County of San Mateo
Environmental Services Agency
Parks and Recreation Department

Decision-Making Guidelines for
Vegetation Management,
San Mateo County Parks

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This report was prepared by:
May & Associates, Inc.
730 Clementina Street,
San Francisco, CA 94103
(415) 391-1000
www.mayandassociatesinc.com

CHAPTER 0. EXECUTIVE SUMMARY

The San Mateo County Parks and Recreation Division of the Environmental Services Agency (County) is seeking to improve its efforts to organize, prioritize, schedule, and efficiently implement vegetation management projects throughout the County Parks System.

This document is intended to help San Mateo County Park staff in making informed decisions about future vegetation management priorities and actions. ***This report is not a plan of action, but simply a series of guidelines to help guide future decisions about vegetation management.*** In addition, this document is intended to provide user-friendly "how to" advice to park rangers, volunteers, and others to help select vegetation management actions that are more efficient and effective.

The County Park staff will need to conduct the following actions in order to prioritize future projects and move forward to implementation:

1) **Finalize the list of projects presented in Section 4.1 (update regularly as more projects are added).**

2) **Prioritize the list of Projects by numerically scoring, then comparing the projects using the methods and selection scoring criteria presented in Section 4.2 and 4.3.**

3) **Once the top priority projects are selected, seek funding, staff time, and volunteer support necessary to implement the projects.**

4) **Use the procedures presented in this report to guide implementation in order to ensure effectiveness and standardization of results.**

5) **Repeat project prioritization regularly, typically every year or 5 years and update the list of priority projects as needed.**

This report is organized as follows:

- **Chapter 1 Presents the Purpose and Need for the Document,** and establishes overall goals and objectives for vegetation management in the San Mateo Parks system. It also details the participants and stakeholders who participated in the development of this document.

- **Chapter 2 Presents the Vegetation Management Context**, including a description of parks users and user priorities; a review of what the current park vegetation management practices are; a description from park staff of what they believe are the issues and concerns; and a regulatory framework for park projects.

- **Chapter 3 Describes the Existing Conditions at each Park,** including a general park overview of park resources (Rana 2002); a list of park-specific goals, policies, and management objectives (derived from a variety of existing planning documents); and a summary of current and ongoing activities (provided by oral interviews with park staff).

- **Chapter 4 Lists All Park Projects,** including those that are planned, or underway, and provides a method for assessing, prioritizing, and ranking park projects.

- **Chapter 5 Provides Details on Vegetation Management Techniques,** organized by subject matter, and ties the vegetation management actions back to the goals and objectives presented in Chapter 1.

- **Chapter 6 Describes Long-Term Maintenance Needs** for the entire park system.

- **Chapter 7 Provides References**, both written and personal communications, used in development of this document.

These chapters are supported by information presented in the Appendices, including:

- **Appendix A. Technical "How To" Information on Vegetation Management Techniques**;
- **Appendix B. Forms** (provides reproducible standard forms for office and field use);
- **Appendix C. Informational Brochures and Handouts**;
- **Appendix D. List of Helpful Resources** to contact for more information;
- **Appendix E. Expanded Bibliography** intended to expedite finding information in original source documents; and
- **Appendix F**. **Relevant Project Maps.**

CHAPTER 1. INTRODUCTION

The San Mateo County Parks and Recreation (County Parks) Division's mission is to preserve the County's natural and cultural treasures, and provide safe, accessible parks, recreation, and learning opportunities to enhance the community's quality of life. County Parks operates 16 separate parks, three regional trails, and numerous other county and local trails encompassing approximately 15,680 acres and serving the 707,000 population of San Mateo County (2000 census data).

The Vegetation Management Guidelines ("the Guidelines") presented in this report are intended to assist County Parks with identifying vegetation management projects critical to satisfying their mission, and then prioritizing, scheduling, and efficiently implementing the selected projects throughout the County Parks System (Parks).

This report was funded through a special grant from the Roberti-Z'Berg-Harris Urban Open Space and Recreation Program (authorized under Proposition 12), and a grant from the San Mateo County Parks and Recreation Foundation.

1.1 PURPOSE AND NEED

The Guidelines are intended to provide a field-based decision-making framework to guide implementation of County Park's mission through ongoing annual maintenance activities, as well as describe methods to prioritize special one-time projects that will increase the resource and recreational values of the Parks system over a ten year management timeframe.

Over time, shifting resource issues, funding, planning and management priorities, and varying levels of visitor use, have made it challenging for parks staff to identify and prioritize vegetation management activities within individual parks and throughout the entire park system. In large parks, issues such as recreational uses, visitor safety, resource conservation, and park facility and resource maintenance are intertwined. This document focuses primarily on means to protect and enhance the vegetative resources of the entire Park System.

This document is intended to help San Mateo County Park staff in making informed decisions about future vegetation management priorities and actions. It is important to note that this document does not provide a plan of action, but is simply a series of guidelines to help guide future decisions about vegetation management. In addition, this document is intended to provide user-friendly "how to" advice to park rangers, volunteers, and others to help select vegetation management actions that are more efficient and effective.

1.2 PROJECT GOALS

Vegetation Management Guidelines are intended to assist County Parks staff and park users with developing clear and consistent guidelines and procedures for conducting ongoing vegetation management activities and to provide tools for selecting and prioritizing future vegetation management projects.

