitor particulate levels during larger prescribed burns in GGNRA provided the necessary staff and equipment can be made available for GGNRA use.

Soils and Water Quality Mitigation Measures

- SW-1** Planned and unplanned fire actions will include strategies to minimize impacts from erosion, such as avoiding steep slopes and highly erosive soils, timing burns to minimize erosion potential, avoiding scraping or burning to bare mineral soil (layer below duff), or using erosion control techniques during or after burns. Subject matter experts will ensure that the erosion control plan for each action is sufficient to prevent long-term moderate or major impacts on the rate of soil erosion. Sites with identified high potential for soil erosion will be monitored.
- SW-2** Following a prescribed fire or wildland fire, visual monitoring will be conducted downslope of the area burned and at down-gradient water bodies (including ditches, streams, and wetlands) for evidence of increased soil erosion or increased sedimentation. Additional erosion control/sediment control measures will be applied where warranted.
- SW-3** Following wildland fires or prescribed burning, all fire lines (both hand and dozer lines) or other areas disturbed by equipment or vehicles will be rehabilitated as quickly as possible to prevent erosion, discourage the spread of nonnative plants and address soil compaction. Burned area rehabilitation techniques, including recontouring, soil stabilization, and removal and monitoring of nonnative plants, will be used for rehabilitation efforts.
- SW-4** Unless no feasible alternative is available, heavy equipment working on fire management actions (excluding suppression) will not be used in areas with soils that are undisturbed, saturated, or subject to extensive compaction. Where staging of heavy equipment, vehicles, or stockpiling is unavoidable, the limit of allowable disturbance will be clearly demarcated by

- staking, flagging, or fencing. Following the end of work, surface soils will be scarified to retard runoff and promote revegetation.
- SW-5** During implementation of prescribed burns, some of the available coarse, woody debris will be left on the site to foster nutrient recycling and mycorrhizal function and other natural resource benefits.
- SW-6** Mechanical regrading and rehabilitation of fire roads will be conducted to specifications identified in the GGNRA Trails Inventory and Condition Assessment and the Memorandum of Understanding for Maintenance and Management of Dirt Roads with adjacent land management agencies.
- SW-7** After tree felling, stumps will be left in place in areas with highly erosive soils or on steep slopes.
- SW-8** Where surface soils supporting native vegetation will be disturbed as part of fire management actions, the topsoil layer will be excavated and stockpiled separately from other fill and replaced as topsoil at the end of the action.
- SW-9** Erosion and sediment control measures will be implemented as prescribed where project actions could leave soils exposed to runoff prior to revegetation.
- SW-10** Where multiple burn piles are created on undisturbed soils, the size of the piles will be kept small with sufficient distance between piles to minimize impacts on soils from high-intensity fires and to facilitate reestablishment of mycorrhizal fungi and soil microorganisms from adjacent unburned land.
- SW-11** A post-project site stabilization plan will be developed and implemented for all fire management projects.

Wetland Mitigation Measures

- WET-1** Fires will be allowed to back into, around, or through wetlands and meadows to avoid suppression damage. Wetlands will be avoided to the greatest extent possible while constructing fire lines and breaks during wildfire suppression. Where wetlands are used as a natural boundary to help contain a fire, the control line will be sited outside the wetland area. Trample lines (rather than dug lines) may be used if it is necessary to site the control line in the wetland.
- WET-2** Foams, saltwater or other fire retardants will not be used on or near wetlands to the greatest extent possible.

Vegetation Mitigation Measures

- VEG-1** Prescribed burns will be conducted at a time of year when introduction or spread of nonnative plants will be minimized and mortality of nonnative plant species will be maximized.

- VEG-2** Soil disturbance during mechanical treatments, prescribed burns, and suppression fires will be minimized to the greatest extent possible to reduce the potential for introduction or spread of nonnative plant species, to protect topsoil resources, and to reduce available habitat for new nonnative plant species.
- VEG-3** Areas subject to fire management treatments will be monitored periodically for the presence of nonnative plant species; if such species become established or spread as a result of such activities, the nonnative, nonhistoric plants will be removed.
- VEG-4** All vegetation management actions under the FMP will conform to federal and state regulations governing interstate and intrastate restrictions (respectively) adopted to prevent the artificial spread of Sudden Oak Death (*Phytophthora ramorum*) beyond the currently affected area. It will be the responsibility of the natural resources division chief to ensure that current guidelines and regulations are circulated to GGNRA staff involved in fire management actions. Relevant regulations are the Code of Federal Regulations, Title 7, Section 301.92 (updated 9/27/04) and California Code of Regulations, Title 3, Section 3700 (updated 9/2/04). Current regulations do not permit the movement of plant species and associated material listed in 3700(c) outside of the regulated quarantine area (defined in 3700(b)), which includes all three GGNRA counties.
- VEG-5** All FMP projects will incorporate techniques that control existing populations of weed species at the project site and incorporate practices to reduce the potential spread of weed species to noninfested areas of the park. Practices to reduce the spread of weed species include the following:
- Movement or deposition of fill, rock, or other materials containing weed seed or viable plant cuttings to areas relatively free of weeds will be restricted.
 - Where feasible based on the density of the weed population present, the fire management project manager will survey the road shoulders of the routes that provide project access for nonnative plant species and coordinate removal of those plants that could be disturbed by passing vehicles.
 - When project vehicles are required to move from off-road use in weed-infested areas to relatively weed-free areas, and water lines and water tenders are available for use, the tires and body of heavy equipment and vehicles will be hosed down before each transit to the relatively weed-free area.
- VEG-6** All herbicide use will be administered through the park's integrated pest management (IPM) coordinator, and only licensed personnel will be allowed to apply pesticides. All herbicide use for fire management actions will be reported monthly to the IPM coordinator.
- VEG-7** No herbicide foliar spraying or direct stump applications will be allowed in riparian or wetland habitats supporting special status species except in the dry season (roughly July 1 through November 15 of each year).

VEG-8 In addition to restrictions for riparian and wetland areas, foliar herbicide will not be applied where saturated soils are present, at wind speeds over 5 miles per hour, or when weather conditions facilitate herbicide movement toward drainages. To limit the potential for wind drift, herbicide application will be limited to backpack sprayers.

Special Status Species Mitigation Measures

SS-1 When emergency actions must be taken to prevent imminent loss of human life or property and these actions would result in a taking of listed species or adverse modification of critical habitat not covered under existing FMP biological opinion, the NPS will respond to the situation in an expedient manner to protect human health and safety. After the incident is under control, the NPS will initiate emergency consultation procedures with the appropriate agency(ies).

SS-2 The fire management project manager will ensure that contractor crews working in areas designated as habitat of listed species are monitored by a qualified biological monitor to ensure that project actions conform to restrictions developed for species protection.

SS-3 All fire management actions will operate under a policy of No Net Loss of Endangered Species Habitat, which applies to all species federally listed as threatened or endangered or proposed for listing. The project review process will be used to document the no net loss finding through the conformance assessment conducted for each FMP action proposed for listed species habitat.

SS-4 To avoid the spread of highly nonnative animal species (e.g., bullfrogs) and protect the habitat of federally listed threatened or endangered species, GGNRA resource advisors and fire management staff will advise local fire agencies responding to wildland fires in the park and vicinity of the following guidance:

- Drawing water from freshwater bodies in GGNRA and Rodeo Lagoon should be avoided unless there are no alternative sources available. If freshwater is drawn or scooped from water bodies in the park, it should be used on wildfires within the same watershed whenever possible.
- Ocean and bay waters are preferred water sources for fighting wildfires in the park and vicinity. Habitats of sensitive aquatic species and mission blue butterflies should be avoided when saltwater is used.

SS-5 An education program for the field personnel involved with the FMP shall be conducted prior to the initiation of field activities. The program shall consist of a brief presentation by a person(s) knowledgeable in the California red-legged frog, San Francisco garter snake, mission blue butterfly, and other appropriate listed species. The program shall include the following: a description of these species, their ecology, and habitat needs; an explanation of their legal status and their protection under the Act; and an explanation of the measures being taken to avoid or reduce effects to these species during implementation of the FMP. The

education may be conducted in an informal manner (e.g., ranger and field personnel in a field setting).

- SS-6** If a California red-legged frog(s), San Francisco garter snake, or early stages of the mission blue butterfly are observed in the work/burn areas, a qualified biologist or an individual trained in the biology and ecology of these listed animals and designated by the NPS shall capture it and move the animal(s) to an appropriate aquatic or upland location outside of the work area.

Special Status Plants

- SS-7** Potential impacts associated with tree removal in the vicinity of the Raven's manzanita, San Francisco lessingia, and Marin dwarf-flax will be evaluated in consultation with the USFWS.
- SS-8** To address fire actions occurring within special status plant species populations, site- and/or species-specific rehabilitation plans will be developed to minimize or avoid impacts on the greatest extent possible.
- SS-9** When FMP actions disturb the habitat of special status plant species, revegetation and weeding plans will be developed in conjunction with project planning.
- SS-10** The potential for research burning and/or mechanical fuel treatments to enhance federally listed threatened or endangered plant habitat will be investigated. Burning in these habitats will be limited to carefully prescribed research burns, designed in conjunction with USFWS staff consultation and in accordance with established recovery plan objectives. Experimental treatments will be scientifically designed with replicate controls and a commitment to post-treatment monitoring.

Salmonids

- SS-11** Except in emergency situations, water drafting from park streams and creeks that support salmonids must be halted when water levels drop to a level that could result in disconnected pools of water in the channel. Any water pumping from salmonid streams will require measures to prevent injury to fish, such as using offstream sumps, restricting approach velocities to less than 0.8 foot per second, and screening at intake with openings no greater than 0.25 inch.
- SS-12** A buffer will be maintained around riparian areas where fire management activities will be restricted. Staging, fire line construction, and vehicle and heavy equipment use will occur outside the buffer area, and any activities such as nonnative vegetation removal and limited prescribed burning will occur under tightly controlled conditions. Any impacts that occur in the buffer area must be correctable by site-specific actions, and must be confined to short-term, minor (or less) adverse effects. In riparian areas directly adjacent to salmonids streams, mechanical FMP projects will be limited to an annual treatment of less than 10 acres and prescribed burning will require additional consultation.

SS-13 The fire management officer will consult with natural resources subject matter experts to identify rehabilitation and revegetation strategies where fuel reduction projects require bank stabilization in riparian areas. Rehabilitation in riparian areas will be accomplished by hand treatment techniques, using erosion control materials if treatment areas are bare prior to rains, revegetating where needed, and where possible, returning native woody material (large woody debris) to stream banks. If removal of vegetation critical to channel shading is planned or work is proposed for the wetted channel of salmonids streams, additional consultation will be needed.

Northern Spotted Owl

SS-14 Treatment activities described in the FMP or any noise generation above ambient noise levels will not occur within 0.40 kilometer (0.25 mile) of a known occupied or previously used northern spotted owl nest site, or within potential spotted owl habitat between February 1 and July 31 (breeding season), or until such date as surveys conforming to accepted protocol have determined that the site is unoccupied or nonnesting or nest failure is confirmed.

SS-15 Mechanical fuel reduction activities in suitable spotted owl habitat, known or potential, will not substantially alter the percent cover of canopy overstory and will preserve multilayered structure. When shaded fuel break features in suitable northern spotted owl habitat are constructed, the resulting multilayered canopy will only be reduced to a height of 6 to 8 feet, or along roadways as needed for emergency vehicle clearance.

SS-16 Prior to fire management activities, project areas will be surveyed for the presence of dusky footed woodrat nests. If feasible, woodrat nests will be protected.

SS-17 Within northern spotted owl habitat, the cutting of native trees greater than 10 inches diameter at breast height (dbh) will be avoided unless a determination is made that the native tree presents a clear hazard in the event of a fire or cutting is the only option to reduce high fuel loading.

SS-18 The fire management officer will arrange for qualified biologists to conduct post-project monitoring to determine short- and long-term effects of fire management actions on spotted owl activity centers if resources are available.

San Francisco Garter Snake

SS-19 No heavy equipment will be used off of existing fire roads or developed features in areas of known San Francisco garter snake habitat. If use of heavy equipment and trucks is required during emergency situations or for work that would improve San Francisco garter snake habitat, mitigation measures to avoid mortality will be incorporated into the project schedule. Measures to avoid mortality include hand-clearing areas prior to fire management activities, hand-excavating all burrows, trapping snakes out of the excavation area, using monitors to prevent equipment from injuring listed species, and training workers on identification and avoidance of listed species. Work will be conducted by biologists with a valid 10(a)(1)(A) permit and any collected San Francisco garter snakes will be relocated outside affected areas.

Marbled Murrelet

- SS-20** Where marbled murrelet habitat overlaps northern spotted owl habitat, the restrictions on noise generation in spotted owl habitat above the level of ambient noise will be to August 5. Further, from August 6 through September 30, noise generation will be limited to ambient noise levels from two hours before sunset to two hours after sunrise to protect any nesting marbled murrelets that have not been noted during surveys (USFWS letter to NPS dated April 13, 1994).
- SS-21** In marbled murrelet habitat, felling of very large Douglas-fir or coast redwood trees will be avoided and the fire perimeter will be established at a distance that will preclude the need to fell large trees.

Mission Blue Butterfly

See also Mitigation Measure SS-4 regarding use of ocean and bay waters for suppression actions.

- SS-22** Fire management activities will not occur within or immediately adjacent to existing or potential mission blue butterfly habitat during the flight period of the butterfly from February 15 through July 4.
- SS-23** Pile burning will only be permitted on barren, disturbed soils in mission blue butterfly habitat.
- SS-24** During the information meeting with local fire agencies, the location of mission blue butterfly habitat will be identified. During this meeting and when providing information at an active wildland fire as a resource advisor, natural resources staff will advise the local fire agency of the following guidelines:
- Avoid staging fire suppression actions in or directly adjacent to mission blue butterfly habitat;
 - Construct fire lines outside of mission blue butterfly habitat to the greatest extent possible;
 - Use wet lines wherever feasible, or narrow, hand-constructed fire lines where water is not available to help contain the spread of the fire; and
 - Avoid using saltwater or retardant on habitat of the mission blue butterfly.
- SS-25** The potential for research burning and/or mechanical fuel treatments to enhance butterfly habitat will be investigated. Burning in mission blue butterfly habitat will be limited to carefully prescribed research burns. Experimental treatments will be scientifically designed with replicate controls and a commitment to post-treatment monitoring. No more than five percent of existing mission blue butterfly habitat in each county will be treated experimentally each year.

- SS-26** Where possible, maintain a 100-foot-wide buffer between fire management activities and mission blue butterfly habitat except when fires are being conducted for research purposes. For habitat enhancement projects, additional measures will include establishment of buffer areas, flagging of *Lupinus albifrons* in the vicinity of activities, installation of temporary fencing, dust control, and worker education (USFWS Biological Opinion for the Fort Baker Plan/EIS, September 29, 1999).
- SS-27** The fire management officer will arrange for the removal of nonnative plants within and adjacent to mission blue butterfly habitat following fire management actions, including fire suppression.

San Bruno Elfin Butterfly

- SS-28** No planned fire management actions will occur in San Bruno elfin butterfly habitat. Proposed project areas in San Mateo County will be assessed to determine the potential for occurrence of San Bruno elfin butterfly habitat.
- SS-29** A 100-foot-wide buffer will be maintained between fire management activities and potential San Bruno elfin butterfly habitat.
- SS-30** During the information meeting with local fire agencies, the location of San Bruno elfin butterfly habitat will be identified. During the meeting and when advisors are called to provide information at an active wildland fire, natural resources staff will advise the local fire agency of the following guidelines:
- Avoid staging fire suppression actions in or directly adjacent to San Bruno elfin butterfly habitat;
 - Construct fire lines outside of San Bruno elfin butterfly habitat to the greatest extent possible;
 - Use wet lines wherever feasible, or narrow, hand-constructed fire lines where water is not available to help contain the spread of the fire; and
 - Avoid the use of saltwater or retardant drops on San Bruno elfin butterfly habitat.
- SS-31** Conduct fire management activities in areas directly adjacent to San Bruno elfin butterfly habitat outside the flight period of the butterfly, which is from February 1 through May 15.

Tidewater Goby

See also Mitigation Measure SS-4 regarding scooping of Rodeo Lagoon water for use in suppression actions.

- SS-32** During information meetings with local fire agencies (see Mitigation Measure NR-1), and on the scene of active suppression actions, natural resource advisors will inform responding fire agencies that Rodeo Lagoon shall not be used for water drafting unless needed to protect life and property and no other feasible water source is available.

California Red-Legged Frog

See also Mitigation Measure SS-4 regarding use of freshwater ponds as a water source for suppression actions and areas of the park sensitive to the use of ocean and bay waters for suppression actions.

- SS-33** All suitable habitat within areas proposed for fire management activities will be surveyed and flagged by a qualified biologist to determine whether the site supports suitable breeding or nonbreeding areas for the California red-legged frog.
- SS-34** To prevent direct injury to California red-legged frogs, removal of vegetation within suitable frog habitat will be accomplished by a progressive cutting of vegetation from the overstory level to ground level to allow frogs to move out of the treatment area.
- SS-35** If likely habitat is identified at the project site, a qualified and permitted biologist will follow accepted protocol and collect and relocate any individual red-legged frogs to nearby suitable habitat, in accordance with the biological opinion from the USFWS.

Western Snowy Plover

- SS-35** Where fire management actions involve operation of vehicles or heavy equipment on the beach, the fire management officer or the resource advisor (in the case of a wildfire) will ensure that vehicles will be driven at slow speeds (15 miles per hour maximum) over the wet sand portion of the beach and that natural wave-cast debris will be left on the beach to provide foraging habitat for the western snowy plover.
- SS-37** To avoid disturbance of western snowy plovers, aircraft assisting the NPS in the implementation of FMP projects will avoid flying directly over and parallel to the beach to the greatest extent possible.

California Brown Pelican

- SS-38** To avoid disturbance to the California brown pelican from late spring to early winter:
- Avoid operating aircraft below and within 500 feet of Rodeo Lagoon, Bird Island, and Bolinas Lagoon to the greatest extent possible.
 - Avoid drafting water from Rodeo Lagoon, the ocean near Bird Island, or Bolinas Lagoon.

Monarch Butterfly

- SS-39** All known clustering sites of monarch butterflies will be considered for protection from fire management actions.

Wildlife and Important Habitat Mitigation Measures

- WIL-1** Prescribed burns, mechanical treatments, and mowing of shrubs and grasses taller than 8 inches will not be conducted during the bird-nesting season, from March 1 through July 31, unless a qualified biologist conducts a pre-project survey for nesting birds and determines that birds are not nesting within the project area. To the greatest extent possible, these activities will be planned and conducted outside bird-nesting season. In intensively managed landscapes where mowing is justified for fuel reduction, vegetation will be maintained at a

- height of less than 8 inches throughout the nesting season (March 1 through July 31) to discourage the nesting of ground-dwelling bird species.
- WIL-2** In addition to WIL-1, in order to protect nesting raptors, trees shall not be removed between January 1 and March 1 unless qualified personnel conduct a pre-project survey for nesting birds and determine that birds are not nesting within the project area. If nesting raptors are detected, a qualified biologist will delineate a suitable buffer.
- WIL-3** Subject to project review conditions, fire management actions proposed for areas of the park that provide only limited habitat (such as areas dominated by broom or ivy species) may be conducted at any time
- WIL-4** Since older burn piles could provide wildlife habitat, the piles will be spread out (to move out animals) as much as possible before burning. If moving the piles is not feasible, the fire management project manager will ensure that piles are lit from one side only (with firefighters on the ignition side), so that any wildlife in the pile can run out.
- WIL-5** For prescribed fire projects proposed in the Muir Woods FMU, the fire management officer will arrange for a qualified biologist to conduct bat surveys of the tree hollows within the burn unit to identify potential maternity colonies. Measures will be implemented to protect active maternity roosts.