The goals of the Guidelines are:

Goal 1: Identify Vegetation Management Issues within each Park
Some of the vegetation management issues are: fuel load reduction, sensitive species habitat restoration, non-point source pollution, invasive plant eradication, pests and plant disease, green waste management, forest management, grazing opportunities, and managing lands for recreational activities.

Goal 2: Develop Methods to Select and Prioritize Vegetation Management Activities
The evaluation system is intended to be a practical decision-making tool for use by County Parks staff to assess and re-assess vegetation management needs given an understanding of available staff and volunteer resources, and based on clearly defined, consensus-based priorities.

Goal 3: Prepare Monitoring Strategies to Evaluate Success of Vegetation Management Projects
The monitoring strategies will include defined success criteria to allow for periodic re-evaluation of priorities. In order to build efficiency into the system, monitoring for each project will include field-based decision making and adaptive management. Documenting monitoring efforts will allow the lessons learned in each project to be transferred to other members of County Parks and the conservation community as a whole.

Goal 4: Identify Opportunities for Partnering with Agencies and Community Organizations
This goal fulfills the Parks mission by providing learning opportunities and enhancing the quality of life through community involvement. Partnering with local stakeholders also helps stretch limited budgets and staffing while accomplishing ecological benefits that might not otherwise be achieved.

Goal 5: Develop Best Management Practices (BMPs) for Sensitive Species Habitats
Development of BMPs could allow for the Guidelines to be used by the County to obtain project approvals necessary under the California Environmental Quality Act (CEQA).

1.3 VEGETATION MANAGEMENT OBJECTIVES

The following are typical vegetation management objectives for recreational uses in wildland settings. Similar lists were developed by the National Park Service, State Lands, Department of Fish and Game, and other large landowners in California, and have been modified to fit the needs of San Mateo County Parks.

This list should not be considered an adopted policy of the County of San Mateo, but rather should be treated as a suggested list of vegetation management priorities that apply in most park settings. This list should be updated annually as necessary to reflect changing park management objectives.

Objective 1: Maintain Sensitive Species and Habitats

- Manage parks for overall habitat diversity;
- Implement federal and state Endangered Species Act compliance measures (e.g. San Bruno Mountain Habitat Conservation plan, any Biological Opinions related to sensitive species on park lands);
- Monitor and update records of sensitive species occurrences; and
- Implement special projects to improve sensitive species and their habitat (as funding allows), including:

- Invasive plant control projects related to sensitive species (**Example** - gorse control at San Bruno Mountain);
- Creek and other wetland improvements (**Example** - Colma Creek habitat restoration project);
- Other special projects (**Example** - Fitzgerald Marine Preserve visitor use actions).

Objective 2: Maintain Multiple Recreational Uses

- Encourage multiple recreational uses within each park;
- Manage vegetation and trails for multiple uses;
- Where problems arise between different recreational user groups, develop solutions with stakeholders that are sensitive to the various user group; and
- Include interpretive and educational components in vegetation projects as funding allows. Some examples are signs, kiosks, docent programs, school study and work programs.

Objective 3: Maintain Visitor Use and Safety

- Inspect and maintain trails annually by cutting overhanging brush, repairing erosion, and clearing culverts;
- Over time, reconfigure problem trails to reduce maintenance costs;
- Actively landscape and maintain high visitor use areas with native plants where possible); and
- Detect and remove unauthorized trails regularly, and improve overall park access and circulation patterns over time;
- Manage poison oak along trails; and
- Address homeless encampments, trespass onto park lands and other undesirable human uses.

Objective 4: Manage For "Sustained Control" of Invasive Plants over Time

- Develop and maintain a list of priority invasive plants (based on the ranking system developed by the California Invasive Plant Council (Cal-IPC);
- Coordinate with local Agricultural Commissioner, Weed Management Area and Cal-IPC to update priority invasive plant list over time, determine most effective treatments, and obtain assistance with control activities. Monitor parks annually for new introductions and treat targeted priority invasive plants;
- Manage non-target invasive plants where their presence conflicts with other management priorities; and
- Develop and maintain a GIS database of invasive plant infestations and treatments.

Objective 5: Maintain Healthy Native Plant Communities to Discourage Invasive Plant Establishment

- Minimize soil disturbance wherever possible;
- Maintain a dense cover of native plants (particularly shrubs) to discourage invasive establishment;
- Monitor parks annually for threats to native plant communities;
- Reduce park-to-park transmission of weeds by washing equipment after leaving infested areas; and

- Use seed-free rice straw for erosion control to prevent introduction of weeds.

Objective 6: Encourage Park Stewardship

- Develop long-term strategies to effectively utilize volunteer groups, neighborhood groups and individual concerned citizens;
- Encourage "Friends of" groups and include them in decision making;
- Conduct outreach via letters, handouts, and signs encouraging park users to help with park stewardship (e.g. work days, fundraising, sensitive species and weed monitoring, trail maintenance, etc.);
- Encourage good neighbor relations by developing personal relationships with park neighbors; and
- Address park boundary issues such as invasive plant encroachment from backyard gardens, fire management, domestic pet problems, trespass, and law enforcement issues as they arise.

Objective 7: Plant Site-Appropriate Native Species, Emphasizing Local Diversity

- As appropriate, use native plants for landscaping;
- When developing restoration projects, emphasize the long-term development of multi-age, multi-species habitats that mimic natural local habitat conditions; and
- Emphasize low-maintenance, low-water use plantings;
- Use native plants that have been located in the park; and
- When possible, use seeds or cuttings conducted within the park or watershed.

Objective 8: Maintain Revegetation Sites until Plantings are Established

- Establish quantitative success criteria;
- Monitor sites regularly;
- Mulch;
- Provide adequate water to plantings;
- Provide weed monitoring and removal; and
- Replace plantings as necessary to achieve successful establishment.

Objective 9: Actively Manage Forests to Reduce Fire Fuels and Increase Forest Health

- Census forests to determine hazardous fuel areas;
- Develop a GIS database of hazardous tree locations (in forested and other areas) and update it regularly;
- Thin underbrush;
- Educate adjacent landowners about the need to maintain defensible space between their properties and parklands;
- Inspect and remove hazard trees;
- Detect and treat diseased plants, contain spread of disease; and
- Manage fire breaks to decrease erosion and the spread of invasive plants.

Objective 10: Protect Watersheds from Erosion and Non-Point Source Pollutants

- Improve drainage systems, trails, and other development to reduce further degradation of erosion hazards along shorelines;
- Design trails and infrastructure to reduce erosion;

- Include Integrated Pest Management Practices into park activities;
- Control non-point source pollution and erosion control through BMP's; and
- Inspect and "storm proof" parks throughout the season, in particular prior to winter rains.

Objective 11: Implement Integrated Pest Management

- Minimize use of herbicides; and
- Use an integrated approach to managing all invasive species, plant pests and diseases.

Objective 12: Manage Habitat Conversion in Sensitive Species Habitat

- Control natural sucessional changes from grassland to shrubland at Edgewood Preserve and San Bruno Mountain to maintain sufficient butterfly habitat onsite over time (e.g. remove shrubs, encourage grassland establishment, and/or graze sites).
- Control natural sucessional changes in forests supporting marbeled murrulet at the Pescadero Park Complex.

1.4 DOCUMENTS AND STUDIES REVIEWED FOR THIS DOCUMENT

The Guidelines extracted information from a variety of planning studies and resource documents and developed related objectives based on the condition of the vegetation resource, historical context, ecological trends, and the potential contribution of community and Parks staff.

It is important to note that no attempt was made in this document to assess these documents for relative importance or applicability in the context of the current Park Management system. For the purpose of developing the comprehensive list of Park projects, all of the documents were treated as equally important. This approach was used as a starting point for discussions amongst Park staff and others as to which of the projects and policies listed in the over 90 planning documents are currently being implemented, or should be implemented under the current Park management.

Refer to Appendix E for an expanded Bibliography presented by Park and resource.

1.5 PARTICIPANTS AND STAKEHOLDERS

The Guidelines were developed in close coordination with County Park staff who operate, manage, and oversee 16 parks, three regional trails, and numerous other county and local trails encompassing approximately 15,680 acres. Because of limited staffing and funding, these dedicated staff have had to do more with less, often having to make tough management decisions related to vegetation management and park use. Volunteer groups have often stepped in to help, especially at Edgewood, San Bruno, and Fitzgerald, some of the most used Parks in the system. Other agencies have also provided assistance, both sharing technical knowledge, and sharing resources, including the U.S. Fish and Wildlife Service, California Department of Fish and Game, California Department of Forestry, local fire departments, San Mateo County Planning Department, local Supervisors, San Mateo County Agricultural Commissioner's Office, San Mateo Weed Management Area and others.

The following is a list of staff, and other participants and stakeholders who have contributed during development of this plan:

- Dave Holland, Director
- Dave Moore, Superintendent
- Gary Lockman, Superintendent
- Sam Herzberg, Senior Planner
- Jesse Gilley, Park Ranger IV
- Matt Del Carlo, Park Ranger IV
- Pam Noyer, Park Ranger IV
- Priscilla Alvarez, Park Ranger IV
- Ty Kang, Park Ranger IV
- Albert Zuker, Park Ranger III
- John Trewin, Park Ranger III
- Steve Durkin, Park Ranger III
- Doug Heisinger, Park Ranger II
- Bill Crawford, Lead Gardener
- Ron Pummer, Weed Abatement District, County Ag Commissioner
- Autumn Meisel, Thomas Reid & Associates, Inc.
- Jen Zarnoch, May & Associates, Inc.
- Joe Cannon, Heart of the Mountain
- Mark Heath, Shelterbelt Builders, Inc.

1.5.1 Interested Organizations

San Mateo County Parks enjoys the support of several dedicated and active volunteer groups that provide a wide variety of support services, including (but not limited to):

- Invasive species control;
- Trail maintenance and litter pick up;
- Sensitive species surveys (including fisheries assessments);
- Water quality monitoring;
- Park planning and grant applications;
- Docent walks and education; and
- Report writing, data collection, data entry.