Cultural Resources Mitigation Measures

- CUL-1** *Project Preparation Phase.* To assure that cultural resources are considered early in the fire management planning process and afforded the utmost protection, the following preparatory actions will be undertaken:
- Computer and other databases containing cultural resources data will be maintained by cultural resource staff in coordination with the needs of fire management activities.
 - Appropriate cultural resources monitoring protocols will be established by cultural resources staff and applied to fire management practices as warranted.
 - Potential research opportunities to study the effects of fire management actions on cultural resources will be identified by cultural resources staff.
 - Cultural resources specialists from adjacent land management agencies will be consulted by NPS staff, as appropriate, in order to coordinate mitigation efforts prior to fire management actions.
 - Indigenous archeological sites, spiritual sites, and important plant communities will be identified and appropriately managed for preservation, maintenance, and/or enhancement by park cultural resources staff. Consultation with local Native American communities will, where pertinent, continue to occur in the context of fire management actions.

- Fire management personnel and other staff will receive annual training in cultural resources in relation to fire management activities.

CUL-2 *Project Planning Phase.* All areas slated for fire management activities will be considered for pre-action field surveys, based on the recommendations of cultural resource specialists and the need to identify cultural resources in proposed project areas. This includes areas likely to be disturbed during future wildfire suppression activity, such as helispots, staging areas, and spike camps. Site-specific information gathering may include the following:

1. In cultural landscape areas, parameters for identifying vegetation for removal or retention will be incorporated into project planning.
2. Evaluation of the relative hazards of fuel loads in proposed project areas will address the protection of cultural resource values, including:
 - 2(a) Maintenance of light fuel loads on and in close proximity to cultural resources;
 - 2(b) Benefits gained from reduced fuel loads in relation to the need to avoid or minimize adverse effects on cultural resources;
 - 2(c) Opportunities to restore or enhance the historic character of cultural landscapes;
 - 2(d) In developing burn plans, assessment of the potential effects of heat intensity and duration above, at, and below the surface in relation to cultural resources; and
 - 2(e) For projects with the potential for accelerating the rates of erosion, potential effects of erosion on cultural resources.

CUL-3 *Project Implementation.* Adverse effects on known and unknown cultural resources will be avoided or minimized during the implementation of fire management projects. A variety of treatments and techniques, as detailed in the project planning and preparation phase for individual projects, will be used for the protection of cultural landscape features during implementation of both prescribed fire and mechanical treatment activities, as follows:

1. A cultural resource specialist or resource advisor will:
 - 1(a) Be present during fire management actions, as stipulated, where recorded and suspected but not-yet-recorded historic or prehistoric resources are considered at risk;
 - 1(b) Deliver a pre-project briefing to fire management staff as necessary; and
 - 1(c) Share data with fire management personnel as needed to avoid or minimize adverse effects.

2. Vegetation will be flagged, or otherwise identified, in order to properly carry out project planning stipulations for:
 - 2(a) Retention, based upon age determination or diameter thresholds as previously agreed upon;
 - 2(b) Raising the skirts on landmark trees and other tree pruning;
 - 2(c) Flush-cutting trees removed from cultural resource areas unless otherwise stipulated; and
 - 2(d) Brush removal within agreed-upon boundaries.
3. Fences may be a character-defining feature of historic properties. In such cases:
 - 3(a) Avoid fences with heavy equipment;
 - 3(b) Remove brush and scrub only by hand or with hand-tools in a 10-foot-wide buffer zone along fence lines;
 - 3(c) Provide vehicle access at gates where necessary; and
 - 3(d) Cut other openings, if necessary, between fence posts.
4. Field patterns may be a character-defining feature of historic properties. In such cases:
 - 4(a) Use prescribed burn to restore field patterns;
 - 4(b) Protect fences by not using heavy equipment within a 10-foot-wide buffer zone, and instead using less damaging methods to lessen fire danger, such as watering, hand removal, and hand tools; and
 - 4(c) Use hand removal of noncontributing vegetation near or in historic vegetation.
5. Structures and small-scale features may contribute, or be themselves, historic properties. In such cases:
 - 5(a) Remove brush approximately 30 feet from burnable structures, depending on slope, with hand tools being the default method; and
 - 5(b) If there are foundation plantings, create defensible space outside ornamental edge plantings wherever possible.
6. Some areas may be sensitive for archeological resources on or near the surface. In such cases:
 - 6(a) Do not drag cut vegetation;
 - 6(b) Do not use rakes;

- 6(c) Use no burning when surface or subsurface resources are sensitive to heat; and
- 6(d) Avoid using surface scarification to retard runoff in archeological sites.
- 7. Erosion will be minimized to the extent possible, by methods such as:
 - 7(a) Constructing control lines perpendicular to the slope;
 - 7(b) Using the existing road network;
 - 7(c) Keeping heavy equipment off paths and trails;
 - 7(d) Keeping heavy equipment away from areas adjacent to ponds and riparian corridors; and
 - 7(e) Avoiding these and other areas marked by flagging.

CUL-4 *Post-Project Phase.* Adverse effects on known and suspected cultural resources will continue to be avoided or minimized through careful consideration of actions during the post-action phase of mechanical treatment, prescribed fire, and fire suppression activities.

- 1. The post-action condition of all recorded cultural resources will be assessed, as necessary.
 - 1(a) Post-action surveys may be conducted both in previously surveyed areas and in unsurveyed areas.
 - 1(b) Previously unrecorded cultural resources will be assessed for condition, and stabilization and other protection needs.
- 2. Stabilization and other treatment needs of cultural resources will be addressed in the development and implementation of Emergency Stabilization Plans and Burned Area Restoration Plans, and in the development of funding requests for these and other post-fire programs as needed.
- 3. Monitoring and research data will be compiled, evaluated, and used to help refine cultural resource compliance for future fire management actions and objectives.

Visitor Use and Visitor Experience Mitigation Measures

VUE-1 Project work hours will normally be limited to normal work hours (8 A.M. to 5 P.M.) to minimize potential noise impacts on nearby residents and park visitors. Exceptions may occur outside of normal work hours where warranted, for example to take advantage of windows of favorable weather or to allow for project completion before wildlife breeding period restrictions begin.

VUE-2 Where noise levels from project operations could be intrusive to adjacent residents or park trail users, all efforts will be made during project planning to site project staging areas in order to optimize the noise level reduction gained from natural barriers and screening

- vegetation. Staging areas will be sited to minimize noise levels for sensitive receptors to the extent feasible without causing adverse environmental effects on park resources, values, or public access.
- VUE-3** Park fire staff will avoid temporary closures of areas of the park during fuel reduction projects if spotters can be available to escort the public safely through the work area.
- VUE-4** To the extent feasible while protecting public health and safety, fire management officer will instruct contractors or NPS crews to secure work sites at the end of the work day so that closures around a project site can be lifted prior to and after working hours during weekdays and all day on weekends.
- VUE-5** The fire management office will develop and implement an education and communication plan for all site-specific fire management implementation projects. For large scale fuel reduction projects (more than 1 acre) that could affect mid- to close-range viewsheds for residents on the park boundary, park staff will arrange a meeting with the community to present the scope of work and provide an opportunity for public comment. Communication plans for projects may include information such as the project scope, schedule, and alternative trail routes, where needed, to be posted in the project vicinity.

Public Health and Safety Mitigation Measures

- PHS-1** Site plans for tree removal projects will be reviewed by the project review committee for potential safety hazards from windthrow and wind pattern change as a result of implementation.

APPENDIX E
SUPPLEMENTAL INFORMATION

1.	GGNRA Run Card	E-1
2.	Daily Resource Availability/Officer Duty Call Sheet	E-3
3.	Weather Information Management System Walk-through	E-5
4.	GGNRA Dispatch Protocol for Wildland Fire	E-7
5.	NFDRS Indices and Park Visitor Fire Restrictions	E-11
6.	Fire Step-up Plan (SOP 37)	E-13
7.	Bay Area Network Parks Burn Index Graph	E-19
8.	Delegation from Superintendent GGNRA to Network FMO	E-21
9.	Marin Emergency Radio Authority (MERA) Radio Talk Group Matrix.....	E-23
10.	MIST Guidelines	E-25
11.	Wildland Fire Situation Analysis	E-39
12.	Incident Complexity Analysis: Types 5, 4 and Transition to Type 3 Incident	E-53
13.	Redbook Complexity Analysis – Types 1 and 2.....	E-55
14.	Minimum Tool Flow Chart.....	E-59
15.	Example of Delegation of Authority Form	E-75
16.	Briefing Checklist Template	E-77
17.	Briefing to the Incident Management Team Template	E-79
18.	Prescribed Fire Plan Template	E-87
19.	BAAQMD Application for Pile Burning	E-107
20.	FMU Maps of Past and Proposed Fire Management Projects.....	E-109
21.	Ignition Index and Fuel Hazard Rating	E-111
22.	GGNRA FMU Vegetation Maps.....	E-115

APPENDIX E, PART 1, GGNRA RUN CARD

GGNRA – MT. TAM AREA RUN CARD				
DAILY FIRE DANGER	MARIN COUNTY RESPONSE ZONES			
LOW	2A	2B	2D	3C
	BC	BC	BC	BC
	PREV	PREV	PREV	PREV
	E1565	E1565	E1565	E1563
	E1585	Hand crew	E1585	Hand crew
	Hand crew	--	MUI E761/762	PSF BC
	--	--	Hand crew	--
MEDIUM	E1563	E1564	E1563	E1565
	E1566	E1563	E1566	E1566
	E1568	E1566	E1568	E1568
	E1564	D21540	D21540	WT1596
	D21540	--	WT1596	Local Gov't T3(2)
	WT1596	WT1592	SNB E861	T3(2)
	Local Gov't T3(2)	BOL E265	SNB WT890	--
HI	E1562	E1568	E1564	E1562
	--	E1562	E1562	E1564

AIRCRAFT AND HANDCREW DISPATCH LOCATIONS (Medium & High Dispatch)	
Air Attack Supervisor -- OV-10	AA140 -- Sonoma
Air Tanker Type 2 – S-2T	AT85 AT95 -- Sonoma
Copter Type 2 -- Super 204	H104 -- Boggs Mtn
Hand crew -- Type 1 (Inmate)	Delta Conservation Camp
Hand crew -- Type 1 (Paid County)	Hamilton Field

Key to Abbreviations:

BC – Battalion Chief

BOL – Bolinas

DZ – Dozer

E – Engine

MUI – Muir Beach

PSF – Presidio Fire Dept

PREV – Prevention Officer

SNB – Stinson Beach

T3 – Type 3 Engine

WT – Water Tender

APPENDIX E, PART 2, DAILY RESOURCE AVAILABILITY

BAY AREA NATIONAL PARKS GOLDEN GATE NRA-POINT REYES NS DAILY RESOURCE AVAILABILITY

Date: _____

Fire Management Office415-464-5233
Point Reyes Law Enforcement-Public Safety Dispatch.....415-464-5170

Duty Officer (Call in order listed): [personally identifiable information removed]

Roger Wong	(w) 415-464-5232	(c) xxx-xxx-xxxx	(h) xxx-xxx-xxxx
Jordan Reeser	(w) 415-464-5235	(c) xxx-xxx-xxxx	(h)xxx-xxx-xxxx
Jon Haag	(w) 415-464-5236	(c)xxx-xxx-xxxx	(h)xxx-xxx-xxxx
Greg Jones	(w) 415-331-6374	(c)xxx-xxx-xxxx	(h) xxx-xxx-xxxx

Agency Administrator/Chief Park Ranger:

Colin Smith	(w) 415-464-5175	(c) xxx-xxx-xxxx	(h)xxx-xxx-xxxx
Yvette Ruan	(w) 415-464-5175	(c) xxx-xxx-xxxx	(h) xxx-xxx-xxxx

TODAY'S PREDICTED FIRE DANGER (circle):

LOW	MODERATE	HIGH	VERY HIGH	EXTREME
-----	----------	------	-----------	---------

TODAY'S AVAILABLE RESOURCES (circle):

ENGINES

Patrol 6-2	Type 6	Available	staffing	_____
Engine 1176	Type 6	Available	staffing	_____
Engine 3-1	Type 3	Available	staffing	_____

HAZARDOUS FUELS REMOVAL MODULE

Crew #9	Type 2-IA	Available	staffing	_____
---------	-----------	-----------	----------	-------

SINGLE RESOURCES: Contact Duty Officer to confirm availability of positions and personnel listed in /ROSS.

COMMITTED RESOURCES:

ACTIVE FIRES:

APPENDIX E, PART 3**WEATHER INFORMATION MANAGEMENT SYSTEM WALK-THROUGH
(WIMS)**

Go to [\[not public information\]](#)

Click on WIMS

User Name: [not public information]

Password: [not public information]

Go to “fast path”, type in “didx” and hit “go”

Click on Station ID, enter date (@1730 today’s date, 0800 yesterday’s date), enter

xxxxx = **Barnabe** or enter PORE in SIG to get all the data

xxxxx = Big Rock

xxxxx = Sky Oaks

As stated in the Step-Up plan, xxxxx **is the first choice**. If it is not available, collect information from either of the others listed (xxxxx, xxxxx)

Scroll over to the BI column to retrieve fire danger information.

forecasted BI (OT column will be F, O = observed)

fuel model MSGC7A2A2 (**NOT** MSGC7B2A2)

Step-Up Plan

Low	Mod	High	Very High	Extreme
0-18	19-27	28-33	34-37	38+

Fax information to GGNRA Dispatch before 1300 hours daily.

APPENDIX E, PART 4**DISPATCH PROTOCOL FOR FIRES
2008**

The Dispatch Protocol is a procedure to be used by the Golden Gate National Recreation Area's Communications Center (CommSec) and responding units, outlining the initial actions to be taken and necessary notifications to be made in the event of a wildland fire within or threatening the Park's boundaries.

The Dispatch Protocol contains time-sensitive information such as names and phone numbers and, thus, should be reviewed and updated annually.

PROCEDURE

1. CommSec gathers the following information about the fire:
 - Location,
 - Type (Structure, Wildland, Vehicle),
 - Color of smoke,
 - Approximate size and character of fire,
 - Any threatened structures/people in the area (which will determine the type of resources dispatched (structural fire, medical, LE for traffic control, etc.),
 - Name, location, and phone number of reporting party.

2. CommSec notifies the following dispatch centers:
 - For Marin County: Marin County Woodacre Dispatch: 415-499-6717
This dispatch center will become the primary point of contact for ordering resources for both initial attack and extended attack fires in Marin County.
 - For San Francisco County: San Francisco Fire Dept.: 415-558-3268.
 - For San Mateo County: CAL FIRE Felton Dispatch: 831-335-5355 and North County Fire Authority: 650-991-8138.
San Mateo County Public Safety Communications: 650-363-4342 (Back-up contact).

3. CommSec will notify Wildland Fire Management, Presidio Fire Department, and, per request of responding Fire units, Law Enforcement personnel as necessary to provide additional support to the incident. The notification process is::

- A long tone followed by “[*Vegetation/Structural/Vehicle Fire*] reported in the vicinity of [*reported street/trail/beach, etc.*]”. Dispatcher will provide additional information. “The following units to respond [*based on the nature of the call*]:
 - Presidio Fire Units,
 - Fire Management Engine(s) 1166/1176
 - Presidio Fire will be paged out per normal procedure.
 - Responding units will provide enroute and on scene times for documentation by CommSec.
4. CommSec contacts the following individuals:
- Fire Duty Officer (Identified on Daily Resource Availability List),
 - Network Fire Management Officer – Roger Wong: 415-464-5232 (work) or xxx-xxx-xxxx (cell),
 - Chief Ranger – Yvette Ruan: 415-561-4745 (work) or xxx-xxx-xxxx (cell),
 - Public Affairs officer on duty.
5. CommSec and/or Woodacre Dispatch gathers the following fire size-up information from **Qualified** fire personnel upon arrival (first unit on-scene, Initial Attack Incident Commander). **Prompt the I.C. for this information if not relayed:**
- Specific fire location,
 - Fire size,
 - Fuel type,
 - Fire behavior (smoldering, creeping, running, torching, crowning),
 - Direction of fire spread and wind speed,
 - Values at risk (structures, etc.),
 - Best **safe** access,
 - Request for resources (type and quantity)
 - Special hazards (e.g. downed power lines, aerial hazards, hazmat, etc.).

Note: By this time, a **Qualified I.C.** should have arrived on-scene at the incident, assumed command, and identified himself/herself to CommSec and/or Woodacre Dispatch. In turn, the appropriate dispatch center will alert all incoming and on-scene personnel that an I.C. has been established. Additionally, the dispatch center(s) will broadcast similar updates of any changes in command. All incident tactical radio traffic should be relayed to the I.C. The I.C. will identify himself/herself on the radio by using the fire name, followed by “I.C.” **It is the**

understanding that, by agreement, MCFD in Marin County, CAL FIRE and/or NCFCA in San Mateo County, and PFD and/or SFFD in San Francisco County, will handle some fire incidents alone. CommSec will, nonetheless, request a copy of the appropriate incident dispatch log for Park records. Once obtained, CommSec will send a copy of the incident dispatch log to the Fire Management Office.

Definition of terms:

Fire Duty Officer (FDO): A designated daily fire supervisor in charge of coordinating wildland fire activities. The Fire Duty Officer is responsible for knowing fire resource availability and, if necessary, responding to wildland fires within or threatening the Park's boundaries.

Network Fire Management Officer (FMO): Currently, the Division Chief for Fire Management at Point Reyes National Seashore (PRNS), Roger Wong, is serving as the FMO for the Bay Area Network Parks (GGNRA, PRNS, Pinnacles National Monument, Eugene O'Neill National Historic Site and John Muir National Historic Site). The FMO will designate an acting FMO when he is unavailable.

APPENDIX E, PART 5**GGNRA****NFDRS INDICES AND PARK VISITOR FIRE RESTRICTIONS****Fire Danger – How Will It Affect You?**

If the FIRE DANGER RATING is....	Is this type of use allowed??			
	Self-contained gas stoves (in designated picnic areas and campgrounds)	Park provided grills (in designated picnic areas and campgrounds)	Self-contained charcoal barbecue grills (in designated picnic areas and campgrounds)	Beach open pit fires*
LOW	YES	YES	YES	YES
MODERATE	YES	YES	YES	YES
HIGH	YES	YES	YES	NO
VERY HIGH	YES	NO	NO	NO
EXTREME or RED FLAG WARNING	YES	NO	NO	NO

* In conformance with GGNRA revised Ocean Beach Fire Policy.

- ✘ Fires shall at all times be maintained in a safe condition that does not threaten any person, natural or structural feature.
- ✘ Firewood gathering is prohibited.
- ✘ The possession or discharge of fireworks is prohibited.
- ✘ Never leave a fire unattended.
- ✘ Report all wildfires immediately.
- ✘ Extinguish all fires prior to departure.
- ✘ Ground fires are not permitted.
- ✘ Ask a park ranger for further information.

APPENDIX E, PART 7

GOLDEN GATE NATIONAL RECREATION AREA



FIRE MANAGEMENT STEP- UP PLAN (SOP 37)

ACTION CLASS	FIRE DANGER (NFDRS RATING)	BURNING INDEX	ACTIONS
I	LOW	0-18	<ul style="list-style-type: none"> ➤ Optimal Staffing: Minimum of two (2) firefighters on duty (one FF must be at least ENOP qualified). ➤ Fire personnel conduct preparedness operations during regular tour of duty hours. ➤ Conduct daily fire weather and safety briefings. ➤ Maintain engines in fire-ready condition. ➤ Perform apparatus inspections and report inoperative units to FMO by 1000 hours. ➤ Deliver daily staffing report and fire danger rating to FMO, GGNRA Dispatch, Marin County Fire, and Mendocino N.F. dispatch by 1000 hours. ➤ Ensure PPE and IA gear are immediately available.
II	MODERATE	19-27	<ul style="list-style-type: none"> ➤ Includes all actions for Action Class I. ➤ Optimal Staffing: Minimum of three (3) firefighters on duty (staffing must include at least one ENOP and one, separate, ICT5).

ACTION CLASS	FIRE DANGER (NFDRS RATING)	BURNING INDEX	ACTIONS
III	HIGH	28-33	<ul style="list-style-type: none"> ➤ Includes all actions for Action Class II. ➤ Optimal Staffing: Minimum of four (4) firefighters on duty (staffing must include one ENGB and one ICT4). ➤ Engine captain places firefighters on two-hour, after-hour call-back. ➤ GGNRA Dispatch will broadcast the "High" Fire Danger Broadcast at 1000 hours.* ➤ All open fires prohibited except for portable gas stoves and charcoal grills. ➤ Issued open fire permits are voided. ➤ "High Fire Danger" signs posted at pre-designated locations by fire personnel and ranger staff. ➤ "No Fires" signs posted at pre-designated locations.

ACTION CLASS	FIRE DANGER (NFDRS RATING)	BURNING INDEX	ACTIONS
IV	VERY HIGH	34-37	<ul style="list-style-type: none"> ➤ Includes all actions for Action Class III. ➤ Optimal Staffing: Minimum of five (5) firefighters on duty. (staffing must include one ENGB, one ENOP, and one ICT4) ➤ Coordinate with PORE Fire Mgmt. Office on the distribution of BAN suppression resources. ➤ Chief Ranger briefed on situation and staffing. ➤ Fire personnel may be called to work extended hours and/or weekends at FMO's discretion. ➤ FMO may request additional staffing by red-carded personnel from other park divisions. ➤ Establish funding for extended and/or additional staffing though appropriate emergency account. ➤ Engine crew will patrol for smokes at least once in the afternoon hours. ➤ Engine crew stays within a five minute hike from vehicles after 1000 hours. ➤ Projects may be postponed if they pose an unacceptable fire risk. ➤ Firefighters placed on one-hour after-hours call-back. ➤ Park Dispatch will broadcast the "Very High" Fire Danger Broadcast at 1000 hours.** ➤ All open fires prohibited except for portable gas stoves.

ACTION CLASS	FIRE DANGER (NFDRS RATING)	BURNING INDEX	ACTIONS
V	EXTREME	38+	<ul style="list-style-type: none"> ➤ Includes all actions for Action Class IV. ➤ All firefighters will wear full PPE. ➤ Optimal Staffing: Minimum of six (6) firefighters on duty (staffing must include one ICT4, one ENGB, one ENOP, and one FFT1). ➤ Physical fitness training cancelled. ➤ Park Dispatch will broadcast the “ Extreme” Fire Danger Broadcast at 1000 hours.*** ➤ FMO recommends road, campground, and/or picnic area closures to the Chief Ranger. ➤ Post “Extreme Fire Danger” signs at pre-designated locations. ➤ Prohibit the use of any equipment that could provide a potential source of ignition. ➤ Prohibit all outdoor “Hot Work” permits.

* High Fire Danger Rating Broadcast: “Standby for today’s fire danger information. Today’s fire danger rating is **HIGH**. Action class is 3. All open fires are prohibited today except for charcoal grills and self-contained, portable gas stoves, which are allowed only in designated campground and picnic areas. The Fire Management Office has Engine 1166/1176 staffed today with “X” firefighters. This concludes today’s fire danger broadcast.”

** Very High Fire Danger Rating Broadcast: “Standby for today’s fire danger information. Today’s fire danger rating is **Very High**. Action class is 4. All fire personnel and red-carded law enforcement personnel are required to have their wildland fire gear immediately available. All fires, including cooking fires and charcoal grills, are prohibited today except for self-contained, portable gas stoves, which are allowed only in designated campground and picnic areas. The Fire Management Office has Engine 1166/1176 staffed today with “X” firefighters. This concludes today’s fire danger broadcast.”

*** Extreme Fire Danger Rating Broadcast: “Standby for today’s fire danger information. Today’s fire danger rating is **Extreme**. (If appropriate) The National Weather Service has issued a Red Flag Warning. Action class is 5. All fire personnel and red-carded law enforcement personnel are required to have their wildland fire gear immediately available. All fires, including cooking fires and

charcoal grills, are prohibited today except for self-contained, portable gas stoves, which are allowed only in designated campground and picnic areas. Smoking on trails is prohibited. The Fire Management Office has Engine 1166/1176 staffed today with "X" firefighters. All fire management personnel are to remain on duty until further notification. This concludes today's fire weather broadcast".

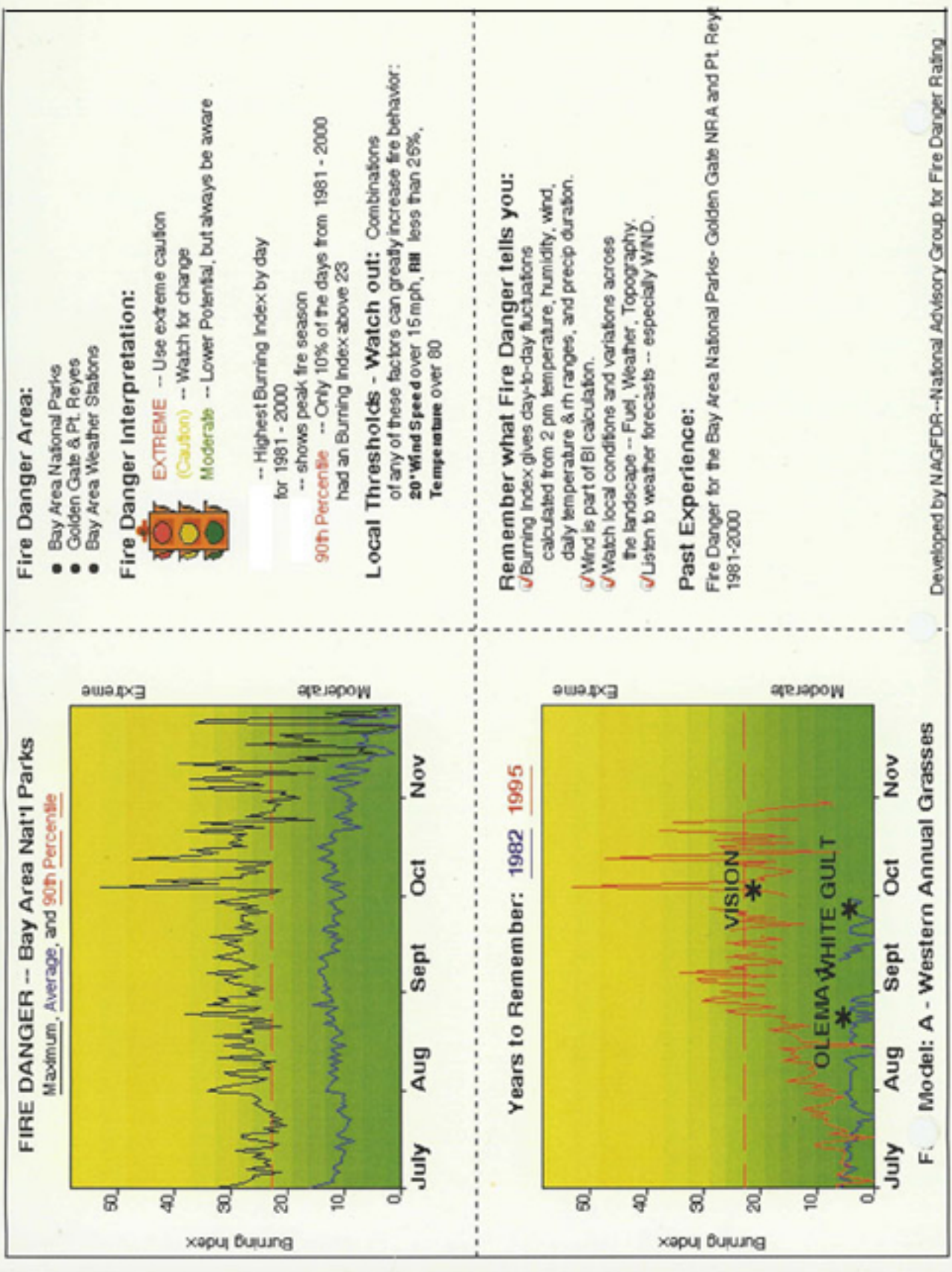
NOTE: Certain factors can potentially contribute to increased fire activity. At the discretion of the Fire Management Officer or, alternatively, the pre-designated Fire Duty Officer, the following conditions may increase the Action Class to level IV (Very High) or Action Class V (Extreme) (per RM-18):

- Extreme wind conditions (e.g. sustained 20-foot wind speed in excess of 20 mph)
- Red Flag Warnings issued by the National Weather Service
- Weather conditions which approximate local thresholds documented on Bay Area National Parks Fire Danger Pocket Cards (i.e. a combination of any two or more of the following factors: 20-foot winds speeds of 15+ mph, relative humidity (of less than 25%, and temperature in excess of 80 degrees Fahrenheit).
- Predicted or observed lightning activity level (LAL) of 4, 5, or 6
- Predicted burn index in exceedance of the 90th percentile (B.I.=24+)
- Periods of unusually high park visitation (e.g. National holidays and special events)

Golden Gate National Recreation Area fire management personnel base management responses to observed and predicted fire danger, including preparedness (pre-suppression) activities and minimum staffing levels, on the Step-up Plan (SOP 37). The Step-up Plan is a policy-compliant plan which provides a documented procedure designed to direct incremental preparedness actions in response to increasing fire danger. The Step-up Plan's five Action Classes are based upon a range of burning indices (BI) predicted daily, using the National Fire Danger Rating System (NFDRS). As the burning index increases with escalating fire danger, preparedness activities and staffing levels subsequently increase. NFDRS outputs can be obtained from the Weather Information Management System (WIMS). Additionally, the Fire Management Officer, or alternatively, the pre-designated Fire Duty Officer, may elect to move the Action Class to a higher level. The criteria for doing so are defined in the Step-up Plan. The Step-up Plan will be in operation from approximately June 1 through November 15 each year.

SUPPLEMENTAL INFORMATION

APPENDIX E, PART 7, BAY AREA NATIONAL PARKS BURN INDEX GRAPH



APPENDIX E, PART 8, DELEGATION FROM SUPERINTENDENT TO FMO**United States Department of the Interior**

NATIONAL PARK SERVICE
Golden Gate National Recreation Area
Fort Mason, Building 201
San Francisco, California 94123

DELEGATION FOR PARK FIRE MANAGEMENT OFFICER FROM GENERAL SUPERINTENDENT, GOLDEN GATE NATIONAL RECREATION AREA

THE FIRE MANAGEMENT OFFICER FOR POINT REYES NATIONAL SEASHORE IS DELEGATED AUTHORITY TO ACT ON MY BEHALF FOR THE FOLLOWING DUTIES AND ACTIONS:

- PROVIDE DIRECTION, SUPERVISION AND LEADERSHIP TO THE PARK FIRE PREPAREDNESS-OPERATIONS STAFF OUTLINED IN THE ATTACHED ORGANIZATION CHART.
- COORDINATE WITH AND PROVIDE TIMELY AND ACCURATE REPORTS TO CHIEF RANGER ON ALL ACTIVITIES OF FIRE PREPAREDNESS OPERATIONS PERSONNEL.
- COORDINATE HAZARDOUS FUELS BUDGET EXPENDITURES WITH GOGA BUDGET ANALYST TO ASSURE FISCAL GUIDELINE ACCOUNTABILITY PER REGIONAL AND PARK FUNDING CRITERIA.
- ASSURE PERSONNEL PARTICIPATING IN PRESCRIBED FIRE AND WILDFIRE OPERATIONS ARE FULLY QUALIFIED.
- RESPOND TO PREPAREDNESS, SEVERITY AND HAZARDOUS FUELS FUNDING REQUESTS FOR FY08 PARK WILDLAND FIRE OPERATIONS.
- ENSURE ALL PARK FIRE INCIDENTS ARE MANAGED IN A SAFE AND COST-EFFECTIVE MANNER.
- RESPONSIBLE FOR REPRESENTING GOLDEN GATE NATIONAL RECREATION AREA IN ALL MATTERS RELATED TO WILDLAND AND PRESCRIBED FIRE MANAGEMENT WITH LOCAL COOPERATORS AND THE NORTHERN CALIFORNIA GEOGRAPHICAL AREA.
- COORDINATE PARK FIRE PREVENTION ACTIVITIES WITH THE CHIEF RANGER AND FIRE CHIEF - PRESIDIO FIRE DEPARTMENT AND ASSIST WITH APPROPRIATE PROGRAM DIRECTION AND GUIDANCE.

- COORDINATE, PREPOSITION, SEND AND ORDER FIRE AND AVIATION RESOURCES IN RESPONSE TO CURRENT AND ANTICIPATED PARK, REGIONAL AND NATIONAL FIRE CONDITIONS.
- RESPONSIBLE FOR REPRESENTING GOLDEN GATE NATIONAL RECREATION AREA ON ALL PACIFIC WEST REGION MATTERS RELATED TO THE WILDLAND FIRE MANAGEMENT PROGRAM.
- MANAGE INCIDENT QUALIFICATIONS CERTIFICATION SYSTEM AND CERTIFY INCIDENT QUALIFICATION CARDS EXCLUSIVELY FOR GOLDEN GATE NATIONAL RECREATION WILDLAND FIRE STAFF (EXCLUDES PRESIDIO FIRE DEPARTMENT AND COLLATERAL FIRE DUTY PERSONNEL).
- CREATE AWARENESS THAT PUBLIC AND FIREFIGHTER SAFETY IS THE FIRST PRIORITY IN ANY FIRE ACTIVITY.
- RESPONSIBLE FOR DETERMINING IF SAFETY ISSUES RELATED TO WILDLAND FIRE REQUIRE SITUATIONAL “STAND DOWNS” AND/OR SUSPENSION OF WILDLAND FIRE ACTIVITIES IF SAFETY CONCERNS DICTATE.

THIS DELEGATION AND AUTHORIZATION WILL EXPIRE ON OCTOBER 1, 2007. AFTER THAT DATE GOLDEN GATE NATIONAL RECREATION AREA WILL ASSUME ALL FIRE MANAGEMENT RESPONSIBILITIES UNLESS A NEW DELGATION OF AUTHORITY IS SIGNED.

BRIAN O’NEILL
GENERAL SUPERINTENDENT, GOLDEN GATE NATIONAL RECREATION AREA

APPENDIX E, PART 9, MERA RADIO TALK GROUP MATRIX

NERA FIRE TALKGROUP TEMPLATE - 3/30/07

Z/M	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	FD DSP Fire Dispatch	EMS Dispatch	HOSP All Hospital	MGH1 Marin Consult	MGH2 Marin Report	KSR1 Kaiser Consult	KSR2 Kaiser Report	NCH1 Novato Consult	NCH2 Novato Report	EMS10 EMS Tactical	LG CLL Local Gov. Call	LG TLK Local Gov. Talk	FD CLL Law Call	PD TLK Law Talk	911 Emerg	FD EMR Fire Emerg
B	FD DSP Fire Dispatch	FD CLL Fire Call	FD TLK Fire Talk	CPW County Pub Wks	NPW Novato Pub Wks	SRPW1 San Rafael Pub Wks	CMPW Corte Mad Pw	LPW Larkspur Pub Wks	RPW Ross Pub Wks	SAPW San Anis Pub Wks	FPW Fairfax Pub Wks	SPW Sausalito Pub Wks	MYPW Mill Vly Pub Wks	TPW Tiburon Pub Wks	BPW Belvedere Pub Wks	FD EMR Fire Emerg
C	FD DSP Fire Dispatch	IC CLL ICS Call	ICS3 ICS Talk	ICS4 ICS Talk	ICS5 ICS Talk	ICS6 ICS Talk	ICS7 ICS Talk	ICS8 ICS Talk	ICS9 ICS Talk	ICS10 ICS Talk	ICS11 ICS Talk	ICS12 ICS Talk	ICS13 ICS Talk	ICS14 ICS Talk	ICS15 ICS Talk	FD EMR Fire Emerg
D	FD DSP Fire Dispatch	CTL D2 Novato Control	CTL D3 Novato Control	TAC D4 Fire Tactical	CMD D5 Fire Command	TAC D6 Fire Tactical	NV CMD Novato Command	TAC D8 Fire Tactical	TAC D9 Fire Tactical	NP Novato Dispatch	NP 2 Novato Dispatch	PD MAC PD Mut Aid	CNV 13 Fire Car To Car	CNV 14 Fire Car To Car	NF AD Novato Admin	FD EMR Fire Emerg
E	FD DSP Fire Dispatch	CTL E2 San Rafael Control	CTL E3 San Rafael Control	TAC E4 Fire Tactical	CMD E5 Fire Command	TAC E6 Fire Tactical	SR CMD San Rafael Command	TAC E8 Fire Tactical	TAC E9 Fire Tactical	SRPD San Rafael Dispatch	JL CLL Jail Call	COURT Marin Fire Disp	CNV 13 Fire Car To Car	CNV 14 Fire Car To Car	SRF AD San Rafael Admin	FD EMR Fire Emerg
F	FD DSP Fire Dispatch	CTL F2 Central Control	CTL F3 Central Control	TAC F4 Fire Tactical	CMD F5 Fire Command	TAC F6 Fire Tactical	CA CMD Central Command	TAC F8 Fire Tactical	TAC F9 Fire Tactical	TCP TCPD Dispatch	SAP SAPD Dispatch	FP Ffrk PD Dispatch	CNV 13 Fire Car To Car	CNV 14 Fire Car To Car	CAF AD Central Admin	FD EMR Fire Emerg
G	FD DSP Fire Dispatch	CTL G2 Southern Control	CTL G3 Southern Control	TAC G4 Fire Tactical	CMD G5 Fire Command	TAC G6 Fire Tactical	SA CMD Southern Command	TAC G8 Fire Tactical	TAC G9 Fire Tactical	SMP SMPD Dispatch	GGNRA GoldenGate Nat Rec	CHP CHP Dispatch	CNV 13 Fire Car To Car	CNV 14 Fire Car To Car	SAF AD Southern Admin	FD EMR Fire Emerg
H	FD DSP Fire Dispatch	CTL H2 Woodacre Control	CTL H3 Woodacre Control	TAC H4 Fire Tactical	CMD H5 Fire Command	TAC H6 Fire Tactical	WS CMD Western Command	TAC H8 Fire Tactical	TAC H9 Fire Tactical	SO Marin SO Dispatch	MMWD Marin Water Dist	FD INF Fire Weather	CNV 13 Fire Car To Car	CNV 14 Fire Car To Car	WSF AD West Fire Admin	FD EMR Fire Emerg
I	FD DSP Fire Dispatch	EVENT 2 Special Events	EVENT 3 Special Events	EVENT 4 Special Events	EVENT 5 Special Events	EVENT 6 Special Events	EVENT 7 Special Events	EVENT 8 Special Events	EVENT 9 Special Events	EVENT10 Special Events	EOC Emerg Ops Center	OES County of Marin OES	CPR RG Cnty Park Ranger	OSD Open Boxes	KNOX Knox Boxes	FD EMR Fire Emerg
M	FD DSP Fire Dispatch	USAR 2 USAR Tactical	USAR 3 USAR Tactical	USAR 4 USAR Tactical	USAR 5 USAR Tactical	ICS 6 ICS Tactical	ICS 7 ICS Tactical	ICS 8 ICS Tactical	ICS 9 ICS Tactical	ICS 10 ICS Tactical	SAR 1 Search & Rescue	SAR 2 Search & Rescue	SAR 3 Search & Rescue	CWMAAR Mutual Aid Repeater	CWMAAD Mutual Aid Direct	FD EMR Fire Emerg