Interested organizations that are particularly active in San Mateo County Parks include:

- Audubon Society
- California Native Plant Society
- Friends of Edgewood Park
- Friends of Fitzgerald Marine Reserve
- Friends of Huddart and Wunderlich
- Friends of San Bruno Mountain
- Friends of San Pedro Valley County Park
- NOAA, LIMPETS program
- San Bruno Heart of the Mountain
- San Bruno Mountain Watch

- San Francisquito Creek Watershed Coalition
- San Pedro Creek Watershed Coalition
- Volunteer Horse Patrol

1.5.2 Public Process and Citizen Concerns

The Guidelines were developed with both formal and informal public participation. Volunteers have contributed directly to individual Park's planning, providing substantial research and writing as well as hours of field help collecting data. Intimate knowledge of individual parks, as shared by individual rangers and other park staff, volunteers, and contractors has proven especially valuable.

The project team conducted several information gathering sessions, including group meetings, and email exchanges with numerous County staff, knowledgeable vegetation management specialists, community members, and others interested and involved in the project. The group meetings included the following:

- A start-up meeting and informal discussion session about the results of the literature review and the goals and objectives for the report on October 12, 2005.
- Telephone interviews with key park staff in January & February 2006.
- Informational meeting with staff from January to April 2006 to discuss outstanding issues and concerns related to plan development.
- Formal presentation of the Review Draft document to Parks Staff on April 6, 2006;
- A presentation of the Draft document to the public in May 2006;
- A working group session related to how to prioritize projects in November 2006; and
- A final presentation of the Guidelines to the Board in December 2006.

CHAPTER 2. VEGETATION MANAGEMENT CONTEXT

In order to plan for consistent vegetation management, it is important to have a clear picture of the existing management context. This chapter includes a summary of park usage, current vegetation management staffing and routine projects, and ends with a compilation of policies that direct parks vegetation management actions.

2.1 PARK USAGE

Based on the results from a 2001 survey of San Mateo County residents conducted by San Mateo County Parks and Recreation, park usage is high, with 9 out of 10 residents visiting one or more of the County Parks in 2001. The overwhelming preference of park users is passive recreational facilities (hiking and walking trails, environmental programs). Park usage studies indicate that both the Pescadero Creek/Memorial/Sam McDonald Park complex and the Fitzgerald Marine Reserve are tied for the highest visitor use. An estimated 56% of County residents polled during the 2001 survey reportedly use these Parks every year. The top ranked spending priority indicated by residents is natural resources management (e.g. protecting wildlife, watersheds, and open spaces). (Research and Consulting for Strategic Planning 2001).

These 2001 survey results give weight and importance to vegetation management activities that focus on maintaining natural resource values and trail systems.

2.2 CURRENT MAINTENANCE ISSUES AND CONCERNS

2.2.1 Current Park Department Field Staff Practices

At present, San Mateo Park Department Field Staff are divided into five units:

- **Area 1 – North County Parks (bay side of Skyline);**
- **Area 2 – South County Parks(bay side of Skyline);**
- **Area 3 – Coast Parks(ocean side of Skyline);**
- **Area 4 – Maintenance Unit(located at Coyote Point); and**
- **Area 5 – Marina.**

For Unit 1, 2, 3, and 5, there is one head ranger (a Ranger IV designation), with a maximum of eleven supporting rangers (Ranger designations of III, II or I). In addition to the Rangers, Coyote Point Marina also has one specialized position, the Assistant Harbor Master. Area 4, also referred to as the Maintenance Unit, is supervised by a Ranger IV with a support staff made up of rangers and specialized positions such as the gardening crew, electrician, equipment mechanic, and equipment operator. The maintenance functions of this Unit are described below in Section 2.2.2.

Ranger duties encompass a wide range of responsibilities. A general list of duties follows (not meant to be all inclusive):

- Coordination & Cooperation with interested parties (neighbors, volunteer groups, advocacy groups)
- Data collection
- Endangered Species Act, USFWS, CDFG, NOAA adherence
- Enforcement
- Erosion & sediment control

- Litter pickup
- Hazardous tree maintenance
- Landscaping
- Invasive vegetation maintenance
- Oversight of mowing staff, equipment operators, contractors
- Project planning and permitting
- Poison oak maintenance
- San Mateo County ordinance enforcement
- Sensitive species (plants, wildlife, habitat) protection
- Trail maintenance
- Utility maintenance
- Visitor education/interpretation
- Volunteer coordination
- Visitor safety
- Wildlife control

2.2.2 Maintenance Unit Practices

The Maintenance Unit (Area 4) works on Department-wide major projects and utilizes specialized skills to assist Park Rangers in all areas in order to maintain the parks. The gardening crew with one Lead Gardener and three gardeners, is assigned to the County Parks' Maintenance Section- Area 4. Their primary responsibilities are mowing, herbicide application, and maintenance and repair of irrigation systems, pruning, mechanical and manual removal of exotic species. In addition, the Maintenance Unit, including the equipment operator and equipment mechanic assists with other system-wide projects as staffing, funding and scheduling allows. They operate the larger equipment for annual mowing, mechanical brush mowing, and tree removal.

An organizational reassignment was completed in December 2002 that re-assigned the gardening crew staff responsibilities to a Division-wide scope, rather than focusing on one park unit. The Gardening Crew is located in Coyote Point. The Gardening Crew is responsible for the following types of specialty park-wide activities:

- Mowing of most irrigated turf (lawns);
- Maintenance, repair, and scheduling of most (but not all) irrigation systems; and
- Application and monitoring of herbicides, using approved IPMP practices.

In addition, the Gardening Crew performs the following support functions in other areas:

AREA 1 – Coyote Point, Junipero Serra, San Bruno Mountain

- Mowing – 100%
- Irrigation – 100%
- Herbicide 100%

AREA 2 – Huddart, Flood, Edgewood, Woodside Store, Wunderlich

- Mowing – 85%
- Irrigation – 0%
- Herbicide - 100%

AREA 3 – San Pedro Valley, Sanchez Adobe

- Mowing – 100%
- Irrigation - 100%
- Herbicide - 0% (Not allowed)

AREA 5 – Coyote Point Marina

- Mowing – 100%
- Irrigation – 100%
- Herbicide 100%

2.2.3 General Park Practices

The Park staff as a whole (i.e. all Park Units) conducts the following types of activities:

Mowing. Park staff utilize a centralized mowing program for irrigated turf areas that uses gardening staff members with oversight from Park Rangers. They use on-site mowers and mowers transported by trailer. Park staff currently maintains irrigated turf areas such as ball fields and picnic areas at the following units:

- Coyote Point Park and Marina;
- Flood Park;
- Huddart Park;
- Edgewood Park;
- Junipero Serra Park;
- San Bruno Mountain
- San Pedro Valley;
- Sanchez Adobe;
- Wunderlich; and
- Regional trails such as Sand Hill, Crystal Springs, and Canada Road.

Other Types of Vegetation Removal. Park staff conduct knife cutting, weed-eating, andbrushcutting, in addition to localized mowing. Park staff conducts these activities at all parks to maintain non-irrigated grassy areas, trail edges, and as needed to control shrubs and other undesirable vegetation. The Equipment Operator and Mechanic/Operator also conduct mechanical vegetation removal. There is also a small "off-road vehicle crew" that use hand tools and small equipment to control vegetation in less accessible areas.

Herbicide Application. The Gardening Crew are the only ones responsible for herbicide application, except for hired contractors. The gardening crew's herbicide application is conducted using the Integrated Pest Management Guidelines developed by the Stormwater Pollution Prevention Committee, of which the Lead Gardener is a member.

The Lead Gardener is required to maintain a valid Qualified Applicators License (QAL) from the State of California Department of Pesticide Regulation. The gardening crew is required to have annual training on the safe and proper use of pesticides, including herbicides. In addition, all garden staff members are required to undergo annual medical evaluations for the pesticide being used. The emphasis of the pesticide program is the use of pre-emergent (Pendulum Aqua Cap®) and post–emergent (Roundup®) herbicides to control weed growth. Only herbicides with Category 3 "CAUTION" labels are used. Pest Control Recommendations have been obtained from a licensed Pest Control Advisor for Coyote Point Park and Marina, Flood Park, Huddart Park, Junipero Serra, Wunderlich, and

Woodside Store. Due to a variety of legal restrictions, other park units do not receive herbicide applications from the gardening crew.
The following is a brief overview of herbicide usage:

1. The Lead Gardener possesses a Qualified Applicator Certificate from the California State Department of Pesticide Regulators and maintains this certificate with continuing education hours.

2. Herbicide applicators must obtain from the County's Agricultural Department an Operator and Site Identification Number (required to purchase, store, and use herbicides).

3. The Lead Gardener sets up and conducts an annual site inspection by the County's Agricultural Department's representative.

4. The Lead Gardener conducts annual safety training for all employees involved in herbicide application.

5. The Lead Gardener reviews work requests for herbicide application at specific Management Units and obtain/prescribe Pest Control Recommendations for each site annually.

6. Herbicide Applicators follow the Pest Control Recommendations for each site.

7. Herbicide application sites are monitored for effectiveness and follow-up activities are prescribed when necessary.

Pesticide spraying is carried out with either a one hundred-gallon spray rig requiring two person operation, or a three-gallon backpack sprayer for spot treatment. All members of the gardening crew are involved. In 2004, the gardening crew applied 4,300 gallons (dilute) Roundup® and 3,700 gallons (dilute) Pendulum® at these units:

- **Coyote Point Recreation Area:** General landscape, roadways, parking lots, and poison oak control;
- **Flood Park:** General landscape defined areas in baseball fields, roadways and parking lots, picnic areas;
- **Huddart Park:** High use public areas, fences, parking lots exotic plant control, and poison oak;
- **Junipero Serra:** Picnic areas, shelter buildings, parking lots, fire control areas, poison oak, exotic ivy and broom species, and trails.
- **Woodside Store:** High use areas; and
- **Wunderlich Park:** Stump treatment, weed management.

Maintenance and Repair of Irrigation Systems. The Maintenance Unit (Area 4) is the only one responsible for repair and maintenance of irrigation systems, with the exception of Flood Park and Huddart Park, Edgewood, where the local Park staff maintain their own irrigation systems. Coyote Point Park has an extensive and complicated system that requires constant maintenance. Junipero Serra, San Bruno Mountain, and San Pedro Valley Parks irrigation systems have been retrofitted and updated by the Park staff over the last two years.