- Scan 1 Conventional Scan
- Scan 2 Radio-Wide Trunked Scan
- Scan 3 Tac D4, CMD D5, Tac D6, FD EMR
- Scan 4 NV CMD, Tac D8, Tac D9, FD EMR
- Scan 5 Tac E4, CMD E5, Tac E6, FD EMR
- Scan 6 SR CMD, Tac E8, Tac E9, FD EMR
- Scan 7 Tac F4, CMD F5, Tac F6, FD EMR
- Scan 8 CA CMD, Tac F8, Tac F9, FD EMR
- Scan 9 Tac G4, CMD G5, Tac G6, FD EMR
- Scan 10 SA CMD, Tac G8, Tac G9, FD EMR
- Scan 11 Tac H4, CMD H5, Tac H6, FD EMR
- Scan 12 WS CMD, Tac H8, Tac H9, FD EMR

Conventional Channels, Not on Trunked System

APPENDIX E, PART 10, MINIMUM IMPACT SUPPRESSION TACTICS**MINIMUM IMPACT SUPPRESSION TACTICS (MIST) GUIDELINES
TABLE OF CONTENTS**

Concept	1
Goal	1
Suppression Responsibility	2
Initial/Extended Attack.....	2
Incident Commander	2
Project Fire.....	2
Type I/II Incident Commander.....	2
Responsible Line Officer.....	2
Resource Advisor	2
Implementation Guidelines	3
Hot-Line/Ground Fuels.....	3
Hot-Line/Aerial Fuels.....	3
Mop-up/Ground Fuels	4
Mop-up/Aerial Fuels	4
Logistics.....	5
Campsite Considerations	5
Personal Camp Conduct.....	6
Aviation Management	6
Aviation Use Guidelines	6
Retardant, Foam and/or Saltwater Use.....	7
Hazardous Materials.....	8
Flammable/Combustible Liquids	8
Flammable Solids.....	8
Fire Retardant/Foaming Agents	8
Fire Rehabilitation	8
Rehabilitation Guidelines.....	8
Demobilization	10
Post-Fire Evaluation.....	10
Data Collect/Document/Recommend	11
Post-Fire Evaluation Report	11
Standard Fire Orders	12
Watch Out Situations	12

CONCEPT

The concept of Minimum Impact Suppression Tactics (MIST) is to use the minimum amount of forces necessary to effectively achieve the fire management protection objectives consistent with land and resource management objectives. It implies a greater sensitivity to the impacts of suppression tactics and their long-term effects when determining how to implement an appropriate suppression response. In some cases, MIST tactics may indicate that cold trailing or wet line would be a more appropriate approach than constructed hand line. In another example, the use of an excavator may be used rather than a dozer. Individual determinations will be dependent on the specific situation and circumstances of each fire.

MIST is not intended to represent a separate or distinct classification of firefighting tactics but rather a mind set of how to suppress a wildfire while minimizing the long-term effects of the suppression action. When the term MIST is used in the GGNRA Operational FMP it reflects the above principle.

Suppression actions on all wildfires within GGNRA will be those having a minimum impact on the physical resources associated with each site. In so doing, the principle of fighting fire aggressively but providing for safety first will not be compromised.

The key challenge to the line officer, fire manager and firefighter is to be able to select the wildfire suppression tactics that are appropriate given the fire's probable or potential behavior. The guiding principle is always least cost plus loss while meeting land and resource management objectives. It is the second part of this statement which must be recognized more than it has been in the past. Appreciation of the resources, both tangible and intangible, and the elements of the visitor experience at GGNRA, may be sometimes difficult to articulate but, nevertheless, are an important component of wildland fire management. As this recognition grows, actions must be modified to accommodate a new awareness and appreciation of them.

These actions, or MIST, may result in an increase in the amount of time spent watching, rather than disturbing, a dying fire to insure it does not rise again. They may also involve additional rehabilitation measures on the site that may not have been previously employed.

When selecting an appropriate suppression response, firefighter and public safety remain the highest concern. Fire managers must also have confidence and assurance in the selected actions to be implemented – that the actions will be effective and will remain effective for the duration of the emergency situation.

GOAL

The goal of MIST is to halt or delay fire spread in order to maintain the fire within predetermined parameters while producing the least possible impact on the resource being protected. These parameters are represented by the initial attack

incident commander's size-up of the situation in the case of a new start or by the escaped fire situation analysis (EFSA) in case of an escaped fire.

It is important to consider probable rehabilitation need as a part of selecting the appropriate suppression response. Tactics that reduce the need for rehab are preferred whenever feasible.

SUPPRESSION RESPONSIBILITY

As stated previously, safety is the highest priority. All action will be anchored to the standard fire orders and watch out situations. Safety will remain the responsibility of each person involved with the incident.

Initial/Extended Attack

Incident Commander Responsibility – To understand and carry out an appropriate suppression response, which will best meet the land management objectives of the area at the least cost plus loss. Insure all forces used on the fire understand the plan for suppressing the fire in conjunction with MIST.

Keep in communication with responsible fire management or line officer to insure understanding and support of tactics being used on the fire. Evaluate and provide feedback as to the tactical effectiveness during and after fire incident.

Project Fire

Type 1/ Type 2 Incident Commander Responsibility – to carry out instructions given by the responsible line officer both verbally and through the WFSA. Establish and nurture a close dialogue with the resource advisors assigned to the fire team. Review actions on site and evaluate for compliance with land line officer direction and effectiveness at meeting fire management protection objectives.

Responsible Line Officer Responsibility – to transmit the land management objectives of the fire area to the fire team and to define specific fire management protection objectives. Periodically review the operation for compliance.

Resource Advisor Responsibility – to insure the interpretation and implementation of WFSA and other oral or written line officer direction is adequately carried out. Provide specific direction and guidelines as needed. Participate in fire team planning sessions, review incident action plans and attend daily briefings to emphasize resource concerns and management's expectations. Provide assistance in updating WFSA when necessary. Participate in incident management team debriefing and assist in evaluation of team performance related to MIST.

IMPLEMENTATION GUIDELINES

Following is a list of considerations for each fire situation. (Text in parenthesis refers to the specific FMP Mitigation Measure (MM) referenced).

Hot-Line/Ground Fuels

- Allow fire to burn to natural barriers.
- Allow fires to back into, around, or through wetlands and meadows to avoid suppression damage. (FMP MM WET-1)
- Where wetlands are used as a natural boundary to help contain a fire, the control line will be sited outside the wetland area. Trample lines (rather than dug lines) may be used if it is necessary to site the control line in a wetland. (FMP MM WET-1)
- Wetlands will be avoided to the greatest extent possible while constructing fire lines and breaks during wildfire suppression. (FMP MM WET-1)
- Resource advisors will work through the Agency Representative to inform the IC to construct fire lines outside of the habitat of the San Bruno elfin or mission blue butterflies to the greatest extent possible. If habitat areas must be used, wet lines should be used if water is available, and if not, narrow, hand-constructed lines should be considered (FMP MM SS-24 & SS30).
- Use cold-trail, wet line or combination when appropriate.
- If constructed fire line is necessary, use only width and depth to check fire spread.
- Burn out and use low impact tools like swatter or 'gunny' sack.
- Minimize bucking and cutting of trees to establish fire line; build line around logs when possible.
- Use alternative mechanized equipment such as excavators, rubber tired skidders, etc. rather than tracked vehicles. Use high pressure type sprayers to clean equipment prior to assigning equipment to the incident command in order to reduce the potential to spread noxious weeds.
- Constantly re-check cold trailed fire line.

B. Hot-Line/Aerial Fuels

- Limb vegetation adjacent to fire line only as needed to prevent additional fire spread.
- During fire line construction, cut shrubs or small trees only when necessary. Make all cuts flush with the ground.

- Minimize felling of trees and snags unless they threaten the fire line or seriously endanger workers. In lieu of felling, identify hazard trees with a lookout or flagging.
- Scrape around tree bases near fire line if it is likely they will ignite.

Mop-up/Ground Fuels

- Do minimal spading; restrict spading to hot areas near fire line.
- Cold-trail charred logs near fire line; do minimal tool scarring.
- Minimize bucking of logs to extinguish fire or to check for hotspots; roll the logs instead if possible.
- Return logs to original position after checking and when ground is cool.
- Refrain from making bone yards; burned and partially burned fuels that were moved should be returned to a natural arrangement.
- Consider allowing large logs to burn out. Use a lever rather than bucking to manage large logs that have to be extinguished.
- Except in emergency situations, water drafting from park streams and creeks that support salmonids must be halted when water levels drop to a level that could result in disconnected pools of water in the channel. Any water pumping from salmonid streams will require measures to prevent injury to fish, such as using offstream sumps, restricting approach velocities to less than 0.8 foot per second, and screening at intake with openings no greater than 0.25 inch. (FMP MM SS-11)
- Use gravity socks in stream sources and/or a combination of water blivits and fold-a-tanks to minimize impacts to streams.
- Consider using infrared detection devices along perimeter to reduce risk.
- Personnel should avoid using rehabilitated fire lines as travel corridors whenever possible because of potential soil compaction and possible detrimental impacts to rehab work, i.e. water bars.

Mop-up/Aerial Fuels

- Remove or limb only those fuels which if ignited have potential to spread fire outside the fire line.
- Before felling consider allowing ignited tree/snag to burn itself out. Ensure adequate safety measures are communicated if this option is chosen.
- Identify hazard trees with a lookout or flagging.
- If burning trees/snags pose a serious threat of spreading fire brands, extinguish the fire with water or dirt whenever possible.

- Align saw cuts to minimize visual impacts from more heavily traveled corridors. Slope cut away from line of sight when possible.

LOGISTICS

Campsite Considerations

- Resource advisors will work through the Agency Representative to inform the IC to avoid, if feasible, staging fire suppression actions in or directly adjacent to the habitat of San Bruno elfin or mission blue butterflies (FMP MM SS-24 & SS-30).
- Coordinate with the Resource Advisor in choosing a site with the most reasonable qualities of resource protection and safety concerns.
- Evaluate short-term low impact camps such as coyote or spike versus use of longer-term higher impact camps.
- Use existing campsites whenever possible.
- New site locations should be on impact resistant and naturally draining areas such as rocky or sandy soils, or openings with heavy timber.
- Avoid camps in meadows, along streams or on lakeshores. Camps should be located at least 200 feet from water resources or other sensitive areas.
- Consider impacts on both present and future users. An agency commitment to resource values will promote those values to the public.
- Lay out the camp components carefully from the start. Define cooking, sleeping, latrine, and water supply.
- Minimize the number of trails and ensure adequate marking.
- Consider fabric ground cloth for protection in high use areas such as around cooking facilities.
- Use commercial portable toilet facilities where available. If these cannot be used a latrine hole should be used.
- Select latrine sites a minimum of 200 feet from water sources with natural screening.
- Do not use nails in trees.
- Constantly evaluate the impacts which will occur, both short and long term.

Personal Camp Conduct

- Use “leave no trace” camping techniques.
- Minimize disturbance to land when preparing bedding site. Do not clear vegetation or trench to create bedding sites.
- Use stoves for cooking, when possible. If a campfire is used limit to one site and keep it as small as reasonable. Build either a “pit” or “mound” type fire. Avoid use of rocks to ring fires.
- Use down and dead firewood. Use small diameter wood, which burns down more cleanly.
- Don’t burn plastics or aluminum – “pack it out” with other garbage.
- Keep a clean camp and store food and garbage so it is unavailable to wildlife. Ensure items such as empty food containers are clean and odor free, never bury them.
- Select travel routes between camp and fire and define clearly.
- Carry water and bathe away from lakes and streams. Personnel must not introduce soaps, shampoos or other personal grooming chemicals into waterways.

AVIATION MANAGEMENT

One of the goals is to minimize the disturbance caused by air operations during an incident.

Aviation Use Guidelines

- Maximize back haul flights as much as possible.
- Use long line remote hook in lieu of constructed helispots for delivery or retrieval of supplies and gear.
- Take precautions to insure noxious weeds are not inadvertently spread through the deployment of cargo nets and other external loads.
- Use natural openings for helispots and paracargo landing zones as far as practical. If construction is necessary, avoid high visitor use areas.
- Consider maintenance of existing helispots over creating new sites.
- Obtain specific instructions for appropriate helispot construction prior to the commencement of any ground work.
- Consider directional falling of trees and snags so they will be in a natural appearing arrangement.

- Buck and limb only what is necessary to achieve safe/practical operating space in and around the landing pad area.
- To the greatest extent possible, avoid operating aircraft below and within 500 feet of Rodeo Lagoon, Bird Island, and Bolinas Lagoon from late spring to early winter to avoid disturbance to the California brown pelican. (FMP MM SS-38)
- To avoid the spread of highly nonnative animal species (e.g., bullfrogs) and protect the habitat of federally listed threatened or endangered species, resource advisors will advise responding fire agencies of the following guidance:
 - Drawing water from freshwater bodies in GGNRA and Rodeo Lagoon should be avoided unless needed to protect life and property and there is no other feasible water source available. (FMP MM SS-4, SS-32 & SS-38)
 - Avoid drawing water from the ocean near Bird Island or Bolinas Lagoon from late spring to early winter to avoid disturbance to California brown pelicans to the greatest extent possible. (FMP MM SS-38)
 - If freshwater is drawn or scooped from water bodies in the park, it should be used on wildfires within the same watershed whenever possible. (FMP MM SS-4)
 - Ocean and bay waters are preferred water sources for fighting wildfires in the park and vicinity. (FMP MM SS-4)
 - Habitats of sensitive aquatic species, such as wetlands, and mission blue butterflies should be avoided when saltwater is used. (FMP MM SS-4)

Retardant, Foam and/or Saltwater Use

During initial attack, fire managers must weigh the non-use of retardant with the probability of initial attack crews being able to successfully control or contain a wildfire. If it is determined that use of retardant may prevent a larger, more damaging wildfire, then the manager might consider retardant use even in sensitive areas. This decision must take into account all values at risk and the consequences of larger firefighting forces' impact on the land.

- Consider impacts of water drops versus use of foam/retardant. If foam/retardant is deemed necessary, consider use of foam before retardant use.
- Determine if there restrictions on certain types of retardant.
- Foams, saltwater or other fire retardants will not be used on or near wetlands to the greatest extent possible. (FMP MM WET-2).

- Resource advisors will work through the Agency Representative to inform the IC to avoid, if feasible, using saltwater or retardant on habitat of the San Bruno elfin and mission blue butterflies. (FMP MM SS-24 & SS-30).

HAZARDOUS MATERIALS

Flammable/Combustible Liquids

- Store and dispense aircraft and equipment fuels in accordance with National Fire Protection Association (NFPA) and Health and Safety Handbook requirements.
- Avoid spilling or leakage of oil or fuel, from sources such as portable pumps, into water sources or soils.
- Store any liquid petroleum gas (propane) downhill and downwind from firecamps and away from ignition sources.

Flammable Solids

- Pick up residual fusees debris from the fire line and dispose of properly.

Fire Retardant/Foaming Agents

- Do not drop retardant or other suppressants near surface waters.
- Use caution when operating pumps or engines with foaming agents to avoid contamination of water sources.

FIRE REHABILITATION

Rehabilitation is a critical need. This need arises primarily because of the impacts associated with fire suppression and the logistics that support it. The process of constructing control lines, transport of personnel and materials, providing food and shelter for personnel, and other suppression activities has a significant impact on sensitive resources regardless of the mitigating measures used. Therefore, rehabilitation must be undertaken in a timely, professional manner.

During implementation, the resource advisor should be available for expert advice and support of personnel doing this work as well as quality control.

Rehabilitation Guidelines

- Pick up and remove all flagging, garbage, litter, and equipment. Dispose of trash appropriately.
- Clean fire pit of unburned materials and fill back in.

- Discourage use of newly established trails created during the suppression effort by covering with brush, limbs, small diameter poles, and rotten logs in a naturally appearing arrangement.
- Replace dug-out soil and/or duff and obliterate any berms created during the suppression effort.
- Resource Advisors will work through the Agency Representatives on advising the preferred techniques to use to prevent soil erosion and sedimentation of drainages. The standard for waterbar placement is presented below. Waterbar construction must be approved by the Park Resource Advisor prior to any construction as waterbars may not be the environmentally preferred solution to control erosion.

Trail Percent Grade	Maximum Spacing Ft.
6-9	400
10-15	200
15-25	100
25+	50

- Where soil has been exposed and compacted, such as in camps, on user-trails, at helispots and pump sites, scarify the top 2-4 inches and scatter with needles, twigs, rocks, and dead branches. Seed from sources other than the park will not be appropriate to use on barren areas, in order to maintain the genetic integrity of the area. It may be possible, depending on the time of year and/or possibility of a rainy period, to harvest and scatter nearby seed, or to transplant certain native vegetation.
- Blend campsites with natural surroundings, by filling in and covering latrine with soil, rocks, and other natural material. Naturalize campfire area by scattering ashes in nearby brush (after making sure any sparks are out) and returning site to a natural appearance.
- Where trees were cut or limbed, cut stumps flush with ground, scatter limbs and boles, out of sight in unburned area. Camouflage stumps and tree boles using rocks, dead woody material, fragments of stumps, bolewood, limbs, soil and fallen or broken green branches. Scattered sawdust and shavings will assist in decomposition and be less noticeable. Use native materials from adjacent, unimpacted areas if necessary.

- Remove newly cut tree boles that are visible from trails or meadows. Drag other highly visible woody debris created during the suppression effort into timbered areas and disburse. Tree boles that are too large to move should be slant cut so a minimal amount of the cut surface is exposed to view. Chopping up the surface with an axe or pulaski, to make it jagged and rough, will speed natural decomposition.
- Leave tops of felled trees attached. This will appear more natural than scattering the debris.
- Consider -- if no other alternatives are available -- helicopter sling loading rounds and tops from a disturbed site when there has been an excessive amount of bucking, limbing and topping.
- Tear out sumps or dams, where they have been used, and return site to natural condition. Replace any displaced rocks or streambed material that has been moved. Reclaim streambed to its predisturbed state, when appropriate.
- Walk through adjacent undisturbed area and take a look at your rehab efforts to determine your success at returning the area to as natural a state as possible. Good examples should be documented and shared with others!