Landscape Maintenance, Pruning, Control of Invasive Plants. The gardening crews completes pruning and removal of dead and invasive plants as time allows. The Equipment Operator, in the Maintenance Unit, completes tractor mowing of fields and trail margins at all the parks noted previously. The gardeners also tractor mow fields located at Coyote Point Park and Crystal Springs Trail. The gardening crew, as part of the maintenance section, also assists with other maintenance projects and work requests in a limited number of parks, as time allows.

2.2.3. Issues and Concerns

The following information was gathered during interviews with San Mateo County Park Staff. The biggest hurdle for San Mateo County Rangers is to successfully manage all necessary aspects of their required duties is lack of staffing and lack of allotted funds. Due to the budget cutbacks in recent years, resulting in a 30% reduction of county staff, park rangers have been forced to dramatically cut back on their work, yet park management needs remain the same. Simply maintaining current park conditions (i.e. 'status quo management') takes up most staff and monetary resources. Regarding vegetation management, actively controlling invasive species infestations or possibly eradicating them is not at present a high priority. Park staff efforts are currently focused on controlling new infestations. Habitat restoration efforts are also a low priority due to lack of revegetation plans, funding for purchase of native plants, and lack of funding for major invasive plant removal (i.e. eucalyptus tree removal).

Rangers are currently forced to currently focus their resources on duties that may immediately threaten visitor safety (i.e. hazardous tree removal, poison oak control) and necessary fire hazard reduction (mowing of grasslands, creating buffers along urban interfaces). Important responsibilities and projects that are given less staffing and funding resources (or none at all) include:

- Road/trail maintenance (increasing access to park staff);
- Increased fire fuel reduction;
- Erosion control;
- Invasive species control;
- Sensitive species protection;
- Sensitive species identification & monitoring;
- Disease control (Oak Mortality Disease, root rot fungus);
- Visitor education/interpretation;
- Habitat restoration;
- Utility upgrade & maintenance;
- Master Plan implementation;
- New plan development; and
- Research and experimentation of new invasive control measures, etc.

As expected, parks and park staff that have active volunteer groups and other interested parties, (sometimes a result of sensitive species presence) are able to manage more projects (e.g., San Bruno Mountain, Edgewood, etc) than parks with minimal outside resources. Despite the best efforts of staff and dedicated volunteers, the sense among staff and the public is that the parks maintenance is not adequate to keep up with the visitor use and management needs of a modern urban park system. Many trails require ongoing maintenance to allow proper visitor circulation. Likewise, many parks require ongoing fire management and fuel reduction. Invasive species are continuing to spread, degrading the overall resource values of many of the parks.

Other staffing concerns are related to regulatory permitting and compliance- specifically, for parks where complicated or time consuming wetland or endangered species permitting or compliance is required, staff typically do not undertake the work, or select methods (such as pulling invasives by hand) that will not require permitting. One possible way to alleviate this situation is to seek programmatic permits and agreements for routine activities such as invasive plant control near wetlands, road and trail maintenance, and work in endangered species habitats and in coastal areas.

2.3 RELEVANT PLANS AND POLICIES

This section describes the existing plans and policies that may affect vegetation management activities. Over 90 documents were summarized and synthesized to help streamline vegetation and natural resource management decision-making processes. However, there is no substitute for reviewing and understanding the original source documents. The goals and policies developed for each individual Park are presented in Chapter 3.

2.3.1 General Vegetation Goals

San Mateo County General Plan (1986)

The County's General Plan Policies generally describe policies with regard to future development actions. However, some goals and policies pertain to the treatment of vegetation, although they are very general in nature and do not provide prescriptive information regarding vegetation management. The General Plan is available online at: http://www.co.sanmateo.ca.us/smc/department/esa/home/0,2151,5557771_9420293,00.html

Goal 1.1. Conserve, enhance, protect, maintain, and manage vegetative, water, fish and wildlife resources.

Goal 1.3. Protection and productive use of economically valuable vegetative, water, fish and wildlife resources: Protect the availability and encourage the productive use of the County's economically valuable vegetative, water, fish and wildlife resources in a manner that minimizes adverse environmental impacts.

Goal 1.4. Access to vegetative, water, fish and wildlife resources: Protect and promote existing rights of public access to vegetative, water, fish and wildlife resources for purposes of study and recreation consistent with the need to protect public rights, rights of private property owners and protection and preservation of such resources.

Policy 1.21. Importance of economically valuable vegetative, water, fish and wildlife resources: Consider vegetative, water, fish and wildlife resources that are economically valuable as a priority resource to be enhanced, utilized, managed and maintained for the needs of present and future generations.

San Mateo County Significant and Heritage Tree Ordinances

The County's Heritage Tree Ordinance (Section 11000) acknowledges that the County's outstanding heritage tree population has been and continues to be an invaluable asset in contributing to the economic, environmental, and aesthetic stability of the County and the welfare of its people and of future generations and, therefore, that the removal of such trees should be regulated.

The County's Significant Tree Ordinance (Section 12000) acknowledges that the County's existing and future trees and tree communities are a valuable and distinctive natural resource and, therefore, that the cutting, preservation, and replacement of such trees and tree communities should be controlled and supervised.