DEMOBILIZATION

Because demob is often a time when people are tired or when weather conditions are less than ideal, enough time must be allowed to do a good job. When moving people and equipment, choose the most efficient and least impactful method to both the landscape and fire organization mission. An on-the-ground analysis of "How Things Went" will be important.

POST-FIRE EVALUATION

Post-fire evaluation is important for any fire occurrence so management can find out how things went. Identify areas needing improvement, to formulate strategies and to produce quality work in the future. This activity is especially important in sensitive areas due to their fragility and inclination to long-term damage by human impacts.

Resource advisors and functional specialists such as park ecologists, hydrologists, fire management staff and rangers will be responsible for conducting the post-fire evaluation. They are the people who have the experience and knowledge to provide information required to make the evaluation meaningful and productive.

Post-fire evaluation by Burn Area Response Team (BAER) will begin during the suppression effort. An emergency stabilization plan will be completed within 7 days of the date of fire containment per 620 DM 3.

DATA COLLECTION/DOCUMENTATION/RECOMMENDATIONS

This phase will be completed by a review of the rehab plan and visit to the fire site as soon after demobilization as possible. An inventory of comps and helispots will be completed. This will also include an objective overview of other areas covered by the rehab plan.

Observations will be documented in a brief report to the line officer with a copy to the appropriate incident commander. In the report, the evaluator will include recommendations for ensuing fire suppression activities on similar lands. It is important that the evaluator recognize and commend the initial attack forces or overhead team for positive activities. Make special note of the extra efforts and sensitivity to suppression impacts.

STANDARD FIRE ORDERS**FIRE BEHAVIOR**

1. Keep informed on the fire weather conditions and forecasts.
2. Know what your fire is doing at all times.
3. Base all actions on current and expected behavior of the fire.

FIRELINE SAFETY

4. Determine escape routes and safety zones and make them known.
5. Post lookouts where there is possible danger.
6. Be alert. Be calm. Think clearly. Act decisively.

ORGANIZATIONAL CONTROL

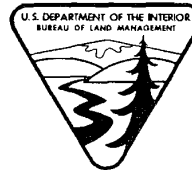
7. Maintain prompt communications with your forces, your boss and adjoining forces.
8. Give clear instructions and be sure they are understood.
9. Maintain control of your forces at all times.

IF YOU CONSIDER 1 – 9, THEN

10. Fight fire aggressively, having provided for safety first.

WATCH OUT SITUATIONS

1. Fire not scouted and sized up.
2. In country not seen in daylight.
3. Safety zones and escape routes not identified.
4. Unfamiliar with weather and local factors influencing fire behavior.
5. Uninformed on strategy, tactics and hazards.
6. Instructions and assignments not clear.
7. No communication link with crew members/supervisor.
8. Constructing fire line without safe anchor point.
9. Building fire line downhill with fire below.
10. Attempting frontal assault on fire.
11. Unburned fuel between you and the fire.
12. Cannot see main fire, not in contact with anyone who can.
13. On a hillside where rolling material can ignite fuel below.
14. Weather is getting hotter and drier.
15. Wind increases and/or changes direction.
16. Getting frequent spot fires across line.
17. Terrain and fuels make escape to safety zone difficult.
18. Taking a nap near the fireline.



WILDLAND FIRE SITUATION ANALYSIS

Wildland Fire Situation Analysis (WFSA) is a decision-making process in which the Agency Administrator or representative describes the situation, establishes objectives and constraints for the management of the fire, compares multiple strategic wildland fire management alternatives, evaluates the expected effects of the alternatives, selects the preferred alternative, and documents the decision. The format and level of detail required is dependent on the specific incident and it's complexity. The key is to document the decision.

WFSA INITIATION

FIRE NAME

JURISDICTION(S)

DATE AND TIME INITIATED

WFSA COMPLETION/FINAL REVIEW

THE SELECTED ALTERNATIVE ACHIEVED DESIRED OBJECTIVES ON (DATE/TIME):

THE SELECTED ALTERNATIVE DID NOT ACHIEVE THE DESIRED OBJECTIVES AND A NEW WFSA WAS PREPARED ON (DATE/TIME):

AGENCY ADMINISTRATOR OR REPRESENTATIVE SIGNATURE:

WFSA INSTRUCTIONS

Section I. WFSA Information Page

The Agency Administrator completes this page.

- I.A. Jurisdiction(s): Assign the agency that have or could have fire protection responsibility, e.g., USFWS, Forest Service, BLM, etc.**
- I.B. Geographic Area: Assign the recognized "Geographic Coordination Area" in which the fire is located, e.g., Northwest, Northern Rockies, etc.**
- I.C. Unit: Designate the local administrative unit, e.g., Hart Mountain Refuge Area, Flathead Indian Reservation, etc.**
- I.D. WFSA #: Identify the number assigned to the most recent WFSA for this fire.**
- I.E. Fire Name: Self-explanatory.**
- I.F. Incident Number: Identify the agency number assigned to the fire, e.g., BOD 296, BNF 001.**
- I.G. Accounting Code: Insert the local unit's accounting code.**
- I.H. Date/Time Prepared: Self-explanatory.**
- I.I. Attachments: Check here to designate attachments used in the completion of the WFSA. "Other" could include data or models used in the development of the WFSA. Briefly describe the "other" items used.**

I. WILDLAND FIRE SITUATION ANALYSIS**A. JURISDICTION(S):****B. GEOGRAPHIC AREA:****C. UNIT(S):****D. WFS#:****E. FIRE NAME:****F. INCIDENT #:****G. ACCOUNTING CODE:****H. DATE/TIME PREPARED:****I. ATTACHMENTS:**

- COMPLEXITY MATRIX/ANALYSIS¹**
- RISK ASSESSMENT¹**
- PROBABILITY OF SUCCESS¹**
- CONSEQUENCES OF FAILURE¹**
- MAPS¹**
- DECISION TREE²**
- FIRE BEHAVIOR PROJECTIONS¹**
- CALCULATIONS OF RESOURCE REQUIREMENTS¹**
- OTHER (SPECIFY)**

¹ Required² Required by the USFS

Section II. Objectives and Constraints

The Agency Administrator completes this page.

II.A. Objectives: Specify criteria that should be considered in the development of alternatives.

Safety objectives for firefighters, aviation, and public must receive the highest priority, Suppression objectives must relate to resource management objectives in the unit resource management plan.

Economic objectives could include closure of all portions of an area, thus impacting the public, or impacts to transportation, communication and resource values.

Environmental objectives could include management objectives for airshed, water quality, wildlife, etc.

Social objectives could include any local attitudes toward fire or smoke that might affect decisions on the fire, safety, etc.

Other objectives might include legal or administrative constraints which would have to be considered in the analysis of the fire situation, such as the need to keep the fire off other agency lands, etc.

II.B. Constraints: List constraints on wildland fire action. These could include constraints to designated wilderness, wilderness study areas, environmentally or culturally sensitive areas, irreparable damage to resources or smoke management/air quality concerns. Economic constraints such as public and Agency cost could be considered here.

II. OBJECTIVES AND CONSTRAINTS

A. OBJECTIVES (must be specific and measurable):

1. **SAFETY:**
Public

Firefighter

2. **ECONOMIC:**

3. **ENVIRONMENTAL:**

4. **SOCIAL:**

5. **OTHER:**

B. CONSTRAINTS:

Section III. Alternatives

The FIRE MANAGER/and or INCIDENT COMMANDER complete(s) this page.

- III.A. Wildland Fire Management Strategy: Briefly describe the general wildland fire strategies for each alternative. Alternatives must meet resource management plan objectives.**
- III.B. Narrative: Briefly describe each alternative with geographic names, locations, etc., that would be used when implementing a wildland fire strategy. For example, "Contain within the Starvation Meadows' watershed by the first burning period".**
- III.C. Resources Needed: Resources listed must be reasonable to accomplish the tasks described in Section III.B. It is critical to also look at the reality of the availability of these needed resources.**
- III.D. Estimated Final Fire Size: Estimated final size for each alternative at time of containment.**
- III.E. Estimated Contain/Control Date: Estimates for each alternative shall be made based on predicted weather, fire behavior, resource availability and the effects of wildland fire management efforts.**
- III.F. Cost: Estimate all fire costs for each alternative. Consider mopup, rehabilitation, and other costs as necessary.**
- III.G. Risk Assessment: Probability of success/Consequences of failure: Describe probability as a % and associated consequences for success and failure. Develop this information from models, practical experience or other acceptable means. Consequences described will include fire size, days to contain, days to control, costs and other information such as park closures and effect on critical habitat. Include fire behavior and long-term fire weather forecasts to derive this information.**
- III.H. Complexity: Assign the complexity rating calculated in the Guide for Assessing Fire Complexity.**
- III.I. Maps: A map for each alternative must be prepared. The map shall be based on the "Probability of success/Consequences of Failure" and include other relative information.**

III. ALTERNATIVES			
	A	B	C
A. WILDLAND FIRE STRATEGY:			
B. NARRATIVE:			
C. RESOURCES NEEDED: HANDCREWS ENGINES DOZERS AIRTANKERS HELICOPTERS			
D. ESTIMATED FINAL FIRE SIZE:			
E. ESTIMATED CONTAIN/ CONTROL DATE			
F. COSTS:			
G. RISK ASSESSMENT: PROBABILITY OF SUCCESS/ CONSEQUENCES OF FAILURE			
H. COMPLEXITY:			
I. ATTACH MAPS FOR EACH ALTERNATIVE			

Section IV. Evaluation of Alternatives

The Agency Administrator(s), FMO and/or Incident Commander(s) completes this page.

IV.A. Evaluation Process: Conduct an analysis for each element of each objective and each alternative. Objective shall match those identified in section II.A. Use the best estimates available and quantify whenever possible. Provide ratings for each alternative and corresponding objective element. Fire effects may be negative, cause no change or may be positive. Examples are: 1) a system which employs a "-" for negative effect, a "0" for no change, and a "+" for positive effect; 2) a system which uses a numeric factor for importance of the consideration (soils, watershed, political, etc.) and assigns values (such as -1 to +1, -100 to +100, etc.) to each consideration, then arrives at a weighted average. If you have the ability to estimate dollar amounts for natural resource and cultural values this data is preferred. Use those methods which are most useful to managers and most appropriate for the situation and agency. To be able to evaluate positive fire effects, the area must be included in the resource management plan and be consistent with prescriptions and objectives of the Fire Management Plan.

Sum Of Economic Values: Calculate for each element the net effect of the rating system used for each alternative. This could include the balance of: pluses (+) and minuses (-), numerical rating (-3 and +3), or natural and cultural resource values in dollar amounts. (Again resource benefits may be used as part of the analysis process when the wildland fire is within a prescription consistent with approved Fire Management Plans and in support of the unit's Resource Management Plan.)

IV. EVALUATION OF ALTERNATIVES			
A. EVALUATION PROCESS	A	B	C
SAFETY Firefighter Aviation Public			
Sum of Safety Values			
ECONOMIC Forage Improvements Recreation Timber Water Wilderness Wildlife Other (specify)			
Sum of Economic Values			
ENVIRONMENTAL Air Visual Fuels T & E Species Other (specify)			
Sum of Environmental Values			
SOCIAL Employment Public Concern Cultural Other (Specify)			
Sum of Social Values			
OTHER			

Section V. Analysis Summary

The Agency Administrator(s), FMO and/or Incident Commander(s) complete this page.

- V.A. Compliance with Objectives:** Prepare narratives that summarize each alternative's effectiveness in meeting each objective. Alternatives that do not comply with objectives are not acceptable. Narratives could be based on effectiveness and efficiency. For example: "most effective and least efficient", "least effective and most efficient", "or "effective and efficient". Or answers could be based on a two-tiered rating system such as "complies with objective" and "fully complies with or exceeds objective". Use a system that best fits the manager's needs.
- V.B. Pertinent Data:** Data for this section has already been presented and is duplicated here to help the Agency Administrator(s) confirm their selection of an alternative. Final Fire Size is displayed on page three, section III.D. Complexity is calculated in the attachments and displayed on page three, section III.H. Costs are displayed on page three, section III.F. Economic Values have been calculated and displayed on page four. Probability of Success/Consequences of Failure are calculated in the attachments and displayed on page three, section III.G.
- V.C. External and Internal Influences:** Assign information and data occurring at the time the WFSA is signed. Identify the Preparedness Index (1 through 5) for the National and Geographic levels. If available, indicate the Incident Priority assigned by the MAC group. Designate the Resource Availability status. This information is available at the Geographic Coordination Center and needed to select a viable alternative. Designate "yes" indicating an up-to-date weather forecast has been provided to, and used by, the Agency Administrator(s) to evaluate each alternative. Assign information to the "other" category as needed by the Agency Administrator(s).

Section VI. Decision

Identify the alternative selected. Must have clear and concise rationale for the decision, and a signature with date and time. Agency Administrator(s) signature is mandatory.

V. ANALYSIS SUMMARY			
ALTERNATIVES	A	B	C
A. COMPLIANCE WITH OBJECTIVES: SAFETY ECONOMIC ENVIRONMENTAL SOCIAL OTHER			
B. PERTINENT DATA: FINAL FIRE SIZE COMPLEXITY COST RESOURCE VALUES PROBABILITY of SUCCESS CONSEQUENCES of FAILURE			
C. EXTERNAL/INTERNAL INFLUENCES: NATIONAL AND GEOGRAPHIC PREPAREDNESS LEVEL _____ INCIDENT PRIORITY _____ RESOURCE AVAILABILITY _____ WEATHER FORECAST (LONG-RANGE) _____ FIRE BEHAVIOR PROJECTIONS _____			

VI. DECISION
The selected alternative is: RATIONALE:

AGENCY ADMINISTRATOR SIGNATURE _____

DATE/TIME _____

Section VII. Daily Review

The Agency Administrator(s), or designate complete(s) this page.

The date, time and signature of reviewing officials are reported in each column for each day of the Incident. The status of Preparedness Level, Incident Priority, Resource Availability, Weather Forecast, and WFSA Validity is completed for each day reviewed. Ratings for the Preparedness Level, Incident Priority, Resource Availability, Fire Behavior, and Weather Forecast are addressed on page five, section V.C. Assign a “yes” under “WFSA Valid” to continue use of this WFSA. A “no” indicates this WFSA is no longer valid and another WFSA must be prepared or the original revised.

APPENDIX E, PART 12, INCIDENT COMPLEXITY ANALYSIS: TYPES 5, 4 AND TRANSITION TO TYPE 3

If you have checked "Yes" on 3 to 5 of the analysis boxes, consider requesting the next level of incident management support.		
Incident Complexity Analysis (Type 3, 4, 5)		
Fire Behavior	Yes	No
Fuels extremely dry and susceptible to long-range spotting or you are currently experiencing extreme fire behavior.		
Weather forecast indicating no significant relief or worsening conditions.		
Current or predicted fire behavior dictates indirect control strategy with large amounts of fuel within planned perimeter.		
Firefighter Safety		
Performance of firefighting resources affected by cumulative fatigue.		
Overhead overextended mentally and/or physically.		
Communication ineffective with tactical resources or dispatch.		
Organization		
Operations are at the limit of span of control.		
Incident action plans, briefings, etc. missing or poorly prepared.		
Variety of specialized operations, support personnel or equipment.		
Unable to properly staff air operations.		
Limited local resources available for initial attack.		
Heavy commitment of local resources to logistical support.		
Existing forces worked 24 hours without success.		
Resources unfamiliar with local conditions and tactics.		
Values to be protected		
Urban interface; structures, developments, recreational facilities, or potential for evacuation.		
Fire burning or threatening more than one jurisdiction and potential for unified command with different or conflicting management objectives.		
Unique natural resources, special-designation areas, critical municipal watershed, T&E species habitat, cultural value sites.		
Sensitive political concerns, media involvement, or controversial fire policy.		
Release Date: January 2007		

APPENDIX E, PART 13, REDBOOK COMPLEXITY ANALYSIS**Guide to Completing the Incident Complexity Analysis.
(Type 1, 2)**

- If positive responses exceed, or are equal to, negative responses within any primary factor (A through G), the primary factor should be considered as a positive response.
- If any three of the primary factors (A through G) are positive responses, this indicates the fire situation is or is predicted to be of Type 1 complexity.
- Factor H should be considered after numbers 1–3 are completed. If more than two of the items in factor H are answered yes, and three or more of the other primary factors are positive responses, a Type 1 team should be considered. If the composites of H are negative, and there are fewer than three positive responses in the primary factors (A-G), a Type 2 team should be considered. If the answers to all questions in H are negative, it may be advisable to allow the existing overhead to continue action on the fire.

Incident Complexity Analysis Type 1 & 2	YES	NO
A. Fire Behavior (Observed or Predicted)		
1. Burning index (from on-site measurement of weather conditions) predicted to be above the 90% level using the major fuel model in which the fire is burning.		
2. Potential exists for extreme fire behavior (fuel moisture, winds, etc.).		
3. Crowning, profuse or long-range spotting.		
4. Weather forecast indicating no significant relief or worsening conditions.		
Total		
B. Resources Committed		
1. 200 or more personnel assigned.		
2. Three or more divisions.		
3. Wide variety of special support personnel.		
4. Substantial air operation which is not properly staffed.		
5. Majority of initial attack resources committed.		
Total		

Incident Complexity Analysis Type 1 & 2	YES	NO
C. Resources Threatened		
1. Urban interface.		
2. Developments and facilities.		
3. Restricted, threatened, or endangered species habitat.		
4. Cultural sites.		
5. Unique natural resources, special-designation areas, wilderness.		
6. Other special resources.		
Total		
D. Safety		
1. Unusually hazardous fireline construction.		
2. Serious accidents or fatalities.		
3. Threat to safety of visitors from fire and related operations.		
4. Restrictions and/or closures in effect or being considered.		
5. No night operations in place for safety reasons.		
Total		
E. Ownership		
1. Fire burning or threatening more than one jurisdiction.		
2. Potential for claims (damages).		
3. Different or conflicting management objectives.		
4. Disputes over suppression responsibility.		
5. Potential for unified command.		
Total		
F. External Influences		
1. Controversial fire policy.		
2. Pre-existing controversies/relationships.		
3. Sensitive media relationships.		
4. Smoke management problems.		
5. Sensitive political interests.		
6. Other external influences.		
Total		
G. Change in Strategy		
1. Change in strategy to control from confine or contain		
2. Large amounts of unburned fuel within planned perimeter.		
3. WFSA invalid or requires updating.		

Incident Complexity Analysis Type 1 & 2	YES	NO
Total		
H. Existing Overhead		
1. Worked two operational periods without achieving initial objectives.		
2. Existing management organization ineffective.		
3. Overhead overextended mentally and/or physically.		
4. Incident action plans, briefings, etc. missing or poorly prepared.		
Total		
Release Date: January 2008		

APPENDIX E, PART 14, MINIMUM REQUIREMENT DECISION GUIDE

ARTHUR CARHART
NATIONAL WILDERNESS TRAINING CENTER*"Fostering interagency excellence in wilderness stewardship"*

MINIMUM REQUIREMENTS DECISION GUIDE

Process Outline 2008

Step 1: Determine if any administrative action is necessary

First, describe the situation that may prompt action and describe why it is a problem or issue.

Then, answer the following questions to determine if administrative action is necessary in wilderness:

A. Options Outside of Wilderness - Is action necessary within wilderness ?

B. Valid Existing Rights or Special Provision of Wilderness Legislation - Is action necessary to satisfy valid existing rights or a special provision in wilderness legislation (the Wilderness Act of 1964 or subsequent wilderness laws) that allows consideration of the Section 4(c) prohibited uses?