Both ordinances state that the Board of Supervisors has already passed legislation to regulate the commercial harvesting of forest products in this County and that these ordinances do not affect those past ordinances regarding forest harvesting.

As a general rule, a map of Significant Trees proposed for removal is submitted by the Park Rangers to the Park Planners. The map shows the location and size (in circumference or Diameter at Breast Height (DBH)) of trees to be removed. If approved for removal, trees are posted for a 10-day comment period, then removed following the 10 day waiting period if no comments are received. If comments are received, the Park staff waits an additional 10 days during which they respond to comments received before proceeding with removal or cancelling removal, as appropriate. Hazard and dead trees do not require posting. Trees are typically replaced at a ratio of 1 tree for each tree removed. Replacement trees are native trees of the same or similar species. Heritage trees are typically treated in a slightly different manner, based on species, as described in the tree ordinance, and as prescribed by Park staff.

San Mateo County Weed Management Area Memorandum of Understanding

This Memorandum of Understanding (MOU) between the San Mateo County Weed Management Area and other agencies specifies actions and guidelines for each participating agency to abide by. According to the MOU, the County Parks must identify high-risk pathways of invasive weed introduction onto park lands, coordinate the control of invasive weed infestations on park lands with the San Mateo County Agricultural Commissioner's Office, and promote and implement elements of integrated weed management to prevent the establishment and spread of invasive weeds in San Mateo County.

Local Coastal Program (LCP) Policies (1998)

This document only applies to those County Parks in the Coastal Zone, including Fitzgerald Marine Reserve and Mirada Surf. The LCP includes a substantial amount of detailed information regarding allowed uses with regard to natural resources, although most of the policies relate to development activities.

7.9 Permitted Uses in Riparian Corridors:

- Within corridors, permit only the following uses: (1) education and research, (2) consumptive uses as provided for in the Fish and Game Code and title 14 of the California Administrative Code, (3) fish and wildlife management activities, (4) trails and scenic overlooks on public land(s), and (5) necessary water supply projects.
- When no feasible or practicable alternative exists, permit the following uses: (1) stream dependent aquaculture… (2) flood control projects…(3) bridges…(4) pipelines, (5) repair or maintenance of roadways or road crossings, (6) logging operations which are limited to temporary skid trails, stream crossings…(7) agricultural uses, provided no existing riparian vegetation is removed and no soil is allowed to enter stream channels.

7.11 Establishment of Buffer Zones for Riparian Corridors:

- On both sides of riparian corridors, from the "limit of riparian vegetation" extend buffer zones 50 feet outward for perennial streams and 30 feet outward for intermittent streams.
- Where no riparian vegetation exists along both sides of riparian corridors, extend buffer zones 50 feet from the predictable high water point for perennial streams and 30 feet from the midpoint of intermittent streams.
- Along lakes, ponds, and other wet areas, extend buffer zones 100 feet from the high water point except for manmade ponds and reservoirs used for agricultural purposes for which no buffer zone is designated.

7.12 Permitted Uses in Buffer Zones for Riparian Corridors: (same as for riparian corridors, with limitation on development, agriculture, etc.).

7.16 Permitted Uses in Wetlands:

- Nature education and research.
- Fishing.
- Fish and wildlife management.
- Mosquito abatement.
- Diking, dredging and filling only if for restoration or enhancement of biological productivity.

7.18 Establishment of Buffer Zones for Wetlands: Minimum 100 feet landward from the outermost line of wetland vegetation.

7.19 Permitted Uses in Buffer Zones for Wetlands: Same as those allowed for within wetlands, but also allows public trails, scenic overlooks.

7.52 Public Agency Requirements: Require public agencies, to the point feasible, to remove the undesirable pampas grass and French, Scotch, and other invasive brooms from their lands.

Local Coastal Program Policies (1998)

7.33 Permitted Uses (within habitats of rare species):

- Permit only the following uses:
  - Education and research;
  - Hunting, fishing, pedestrian and equestrian trails that have no adverse impact on the species or its habitat; and
  - Fish and wildlife management to restore damaged habitats and to protect and encourage the survival of rare and endangered species.
- If critical habitat has been identified by FWS, permit only those uses deemed compatible by FWS.

Under the Local Coastal Policy (LCP), the County requires, and issues, a Coastal Development Permit for all development in the Coastal Zone subject to certain exemptions. As stated in Section 30106 of the Coastal Act, "development" is defined as:

"On land, in or under water, the placement or erection of any solid material or structure; discharge or disposal of any dredged material or any gaseous, liquid, solid, or thermal waste; grading, removing, dredging, mining, or extraction of any materials; change in the density or intensity of use of land, including, but not limited to, subdivision pursuant to the Subdivision Map Act (commencing with Section 66410 of

the Government Code), and any other division of land, including lot splits, except where the land division is brought about in connection with the purchase of such land by a public agency for public recreational use; change in the intensity of use of water, or of access thereto; construction, reconstruction, demolition, or alteration of the size of any structure, including any facility of any private, public, or municipal utility; and the removal or harvesting of major vegetation other than for agricultural purposes, kelp harvesting, and timber operations which are in accordance with a timber harvesting plan submitted pursuant to the provisions of the Z'berg-Nejedly Forest Practice Act of 1973 (commencing with Section 4511). As used in this section, "structure" includes, but is not limited to, any buildings, road, pipe, flume, conduit, siphon, aqueduct, telephone line, and electrical power transmission and distribution line."