C. Requirements of Other Legislation - (ESA, ARPA, NHPA, Dam Safety Act, Clean Air Act, etc.) - Is action necessary to meet the requirements of other laws?

D. Other Guidance - Is action necessary to conform to direction contained in agency policy, unit and wilderness management plans, species recovery plans, or agreements with tribal, state and local governments or other federal agencies?

E. Wilderness Character - Is action necessary to preserve one or more of the qualities of wilderness character including: ***untrammelled, undeveloped, natural, outstanding opportunities for solitude or a primitive and unconfined type of recreation***, or unique components that reflect the character of this wilderness area?

F. Public Purposes of Wilderness - Is action necessary to support one or more of the public purposes for wilderness (as stated in Section 4(b) of the Wilderness Act) of recreation, scenic, scientific, education, conservation, and historical use?

Step 1 Conclusion: Is Administrative Action Necessary?

If action is necessary, proceed to Step 2 to determine the minimum activity which least impacts the wilderness resource and character.

Step 2: Determine the *minimum* activity

A. Description of Alternative Action - For each alternative, describe what methods and techniques will be used, when the action will take place, where the action will take place and what mitigation measures are necessary.

Alternatives considered should include one with the use of the suggested prohibited equipment or facilities, one with none of the Section 4 (c) prohibitions, and, if possible one with a mix of prohibited and non-prohibited uses. Alternatives should be “feasible” and creative.

B. Alternative Comparison - For each alternative, describe effects based on:

- Wilderness Character
 - Untrammelled
 - Undeveloped
 - Natural
 - Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation
- Heritage and Cultural Resources
- Maintaining Traditional Skills
- Special Provisions
- Safety of personnel, visitors, and contractors
- Economics and Time Constraints
- Additional wilderness-specific Criteria.

➤ Include mitigation (timing, location, frequency, design standards, etc.)

Step 2 Decision: What is the Minimum Activity?

- Identify the selected alternative.
- Describe the rationale for selecting this alternative, based on law and policy criteria.
- Describe any monitoring and reporting requirements.

Approvals and NEPA analysis - Follow agency guidelines.

Reporting – Follow agency requirements

Refer to the MRDG [Instructions](#), and [Worksheets](#) for more information.



ARTHUR CARHART NATIONAL WILDERNESS TRAINING CENTER
2008

MINIMUM REQUIREMENTS DECISION GUIDE

WORKSHEETS

“ . . . except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act...”

– the Wilderness Act, 1964

Please refer to the accompanying MRDG [Instructions](#) for filling out this guide.
The spaces in the worksheets will expand as necessary as you enter your response.

Step 1: Determine if any administrative action is necessary.

<p>Description: Briefly describe the situation that may prompt action.</p>

To determine if administrative action is necessary, answer the questions listed in A - F on the following pages.

A. Describe Options Outside of Wilderness

Is action necessary within wilderness?

Yes: No:

Explain:

B. Describe Valid Existing Rights or Special Provisions of Wilderness Legislation

Is action necessary to satisfy valid existing rights or a special provision in wilderness legislation (the Wilderness Act of 1964 or subsequent wilderness laws) that allows consideration of the Section 4(c) prohibited uses? Cite law and section.

Yes: No: Not Applicable:

Explain:

C. Describe Requirements of Other Legislation

Is action necessary to meet the requirements of other laws?

Yes: No: Not Applicable:

Explain:

D. Describe Other Guidance

Is action necessary to conform to direction contained in agency policy, unit and wilderness management plans, species recovery plans, or agreements with tribal, state and local governments or other federal agencies?

Yes: No: Not Applicable:

Explain:

E. Wilderness Character

Is action necessary to preserve one or more of the qualities of wilderness character including: untrammelled, undeveloped, natural, outstanding opportunities for solitude or a primitive and unconfined type of recreation, or unique components that reflect the character of this wilderness area?

Untrammelled: **Yes:** **No:** **Not Applicable:**

Explain:

Undeveloped: **Yes:** **No:** **Not Applicable:**

Explain:

Natural: **Yes:** **No:** **Not Applicable:**

Explain:

Outstanding opportunities for solitude or a primitive and unconfined type of recreation:

Yes: **No:** **Not Applicable:**

Explain:

Other unique components that reflect the character of this wilderness:

Yes: **No:** **Not Applicable:**

Explain:

F. Describe Effects to the Public Purposes of Wilderness

Is action necessary to support one or more of the public purposes for wilderness (as stated in Section 4(b) of the Wilderness Act) of recreation, scenic, scientific, education, conservation, and historical use?

Recreation: **Yes:** **No:** **Not Applicable:**

Explain:

Scenic: **Yes:** **No:** **Not Applicable:**

Explain:

Scientific: **Yes:** **No:** **Not Applicable:**

Explain:

Education: **Yes:** **No:** **Not Applicable:**

Explain:

Conservation: **Yes:** **No:** **Not Applicable:**

Explain:

Historical use: **Yes:** **No:** **Not Applicable:**

Explain:

Step 1 Decision: Is any administrative action necessary in wilderness?

Yes: **No:** **More information needed:**

Explain:

If action is necessary, proceed to Step 2 to determine the minimum activity.

Step 2: Determine the minimum activity.

Please refer to the accompanying MRDG [*Instructions*](#) for an explanation of the effects criteria displayed below.

Description of Alternatives

For each alternative, describe what methods and techniques will be used, when the activity will take place, where the activity will take place, what mitigation measures are necessary, and the general effects to the wilderness resource and character.

Alternative # _____

Description:

Effects:

Wilderness Character

“Untrammeled”

“Undeveloped”

“Natural”

“Outstanding opportunities for solitude or a primitive and unconfined type of recreation”

Heritage and Cultural Resources

Maintaining Traditional Skills

Special Provisions

Safety of Visitors, Personnel, and Contractors

Economic and Time Constraints

Additional Wilderness-specific Comparison Criteria

Step 2 Decision: What is the Minimum Activity?

Please refer to the accompanying MRDG Instructions before describing the selected alternative and describing the rationale for selection.

Selected alternative:

Rationale for selecting this alternative:

Monitoring and reporting requirements:

Check any Wilderness Act Section 4(c) uses approved in this alternative:

- | | |
|---|--|
| <input type="checkbox"/> mechanical transport | <input type="checkbox"/> landing of aircraft |
| <input type="checkbox"/> motorized equipment | <input type="checkbox"/> temporary road |
| <input type="checkbox"/> motor vehicles | <input type="checkbox"/> structure or installation |
| <input type="checkbox"/> motorboats | |

Record and report any authorizations of Wilderness Act Section 4(c) uses according to agency procedures.

Approvals	Signature	Name	Position	Date
Prepared by:				
Recommended:				
Recommended:				
Approved:				

ARTHUR CARHART NATIONAL WILDERNESS TRAINING CENTER
2008

MINIMUM REQUIREMENTS DECISION GUIDE

INSTRUCTIONS

“ . . . except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act...”

– the Wilderness Act, 1964

Introduction

The Minimum Requirements Decision Guide (MRDG) is designed to assist wilderness managers in making appropriate decisions for wilderness. These instructions refer to completing the MRDG [Worksheets](#). More information about the background of the MRDG and its appropriate uses can be found in the [Overview](#). Please also refer to your agency policies and other guidance in [Agency Guidelines](#) for more direction on how and when to use the MRDG.

Use of this document assumes familiarity with the Wilderness Act, other relevant legislation, and agency policy.

The MRDG is derived from Section 4.(c) of the Wilderness Act and involves two steps. Step 1 determines whether action is **necessary**. If action is necessary, then Step 2 provides guidance for determining the **minimum** activity.

Worksheet Instructions

Step 1: Determine if any administrative action is necessary

Description: Briefly describe the situation. This should not be a description of a possible method or tool, but rather of the situation that prompts the possible need for action. This step should **not** be used to justify use of motorized equipment or mechanical transport, or to approve placement of a structure, facility, or temporary road. In wilderness, the appropriate administrative response may be no action at all.

Correct Examples of description	Incorrect examples of description
An administrative cabin is deteriorating	Need to restore the administrative cabin
A request is received for access into a valid, existing mining claim	Need to build a temporary road for mining claim access.
Blown down trees are blocking trails	Need to use chainsaws to clear the blown down trees
Lack of information on a wildlife species	Need to land a helicopter to survey population
Fire alters wildlife habitat	Need to re-seed area to maintain wildlife habitat
A trail bridge has washed out	Need to replace the washed out bridge, using mules for supplies
Riverbank erosion is destabilizing a pioneer cabin listed on the National Historic Register	Need to sling-load rock gabions to stop erosion
Lack of information on air quality in Class I wilderness air shed	Need to set up air quality monitoring station in wilderness
Invasive species present	Need to use motorized sprayer to treat invasives

A. Options Outside of Wilderness

Is action necessary within wilderness ?

Examples of administrative action that might be explored outside wilderness include:

- Putting up nest boxes or conducting wildlife surveys outside wilderness boundaries.
- Surveying visitors about user conflicts at the trailhead or visitor center, rather than on the trail or at their wilderness campsite
- Locating trail destination and distance signs can be located at trailheads outside wilderness (unless already determined by agency policy).
- Locating monitoring or other administrative structures outside wilderness.

B. Valid Existing Rights or Special Provisions of Wilderness Legislation

Is action necessary to satisfy valid existing rights or a special provision in wilderness legislation (the Wilderness Act of 1964 or subsequent wilderness laws) that allows consideration of the Section 4(c) prohibited uses? Cite law and section.

If there is special provision language (e.g. maintenance of dams and water storage facilities with motorized equipment and mechanical transport, control of fire, insects and disease, access to private lands, etc), whether in the Wilderness Act of 1964 or subsequent designation legislation, consideration of some actions may be required even though they would otherwise be prohibited. The exact reference to the legislation is needed in this box. Examples include:

- Existence of public use cabins and subsistence use and access in Wilderness (Alaska National Interest Lands Conservation Act of 1980, P.L. 96-487, Sec. 1315.(c)).
- Use of motorboats of ten horsepower or less in the Okefenokee Wilderness (Wilderness Act of 1964, P.L. 88-577, Sec. 4.(d)(1); Okefenokee Wilderness Act of 1974, P.L. 93-430, Sec.2).

Some Valid Existing Rights or the provisions of special legislation may be satisfied by an option outside wilderness. Such possibilities would likely reduce impacts to the wilderness resource and character and should be explored.

C. Requirements of Other Legislation

Is action necessary to meet the requirements of other laws ?

Laws not directly concerned with wilderness (such as the Endangered Species Act or National Historic Preservation Act) may influence the need for actions in Wilderness. In some instances, the administrator is asked to satisfy the requirements of multiple laws. For example:

- Recovery of an endangered species dependent on wilderness ecosystems (Endangered Species Act).
- Treatment of a site listed on the National Register of Historic Places (National Historic Preservation Act).

Apparent conflicts between the Wilderness Act and other legislation may require innovative approaches. Not all apparent conflicts are genuine. The requirements of all applicable laws must be met.

D. Other Guidance

Is action necessary to conform to direction contained in agency policy, unit and wilderness management plans, species recovery plans, or agreements with tribal, state and local governments or other federal agencies?

Review guidance for conformance and carefully consider the context of the guidance, plan or agreement. Plans developed using a NEPA analysis are decisions that provide stronger guidance than plans developed with less public or interdisciplinary involvement. Examples include:

- A programmatic decision to treat invasive weeds has already been addressed in a unit level plan that included wilderness. No decision was made regarding the method of treatment.
- The need for bridges, fords, or in-stream structures has been addressed in a listed fish species recovery plan. The plan does not dictate the type of structure, method of construction, or tools required.

Even if relevant programmatic decisions have already been made that satisfy Step 1 of the MRDG, both Step 1 and Step 2 should be completed to determine the minimum administrative activity.

E. Wilderness Character

Is action necessary to preserve one or more of the qualities of wilderness character including: untrammeled, undeveloped, natural, outstanding opportunities for solitude or a primitive and unconfined type of recreation, or unique components that reflect the character of this wilderness area?

Explain how taking action in wilderness is necessary to preserve wilderness character. If there is no need to take action to preserve character explain how taking action may impair one or more of the qualities of wilderness character.

Section 2.(a) of the Wilderness Act directs us to manage wilderness areas for the preservation of their wilderness character. Similar direction is repeated in Section 4.(b). It is recommended that particular attention is paid to the general guidance in the Wilderness Act, as outlined in the boxes on Page 2 of the [Overview](#), and to agency policy. In addition, at least four major components of wilderness character* are mentioned in Section 2.(c) of the Wilderness Act. These are:

“Untrammeled” – Wilderness is ideally unhindered and free from modern human control or manipulation. We strive to have areas where wild nature is allowed to “run free.”

“Undeveloped” – Wilderness retains its primeval character and influence, and is essentially without permanent improvement or human occupation. It provides a contrast with other areas where humans and their work dominate the landscape.

One of the purposes of the Wilderness Act is “...to assure that ...expanding settlement and growing mechanization, does not occupy and modify all areas...”. Structures, installations, and the use of tools which make it easier for modern humans to occupy and modify the land (e.g., motorized equipment and mechanical transport) are limited.

“Natural” – Wilderness ecological and evolutionary systems are substantially free from the effects of modern civilization. Changes in wilderness areas should be the result of natural conditions.

“Outstanding opportunities for solitude or a primitive and unconfined type of recreation” – Wilderness provides opportunities for people to encounter experiences such as natural sights and sounds, solitude, freedom, risk, and the physical and emotional challenges of self-discovery and self-reliance.

In some cases, a particular quality of wilderness character may not be applicable to a proposed action because there would be no change as a result of taking action. For example, replacing an existing trail bridge does not increase or decrease the number of structures and there would be no change to the undeveloped quality of wilderness character. Similarly use of a chainsaw to clear a trail has no effect on wilderness being unhindered or un-manipulated and therefore does not apply to the untrammeled quality of wilderness character.

An example of an action that would preserve or impair certain qualities of wilderness character is treatment to control non-native invasive weeds:

Untrammeled: Weed treatment would impair the untrammeled quality because the action, even if necessary, is an intentional human caused manipulation of “the earth and its community of life”.

Undeveloped: Weed treatment is not applicable to this quality unless motorized equipment or mechanical transport is to be used. In that case, assess the effects of implementing specific alternatives in Step 2.

Natural: Weed treatment improves naturalness and helps preserve this quality.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation: Weed treatment is largely not applicable to this quality. Any enhancement of opportunities for primitive recreation that result from weed eradication is because of the contribution to preserving naturalness.

The potential loss of opportunities for solitude or primitive recreation due to workers using motorized sprayers or other methods may be an impairment of this quality. The effects of implementing specific alternatives should be determined in Step 2.

* This list of wilderness character components is not comprehensive. For a detailed discussion of wilderness character refer to the U.S. Forest Service, Rocky Mountain Research Station, General Technical Report, RMRS-GTR-151: [Monitoring Selected Conditions Related to Wilderness Character: A National Framework](#). Other components can be defined that are of particular importance and reflect the character of your wilderness.

F. The Public Purposes of Wilderness

Is action necessary to support one or more of the public purposes for wilderness (as stated in Section 4(b) of the Wilderness Act) of recreation, scenic, scientific, education, conservation, and historical use?

Identify which of the public purposes are applicable to the issue and then describe how they apply. For example:

Trail bridge replacement.

- Recreation Purpose – Considering whether there is a need to replace an existing trail bridge is consistent with the Recreation public purpose of wilderness.
- Explanation – A trail bridge, as part of the trail system which provides for recreation visitor access, may be considered a necessary structure in wilderness if needed to address safety or resource protection needs.

Air quality monitoring station

- Scientific Purpose – Considering whether there is a need for an installation in wilderness to monitor air quality is consistent with the Scientific public purpose of wilderness.
- Explanation – Gathering information about wilderness use and the effects of outside forces on wilderness may be needed to assist in the management of wilderness.

Commercial cabin rental program

- Recreation purpose - Considering a commercial proposal for a cabin rental program in wilderness is not consistent with the Recreation purpose of wilderness.
- Explanation - Section 4.(c) prohibits commercial enterprise in wilderness.

Step 1 Decision: Is any administrative action necessary? Evaluate the responses made to all questions in Step 1 and determine whether there is a need to proceed to Step 2 and why. If the responses indicate adverse impacts to the wilderness resource and character, document whether there is sufficient reason to proceed to Step 2.

It is possible that at this point more information will be needed in order to ascertain if administrative action is needed. In rare instances, it may be useful to continue with Step 2 to evaluate the benefits and effects of alternatives in order to help determine if any administrative action is necessary.

Step 2: Determine the minimum activity.

Description of Alternatives

For each alternative, describe what methods and techniques will be used, when the activity will take place, where the activity will take place, what mitigation measures are necessary, and the general effects to the wilderness resource and character.

The description of alternatives and effects varies by the complexity of the activity. Identify and describe a full range of feasible alternatives, including necessary mitigation measures that represent the various activities and the methods and tools that could be used. Include a "No Action" alternative to allow for a comprehensive comparison of effects. Complete a form for each alternative being considered.

Compare the potential effects of each alternative on the wilderness resource and character by describing the effects of implementation using the criteria below. This list is not all-inclusive, and other criteria which address the special features or unique character of each wilderness should be developed as needed. Use the criteria for comparing the effects of each applicable phase of the activity including design, construction, management, removal, or restoration.

Alternative Comparison Criteria

Wilderness Character

Describe the effects of each alternative on the preservation of wilderness character in terms of the four qualities listed below. Determine if there will be effects that will prevent the wilderness from remaining unimpaired for the future use and enjoyment as wilderness.

“Untrammeled”

Discuss the degree to which the components or processes of ecological systems are intentionally controlled or manipulated.

“Undeveloped”

Identify how “the imprint of man’s work will remain substantially unnoticeable” and wilderness will continue to be in contrast to other areas of “growing mechanization.” Include the effects of the use of any motorized equipment, mechanical transport, structures or installations on maintaining the undeveloped quality of wilderness character.

“Natural”

Describe the potential for protection, impairment, or restoration of natural conditions (air, water, soil, wildlife, fish, plants, etc.) including endangered, threatened, or rare species, natural biological diversity, and self-regulating ecosystems.

Discuss effects related to protecting natural conditions within the regional landscape (i.e. insects, disease, or non-native species).

“Outstanding opportunities for solitude or a primitive and unconfined type of recreation”

Identify how opportunities for visitors to experience solitude or a primitive and unconfined type of recreation will be protected or impaired.

Describe the effects that will be noticeable to the visitor and that could affect their experience in wilderness. Include effects on visitors from the use of motorized equipment, mechanical transport, landing of aircraft, structures, or installations.

Heritage and Cultural Resource

Describe any effects on protection or management of historic or pre-historic artifacts, sites, structures, or landscapes.

Maintaining Traditional Skills

Explain how the alternative helps maintain proficiency in the use of primitive and traditional skills, non-motorized tools, and non-mechanical travel methods.

Special Provisions

Explain how the special provisions or rights (grazing, mining, water developments, access to non-federal land, etc.) identified in the Wilderness Act (Sections 4 and 5) or subsequent legislation, are managed to minimize impairment to the wilderness resource and character.

Safety of Visitors, Personnel, and Contractors

Describe any safety concerns associated with implementing the alternative on agency personnel, volunteers, and/or contractors and identify hazards that cannot be addressed through training and use of protective equipment.

Identify any potential public safety hazards resulting from implementation of the alternatives.

Economic and Time Constraints

Describe the costs and the amount of time it will take for implementation of the alternative.

Explain how each alternative satisfies any significant timing requirements or identified need for urgency based on protection of the wilderness resource and character.

Note - while administrative activities should always be accomplished with economic efficiency, neither the cost nor the time required for implementation are the over riding factors for administrative use of otherwise prohibited activities.

Additional Wilderness-specific Comparison Criteria

Identify any other decision factors that are relevant to the unique characteristics and special features of this wilderness.

Step 2 Decision: What is the minimum activity?

Select the alternative that represents the minimum requirements necessary to administer the areas as wilderness.

Describe the rationale for selecting it. The selected alternative must conform to law and agency policy and explain why the use of motorized equipment, mechanical transportation, structures, or installations is the minimum necessary requirement.

List any monitoring or reporting requirements.

Track and report the number and type of authorizations by checking the box for each Section 4.(c) use that is included in the selected alternative. Your agency may require additional reports.

Approvals

Depending on agency policy, include the signatures of the administrator who has the authority to approve Section 4.(c) uses or other activities included in the decision, and sign the MRDG. Check your agency policy and consult with your regional or state wilderness program managers to determine the current policy.

APPENDIX E, PART 15

EXAMPLE OF DELEGATION OF AUTHORITY FORM

Fire Management Plan

Delegation of Authority Golden Gate National Recreation Area

As of *[Time]* *[Date]*, I have delegated authority to manage the *[Fire Name]*, *[Fire Number]*, at Golden Gate National Recreation Area, to *[IC's Name]*, the Incident Commander and *[Team Name]*, the Incident Management Team.

The *[Fire Name]* Fire, which originated on *[Date]* is burning in the *[Location]*. My considerations for management of this fire are:

1. Provide for firefighter and public safety.
2. Manage the fire with as little environmental damage as possible. The guide to Minimum Impact Suppression Tactics (MIST) is attached.
3. Key cultural features *[list here]*
requiring priority protection
are: _____
4. Key resource considerations *[list here]*
are: _____
5. Restrictions for suppression
actions include: *[list here]* _____
6. Minimum tools for use are: *[list here]* _____
7. My agency Resource Advisor *[list here]*
will be: _____
8. Manage the fire cost-effectively for the values at risk.
9. Provide training opportunities for the resources area personnel to strengthen our organizational capabilities.
10. Minimum disruption of visitor use consistent with public safety.

Signature and Title of Agency Administrator Date

Amendment to Delegation of Authority (if appropriate)

The Delegation of Authority dated *[Date]*, issued to *[Name of IC]* for the management of the *[Fire Name]* Fire, *[Fire Number]*, is hereby amended as follows. This will be effective at *[Time]*, *[Date]*.

[Text of Amendment here].

Signature and Title of Agency Administrator Date

APPENDIX E, PART 16 BRIEFING CHECKLIST TEMPLATE

FIRE MANAGEMENT PLAN GOLDEN GATE NATIONAL RECREATION AREA BRIEFING CHECKLIST TEMPLATE

Situation

Fire name, location, map orientation, other incidents in the area
Terrain influences
Fuel type and conditions
Fire weather (previous, current, and expected)
Winds, RH, temperature, etc.
Fire behavior (previous, current and expected)
Time of day, alignment of slope and wind, etc.

Mission/Execution

Command
Incident commander/immediate supervisor
Commander's intent
Overall strategy/objectives
Specific tactical assignments
Contingency plans

Communications

Communication plan
Tactical, command, air-to-ground frequencies
Cell phone numbers
Medivac plan

Service/Support

Other resources
Working adjacent and those available to order
Aviation operations
Logistics
Transportation
Supplies and equipment

Risk Management

Identify known hazards and risks
Identify control measures to eliminate hazards/reduce risk
Anchor point and LCES
Identify trigger points for disengagement/re-evaluation of operational plan

Questions or Concerns?

APPENDIX E, PART 17, BRIEFING TO THE INCIDENT MANAGEMENT TEAM**Agency Administrator's Briefing to Incident Management Team – Page 1/7**

GENERAL INFORMATION
Name of Incident:
Type of Incident:
Incident Start Date:
Approximate Size of Incident:
Location:
Time:
Cause:
General Weather Conditions:
Local Weather or Behavioral Conditions:
Land Status:
Local Incident Policy:
Resource Values Threatened:
Private Property or Structures Threatened:
Capability of Unit to Support Team (Suppression and Support Resources):
Agency:
Agency Administrator's Representative:

Agency Administrator's Briefing to Incident Management Team – Page 2/7			
INCIDENT COMMAND (IC) AND TRANSITION			
Name of Current Incident Commander:			
Incident Type (circle one):			
Type 3	Type 2	Type 1	
Date and Time Team will Assume Command:			
Recommended Local Participation in IMT Organization			
Current IC and Staff Roles Desired after Transition:			
Other Incidents in Area:			
Other Command Organizations (Unified/Area/MAC):			
Local Emergency Operations Center (EOC) Established:			
Trainees Authorized:			
Legal Considerations (Investigations in Progress):			
Known Political Considerations:			
Sensitive Residential and Commercial Developments:			
Resource Values:			
Cultural/Archaeological Sites:			
Roadless, Wilderness Areas			
Other Unique Suppression Considerations:			
Local Social/Economic Considerations:			
Private Representatives such as timber, utility, railroads, environmental groups:			

Agency Administrator's Briefing to Incident Management Team – <u>Page 3/7</u>
Incident Review Team Assigned (FAST, Audit, Other):
Name of Incoming Incident Commander:
Name of Agency Administrator:
Local Community Public Affairs Contact(s):
Agency Public Affairs Contact:
Other Contacts:
Unit FMO:
Expanded Dispatch
Other Dispatch:
SAFETY INFORMATION
Accidents and Injuries to Date:
Condition of Local Personnel:
Known Hazards:
Injury and Accident Reporting Procedures:
PLANNING SECTION/GENERAL INFORMATION
Access to Fax and Copy Machines:
Access to Computers and Printers:
Existing Pre-Attack Plans:
Other Nearby Incidents Influencing Strategy/Tactics/Resources:

Agency Administrator's Briefing to Incident Management Team – <u>Page 4/7</u>
Training Specialist Assigned or Ordered:
Training Considerations:
SITUATION UNIT
General Weather Conditions/Forecasts:
Fire Behavior:
Local Unusual Fire Behavior and Fire History in Area of Fire:
Fuel Type(s) at Fire:
Fuel Type(s) Ahead of Fire:
RESOURCES UNIT/REFER TO ATTACHED RESOURCE ORDERS
Personnel on Incident (General):
Equipment on Incident (General):
Resources on Order (General):
Incident Demobilization Procedures:
OPERATIONS SECTION
Priorities for Control, Wildland Fire Situation Analysis Approved:
Current Tactics:
Incident Accessibility by Engines and Ground Support:
AIR OPERATIONS
Air Tactical Group Supervisor:
Air tankers Assigned:

Agency Administrator's Briefing to Incident Management Team – <u>Page 5/7</u>		
Effectiveness of Air tankers:		
Air Base:		
Telephone:		
LOGISTICS SECTION/FACILITIES UNIT		
ICP/Base Pre-Plans:	Yes	No
ICP/Base Location:		
Catering Service/Meals Provided:		
Shower Facilities:		
Security Considerations:		
Incident Recycling:		
SUPPLY UNIT		
Duty Officer or Coordinator Phone Number:		
Expanded Dispatch Organization:		
Supply System to be Used (Local Supply Cache):		
Single Point Ordering:		
LOGISTICS SECTION/COMMUNICATIONS		
National Radio Cache System on Order:	Yes	No
Type:		
Local Network Available:	Yes	No
Temporary:		

Agency Administrator's Briefing to Incident Management Team – <u>Page 6/7</u>		
Cell Phone Cache Available:	Yes	No
Landline Access to ICP:	Yes	No
Local Telecom Technical Support:		
GROUND SUPPORT UNIT		
Route to ICP/Base:		
Route From ICP/Base to Fire:		
Medical Unit:		
Nearest Hospital or Desired Hospital:		
Nearest Burn Center, Trauma Center:		
Nearest Air Ambulance:		
FINANCE SECTION		
Name of Incident Agency Administrative Representative:		
\		
Name of Incident Business Advisor (If Assigned):		
Agreements and Annual Operating Plans in Place:		
Jurisdictional Agencies Involved:		
Need for Cost Share Agreement:		
COST UNIT		
Fiscal Considerations:		
Cost Collection or Trespass:		
Management Codes in Use:		

Agency Administrator's Briefing to Incident Management Team – <u>Page 7/7</u>
PROCUREMENT UNIT
Buying Team in Place or Ordered:
Contracting Officer Assigned:
Copy of Local Service and Supply Plan Provided:
Is All Equipment Inspected and Under Agreement?
Emergency Equipment Rental Agreements:
COMPENSATION/CLAIMS UNIT
Potential Claims:
Status of Claims/Accident Reports:
TIME UNIT
Payroll Procedure Established for T&A Transmittal:

APPENDIX E, PART 18: Prescribed Fire Plan Template

A standardized, reproducible template form for the Prescribed Fire Plan development process is included in this appendix. A standardized format is provided for the Prescribed Fire Plan in PDF. An electronic version editable in Word is also available. Users should prepare the plan using the electronic version.

In the electronic Word version, the Project Name and/or Unit Name should be entered in the document's header which will automatically appear on each following page of the plan.

To insert information into the document's header:

1. Double-click in the header region (upper region of each page displayed on the screen).
2. Type Project and/or Unit information.
3. Double-click *outside* the header region in the body of the document.

You may also access the header under **View > Headers and Footers**. This will open the header region for edits automatically. After entering the information, go again to **View > Headers and Footers** which will return you to being able to enter information into the body of the document.

PRESCRIBED FIRE PLAN

ADMINISTRATIVE UNIT(S): _____

PRESCRIBED FIRE NAME: _____

PREPARED BY: _____ DATE: _____

Name & Qualification

TECHNICAL REVIEW BY: _____ DATE: _____

Name & Qualification

COMPLEXITY RATING: _____

APPROVED BY: _____ DATE: _____

Agency Administrator

Project Name: _____

Unit Name: _____

ELEMENT 2: AGENCY ADMINISTRATOR PRE-IGNITION APPROVAL CHECKLIST

Instructions: The Agency Administrator's Pre-Ignition Approval is the intermediate planning review process (i.e. between the Prescribed Fire Complexity Rating System Guide and Go/No-Go Checklist) that should be completed before a prescribed fire can be implemented. The Agency Administrator's Pre-Ignition Approval evaluates whether compliance requirements, Prescribed Fire Plan elements, and internal and external notifications have been or will be completed and expresses the Agency Administrator's intent to implement the Prescribed Fire Plan. If ignition of the prescribed fire is not initiated prior to expiration date determined by the Agency Administrator, a new approval will be required.

YES	NO	KEY ELEMENT QUESTIONS
		Is the Prescribed Fire Plan up to date? <i>Hints: amendments, seasonality.</i>
		Will all compliance requirements be completed? <i>Hints: cultural, threatened and endangered species, smoke management, NEPA.</i>
		Is risk management in place and the residual risk acceptable? <i>Hints: Prescribed Fire Complexity Rating Guide completed with rational and mitigation measures identified and documented?</i>
		Will all elements of the Prescribed Fire Plan be met? <i>Hints: Preparation work, mitigation, weather, organization, prescription, contingency resources</i>
		Will all internal and external notifications and media releases be completed? <i>Hints: Preparedness level restrictions</i>
		Will key agency staff be fully briefed and understand prescribed fire implementation?
		Are there any other extenuating circumstances that would preclude the successful implementation of the plan?
		Have you determined if and when you are to be notified that contingency actions are being taken? Will this be communicated to the Burn Boss?
		Other:

Recommended by: _____ Date: _____
FMO/Prescribed Fire Burn Boss

Approved by: _____ Date: _____
Agency Administrator

Approval expires (date): _____

Project Name: _____

Unit Name: _____

ELEMENT 2: PRESCRIBED FIRE GO/NO-GO CHECKLIST

<p>A. Has the burn unit experienced unusual drought conditions or contain above normal fuel loadings which were not considered in the prescription development? If NO proceed with checklist., if YES go to item B.</p>	YES	NO
<p>B. If YES have appropriate changes been made to the Ignition and Holding plan and the Mop Up and Patrol Plans? If YES proceed with checklist below, if NO STOP.</p>		

YES	NO	QUESTIONS
		Are ALL fire prescription elements met?
		Are ALL smoke management specifications met?
		Has ALL required current and projected fire weather forecast been obtained and are they favorable?
		Are ALL planned operations personnel and equipment on-site, available, and operational?
		Has the availability of ALL contingency resources been checked, and are they available?
		Have ALL personnel been briefed on the project objectives, their assignment, safety hazards, escape routes, and safety zones?
		Have all the pre-burn considerations identified in the Prescribed Fire Plan been completed or addressed?
		Have ALL the required notifications been made?
		Are ALL permits and clearances obtained?
		In your opinion, can the burn be carried out according to the Prescribed Fire Plan and will it meet the planned objective?

If all the questions were answered "YES" proceed with a test fire. Document the current conditions, location, and results

 Burn Boss

 Date

Project Name: _____

Unit Name: _____

ELEMENT 3 COMPLEXITY ANALYSIS SUMMARY

PRESCRIBED FIRE NAME			
ELEMENT	RISK	POTENTIAL CONSEQUENCE	TECHNICAL DIFFICULTY
1. Potential for escape			
2. The number and dependence of activities			
3. Off-site Values			
4. On-Site Values			
5. Fire Behavior			
6. Management organization			
7. Public and political interest			
8. Fire Treatment objectives			
9. Constraints			
10. Safety			
11. Ignition procedures/ methods			
12. Interagency coordination			
13. Project logistics			
14. Smoke management			

COMPLEXITY RATING SUMMARY	
	OVERALL RATING
RISK	
CONSEQUENCES	
TECHNICAL DIFFICULTY	
SUMMARY COMPLEXITY DETERMINATION	
RATIONALE:	

Project Name: _____

Unit Name: _____

ELEMENT 4: DESCRIPTION OF PRESCRIBED FIRE AREA

A. Physical Description

1. Location:
2. Size:
3. Topography:
4. Project Boundary:

B. Vegetation/Fuels Description:

1. On-site fuels data
2. Adjacent fuels data

C. Description of Unique Features:

ELEMENT 5: GOALS AND OBJECTIVES

A. Goals:

B. Objectives:

1. Resource objectives:
2. Prescribed fire objectives:

ELEMENT 6: FUNDING:

A. Cost:

B. Funding source:

Project Name: _____

Unit Name: _____

ELEMENT 7: PRESCRIPTION

A. Environmental Prescription:

B. Fire Behavior Prescription:

ELEMENT 8: SCHEDULING

A. Ignition Time Frames/Season(s):

B. Projected Duration:

C. Constraints:

ELEMENT 9: PRE-BURN CONSIDERATIONS

A. Considerations:

1. On Site:
2. Off Site

B. Method and Frequency for Obtaining Weather and Smoke Management Forecast(s):

C. Notifications:

Project Name: _____

Unit Name: _____

ELEMENT 10: BRIEFING

Briefing Checklist:

- Burn Organization
- Burn Objectives
- Description of Burn Area
- Expected Weather & Fire Behavior
- Communications
- Ignition plan
- Holding Plan
- Contingency Plan
- Wildfire Conversion
- Safety

ELEMENT 11: ORGANIZATION AND EQUIPMENT

A. Positions:

B. Equipment:

C. Supplies:

Project Name: _____

Unit Name: _____

ELEMENT 12: COMMUNICATION

A. Radio Frequencies

1. Command Frequency(s):
2. Tactical Frequency(s):
3. Air Operations Frequency(s):

B. Telephone Numbers:

ELEMENT 13: PUBLIC AND PERSONNEL SAFETY, MEDICAL

A. Safety Hazards:

B. Measures Taken to Reduce the Hazards:

C. Emergency Medical Procedures:

D. Emergency Evacuation Methods:

E. Emergency facilities:

ELEMENT 14 TEST FIRE

A. Planned location:

B. Test Fire Documentation:

1. Weather conditions On-Site:
2. Test Fire Results:

Project Name: _____

Unit Name: _____

ELEMENT 15: IGNITION PLAN

A. Firing Methods:

B. Devices:

C. Techniques:

D. Sequences:

E. Patterns:

F. Ignition Staffing:

ELEMENT 16: HOLDING PLAN

A. General Procedures for Holding:

B. Critical Holding Points and Actions:

C. Minimum Organization or Capabilities Needed:

ELEMENT 17: CONTINGENCY PLAN

A. Trigger Points:

B. Actions Needed:

C. Additional Resources and Maximum Response Time(s):

Project Name: _____

Unit Name: _____

ELEMENT 18: WILDFIRE CONVERSION

A. Wildfire Declared By:

B. IC Assignment:

C. Notifications:

D. Extended Attack Actions and Opportunities to Aid in Fire Suppression:

ELEMENT 19: SMOKE MANAGEMENT AND AIR QUALITY

A. Compliance:

B. Permits to be Obtained:

C. Smoke Sensitive Areas/Receptors:

D. Impacted Areas:

E. Mitigation Strategies and Techniques to Reduce Smoke Impacts:

ELEMENT 20: MONITORING

A. Fuels Information (forecast and observed) Required and Procedures:

B. Weather Monitoring Required and Procedures:

C. Fire Behavior Monitoring Required and Procedures:

D. Monitoring Required To Ensure That Prescribed Fire Plan Objectives Are Met:

Project Name: _____

Unit Name: _____

E. Smoke Dispersal Monitoring Required and Procedures:

ELEMENT 21: POST-BURN ACTIVITIES

Post-burn Activities That Must be Completed:

Project Name: _____

Unit Name: _____

APPENDICES

- A. Maps: Vicinity and Project**
- B. Technical Review Checklist**
- C. Complexity Analysis**
- D. Job Hazard Analysis**
- E. Fire Behavior Modeling Documentation or Empirical Documentation (unless it is included in the fire behavior narrative in Element 7; Prescription)**

Project Name: _____

Unit Name: _____

A: MAPS

1. Vicinity Map:

Project Name: _____

Unit Name: _____

2. Project Map:

Project Name: _____

Unit Name: _____

C. TECHNICAL REVIEWER CHECKLIST

PRESCRIBED FIRE PLAN ELEMENTS:	S /U	COMMENTS
1. Signature page		
2. GO/NO-GO Checklists		
3. Complexity Analysis Summary		
4. Description of the Prescribed Fire Area		
5. Goals and Objectives		
6. Funding		
7. Prescription		
8. Scheduling		
9. Pre-burn Considerations		
10. Briefing		
11. Organization and Equipment		
12. Communication		
13. Public and Personnel Safety, Medical		
14. Test Fire		
15. Ignition Plan		
16. Holding Plan		
17. Contingency Plan		
18. Wildfire Conversion		
19. Smoke Management and Air Quality		
20. Monitoring		
21. Post-burn Activities		
Appendix A: Maps		
Appendix B: Complexity Analysis		
Appendix C: JHA		
Appendix D: Fire Prediction Modeling Runs		
Other		

S = Satisfactory

U = Unsatisfactory

Recommended for Approval:

Not Recommended for Approval:

Technical Reviewer_____
Qualification and currency (Y/N)_____
Date

Approval is recommended subject to the completion of all requirements listed in the comments section, or on the Prescribed Fire Plan.

Project Name: _____

Unit Name: _____

C: COMPLEXITY ANALYSIS

Project Name: _____

Unit Name: _____

D. JOB HAZARD ANALYSIS

Project Name: _____

Unit Name: _____

**E. FIRE BEHAVIOR MODELING DOCUMENTATION OR EMPIRICAL
DOCUMENTATION**



BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

939 ELLIS STREET
SAN FRANCISCO, CALIFORNIA 94109
(415) 771-6000
Fax # (415) 928-0338
24-Hour Burn Status Recording (800) 792-0787

**REGULATION 5
OPEN BURNING**

NOTIFICATION FORM "C"

HAZARD REDUCTION FIRES

Please Print Legibly

BURNER AND BURN SITE INFORMATION

Property Owner(s):	Date:
Location (Street Address):	Tel: ()
City:	County:
Name of Person Setting the Fire if different:	Planned burn dates:

SPECIFIC TYPE(S) OF MATERIAL TO BE BURNED

Natural Vegetation Cleared From Around Buildings or Structures: (PRC Section 4291-related)	Quantity: () Yd ³ or () Tons
Natural Vegetation Cleared From Other Areas on Property: (Unrelated to PRC Section 4291)	Quantity: () Yd ³ or () Tons

Fires must be set or allowed by the public fire official having jurisdiction. Compliance with Regulation 5 does not relieve a person of the responsibility to know and comply with any other applicable rule, regulation, or law governing the use of fire.

BURN AUTHORIZATION (if required by local fire agency)

Authorizing Public Fire Official:	Tel: ()
Title:	Date Authorized:
Authorizing Fire Agency:	

Emergency Waivers (This section should only be completed by an authorizing public fire official to grant an emergency waiver, pursuant to Regulation 5-404.)

5-401.6 Hazardous Material – See Regulation 5 for definition.

Authorizing Public Fire Official:

Tel: ()

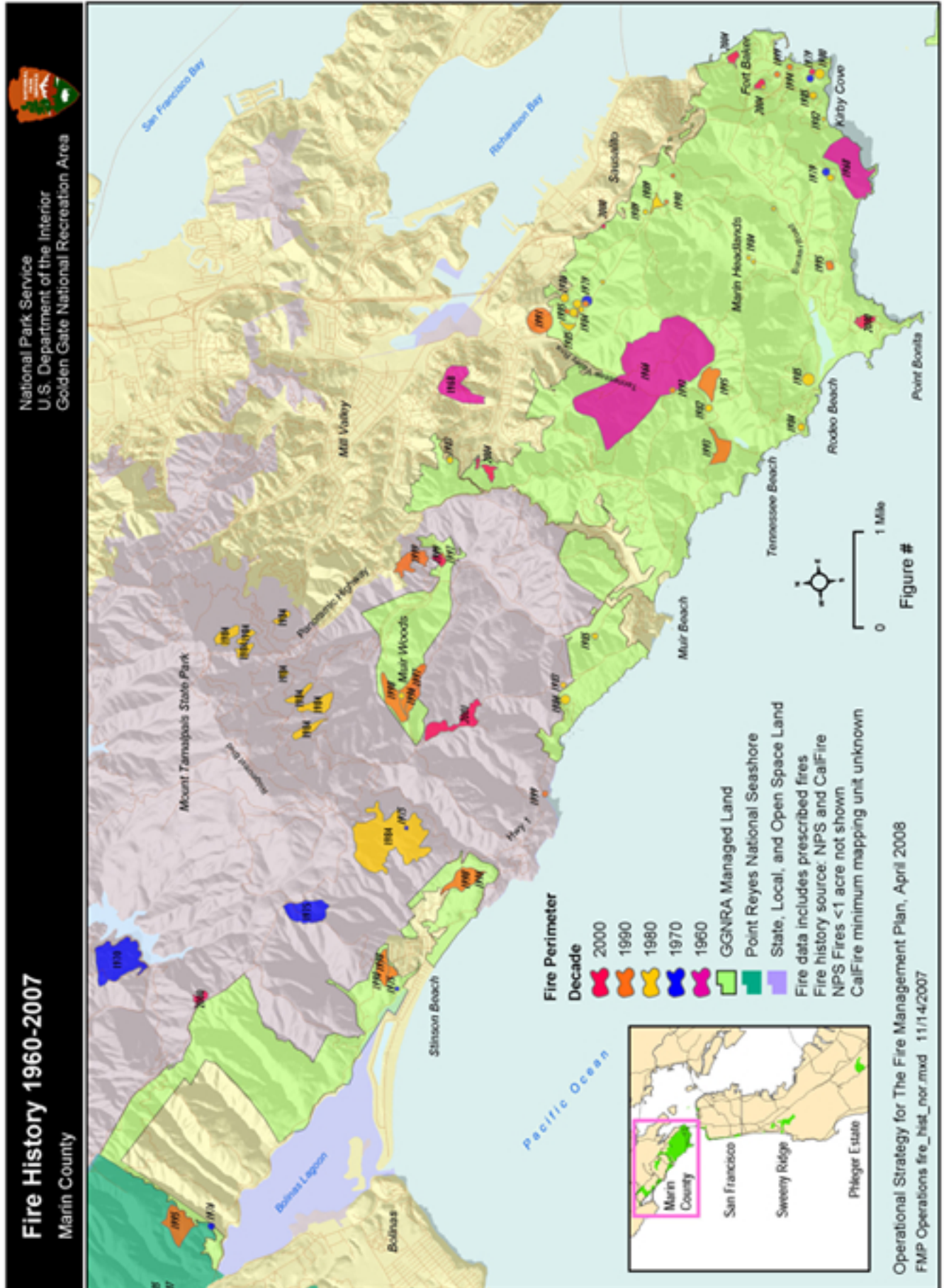
*This notification form is **not** an application for a permit. The District does **not** require a permit in order to burn. You are required to notify the District prior to burning by submitting this form. You will **not** receive a response.*

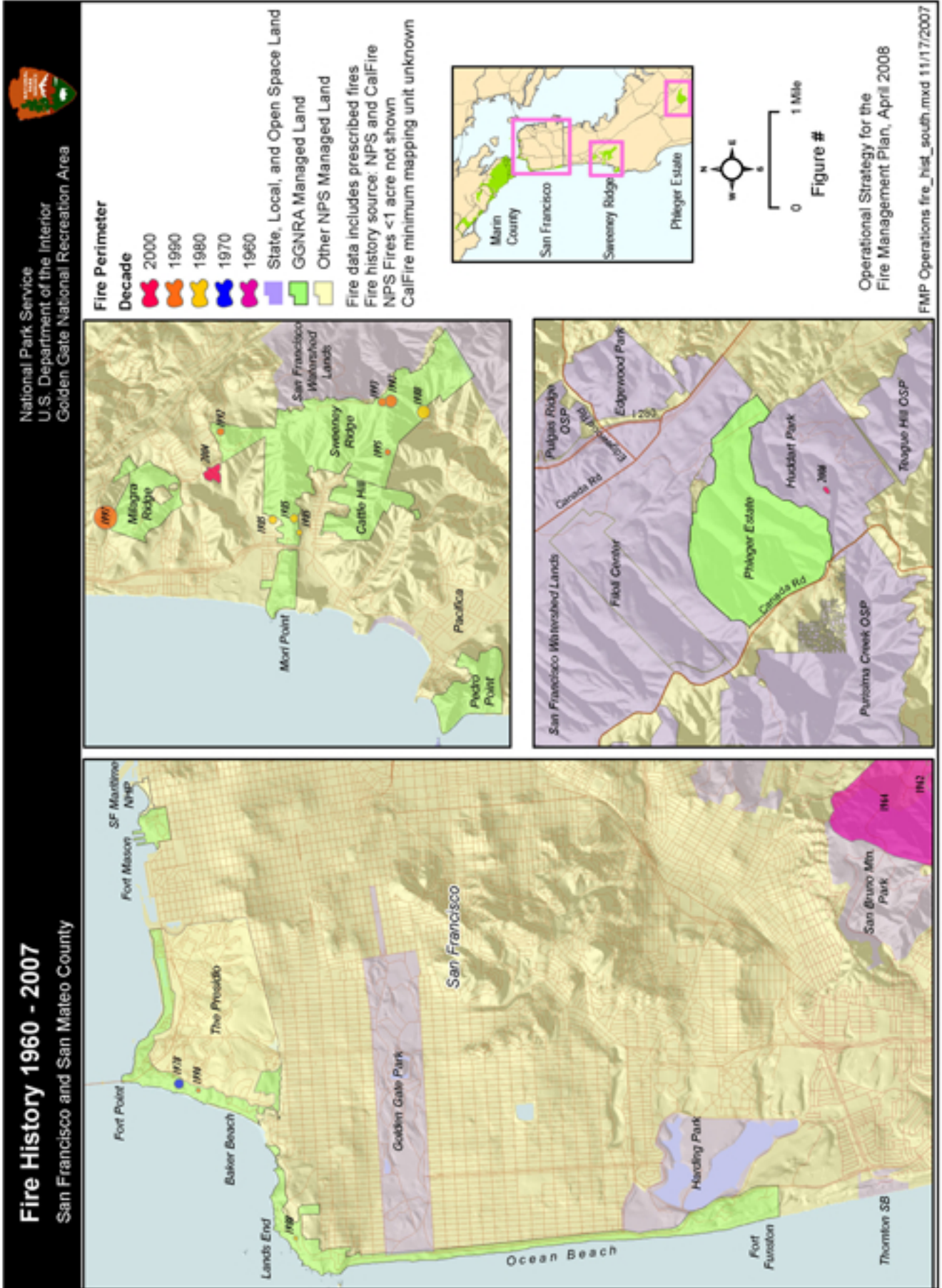
By submitting this notification, I understand and acknowledge the restrictions set forth for a Hazardous Material fire as defined in BAAQMD Regulation 5-208, "Hazardous Material."

Name:

Date:

APPENDIX E, PART 20, FMU MAPS OF PAST AND PROPOSED FMP PROJECTS





Vegetation Type	Fuel Hazard Rating (low, moderate, high, extreme)	Ignition Index (1 to 10; 1 is easy to ignite)	Key Resource Considerations	Potential Fuel Treatments	Treatment Cycle
Grassland and Herbaceous Vegetation					
Coastal Prairie Serpentine bunchgrass California Annual Grassland Ruderal Vegetation	Moderate	1 to 2	<ul style="list-style-type: none"> Special status plants Special status animals Ground nesting birds Native perennial grasslands Serpentine grassland Control of ruderal vegetation 	<ul style="list-style-type: none"> Hand labor Grazing (goats) Prescribed burn Mechanical (mowing of open fields and roadsides). 	1 to 3 years
Scrub Vegetation					
Maritime Chaparral	Extreme	6	<ul style="list-style-type: none"> Sensitive plant community Pallid manzanita Obligate seeders Nesting special status birds 	<ul style="list-style-type: none"> Hand labor Grazing (goats) Prescribed burn Mechanical (mosaic thinning with small equipment to cut selected shrubs) Chemical (Direct application of Garlon 4 limited to eucalyptus stumps). 	5 to 7 years
North Coast Scrub (Xeric and Mesic)	Xeric – Extreme Mesic – High	Xeric – 4 Mesic – 8	<ul style="list-style-type: none"> Nesting special status birds Alameda whipsnake 	<ul style="list-style-type: none"> Hand labor Mechanical (knock down shrubs or cut off tops) 	3 to 7 years
Coyote Brush Scrub	High	4	<ul style="list-style-type: none"> Special status nesting birds Alameda whipsnake 	<ul style="list-style-type: none"> Hand labor Mechanical (knock down shrubs or cut off tops) 	3 to 7 years

Vegetation Type	Fuel Hazard Rating (low, moderate, high, extreme)	Ignition Index (1 to 10; 1 is easy to ignite)	Key Resource Considerations	Potential Fuel Treatments	Treatment Cycle
Broom Scrub	High	6	<ul style="list-style-type: none"> Alameda whipsnake Control of non-native perennials 	<ul style="list-style-type: none"> Hand labor Grazing (goats) Prescribed burn Mechanical (cut broom prior to seed production) Chemical (Direct application of Garlon 4 for French broom). 	Annually
Woodlands and Forest					
Mature Eucalyptus Forest (over 5 years old)	High	1	<ul style="list-style-type: none"> Nesting raptors Wintering monarch butterflies Hummingbirds winter food source Native understory trees & shrubs 	<ul style="list-style-type: none"> Hand labor Prescribed burn Mechanical (tree removal) Chemical (Garlon 4 directly applied to stump to reduce resprouts). 	5 to 7 years
Young Eucalyptus Forest	High	2	<ul style="list-style-type: none"> Intermixed native species (shrubs & trees) 	<ul style="list-style-type: none"> Hand labor Prescribed burn (other methods required to prepare stand) Mechanical (removal of tree stumps) Chemical (Garlon 4 directly applied to stump to reduce resprouts). 	2 to 3 years
Mature Monterey Pine Forest	Moderate to High	2	<ul style="list-style-type: none"> Native understory trees and shrubs Raptor nesting 	<ul style="list-style-type: none"> Hand labor Grazing (goats) Prescribed burn (other methods required to prepare stand) Mechanical (tree removal) 	3 to 10 years

Vegetation Type	Fuel Hazard Rating (low, moderate, high, extreme)	Ignition Index (1 to 10; 1 is easy to ignite)	Key Resource Considerations	Potential Fuel Treatments	Treatment Cycle
Young Monterey Pine Forest (under 20 years old)	High	2	<ul style="list-style-type: none"> Native shrubs and trees 	<ul style="list-style-type: none"> Hand labor Prescribed burn (other methods required to prepare stand) Mechanical (tree removal) 	2 to 3 years
Oak – Bay Woodland	Low	6 to 8	<ul style="list-style-type: none"> Special status plants Animal species of special concern Nesting special status birds and raptors 	<ul style="list-style-type: none"> Hand labor Grazing (cattle, goats) Prescribed burning (other methods required to prepare stand) Mechanical (small equipment to cut selected shrubs and remove brush) 	3 to 10 years
Redwood Forest	Low	8	<ul style="list-style-type: none"> Raptor nesting 	<ul style="list-style-type: none"> Hand labor Prescribed burning (other methods required to prepare stand) Mechanical (small equipment to cut selected shrubs and remove brush) 	10 – 15 years
Riparian Woodland	Low	8	<ul style="list-style-type: none"> Regulatory restrictions Special status species (e.g. steelhead, San Francisco dusky-footed woodrat, California red-legged frog) water quality, e.g., erosion and sediment Streams and water bodies which provide aquatic habitat 	<ul style="list-style-type: none"> Hand labor 	10 to 15 years

Source: LSA Associates, Inc. Wildland Resource Management, Inc. 2007

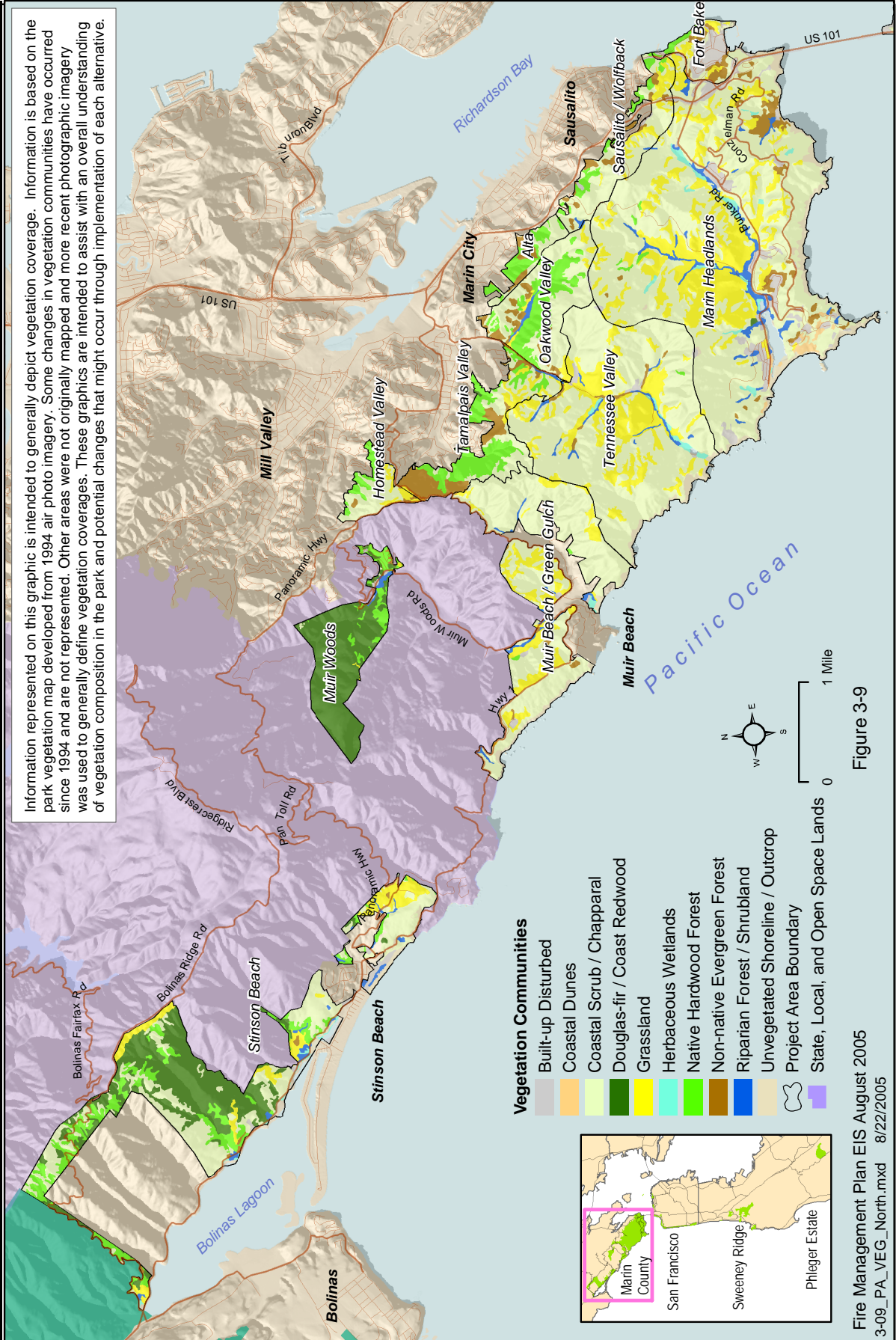


National Park Service
U.S. Department of the Interior
Golden Gate National Recreation Area

Fire Management Project Areas and Vegetation Types

Marin County

Information represented on this graphic is intended to generally depict vegetation coverage. Information is based on the park vegetation map developed from 1994 air photo imagery. Some changes in vegetation communities have occurred since 1994 and are not represented. Other areas were not originally mapped and more recent photographic imagery was used to generally define vegetation coverages. These graphics are intended to assist with an overall understanding of vegetation composition in the park and potential changes that might occur through implementation of each alternative.



- Vegetation Communities**
- Built-up Disturbed
 - Coastal Dunes
 - Coastal Scrub / Chapparal
 - Douglas-fir / Coast Redwood
 - Grassland
 - Herbaceous Wetlands
 - Native Hardwood Forest
 - Non-native Evergreen Forest
 - Riparian Forest / Shrubland
 - Unvegetated Shoreline / Outcrop
 - Project Area Boundary
 - State, Local, and Open Space Lands

Figure 3-9

Fire Management Plan EIS August 2005
3-09_PA_VEG_North.mxd 8/22/2005