The LCP includes Permitted Uses for sensitive habitats, riparian corridors, wetlands, marine and estuarine habitats, sand dunes, sea cliffs, rare and endangered species, and unique species. Permitted uses are those that are considered "resource dependent", and generally include (but are not limited to) uses such as education and research, fish and wildlife management, and trails. In addition, the LCP requires the County to encourage landowners, agencies, and farmers to actively remove weedy, undesirable plants such as pampas grass, broom, eucalyptus, and weedy thistles.

The LCP's definition of development is vague enough such that many vegetation management actions (such as activities involving grading or vegetation removal) within San Mateo County Parks located in the Coastal Zone may require a Coastal Development Permit. Therefore, any proposed activities that may meet the broad definition of "Development" as stated above, even if they are considered "permitted uses" or are required activities under the LCP, may require a Coastal Development Permit from the County (C. Kern, Pers. comm.).

We suggest that Parks within the Coastal Zone that are anticipating ongoing vegetation management action (e.g., Mirada Surf, Fitzgerald Marine) prepare a programmatic permit application. The programmatic permit application should include descriptions of the types of vegetation management activities anticipated, their extent and location, and the methods to be used in their implementation. According to the Coastal Commission, this type of programmatic permit may be granted for an extended time period (possibly for 5 years or more) with provisions for periodic renewal (C. Kern, Pers. comm.).

2.3.2 Wildlife Habitat Goals

San Mateo County General Plan (1986)

The County's General Plan Policies do not differentiate between vegetation and wildlife habitat; therefore, the goals and policies presented in Section 2.3.1 above would also apply to Wildlife Habitat Goals.

2.3.3 Forestry Goals

San Mateo County General Plan (1986)

The County's General Plan Policies do not differentiate between vegetation and forest areas; therefore, the goals and policies presented in Section 2.3.1 above would also apply to Forestry Goals.

San Mateo County Significant and Heritage Tree Ordinances

See discussion above in Section 2.3.1.

2.3.4 Sensitive Species/Habitat Goals

San Mateo County General Plan (1986)

The County's General Plan Policies generally describe policies with regard to future development actions. However, some goals and policies pertain to the treatment of sensitive species and/or habitats, although they are very general in nature and do not provide prescriptive information regarding management.

Goal 1.2. Protect sensitive habitats: Protect sensitive habitats from reduction in size or degradation of the conditions necessary for their maintenance.

Policy 1.20. Importance of sensitive habitats: Consider areas designated as sensitive habitats as a priority resource requiring protection.

2.3.5 Trails

San Mateo County Trails Plan (2001)

This document provides a large amount of information regarding trail planning, design and management for trails within San Mateo County. Many of the policies contained in this document expand upon those given in the General Plan regarding parks and recreation, but are much more detailed. In addition, trail design and management guidelines are given; although most of these pertain to the construction of new trails, some are relevant to ongoing or long-term management activities for existing trails. Only those policies and guidelines pertaining to vegetation and/or natural resource management are given below.

Policies:

6.4.1 – Locate, design and develop trail routes with sensitivity to their potential environmental, recreational and other impacts on adjacent lands, private property, and utilities. If the location of a trail is proposed in a sensitive habitat or wetland and trail use is not allowed by the San Mateo County Local Coastal Program or State Coastal Act, than an alternative trail route must be considered.

6.4.2 – Levels-of-use and types-of-use on trails shall be controlled to avoid unsafe use conditions or risk severe environmental degradation.

6.4.7 – Locate trails to recognize the resources and hazards of the areas they traverse, and to be protective of sensitive habitat areas such as estuaries, wetlands, riparian corridors, erodable soils and other areas where sensitive species may be adversely affected.

6.4.8 – Develop design guidelines to ensure that sensitive species and the habitats they rely on shall be protected, and where possible, enhanced by trail development and trail use.

6.29.4 – Develop a monitoring program for use by the lead agency in evaluating current conditions and determining whether or not new trails or trail management programs (including maintenance, reconstruction, education, and use regulations) are effective in addressing user conflicts, safety issues, and environmental impacts; recommend changes if necessary.

6.32.1 – Trails shall be temporarily closed when conditions become unsafe or environmental resources are severely impacted. Such conditions could include soil erosion, flooding, fire hazard, environmental damage, or failure to follow the specific trail management plan.

6.32.2 – Based upon trail monitoring, develop guidelines for procedures to temporarily close trails and implement steps necessary to correct problems requiring closure.

Design and Management Guidelines:

D.G 1.10.2.2 Trail Use. In special status species habitat areas, trail use levels shall be limited as appropriate to ensure protection of resources. Techniques for limiting use may include, but are not limited to:

- Physical access controls;
- Seasonal or intermittent closures; and
- Exclusion of domestic pets.

M.G.1.4.1 Reasons for Trail Closure. Reasons for trail closure include, but are not limited to (annotated list):

- During seasonal periods critical to special status species;
- During high fire season;
- When a hazardous condition exists (e.g. landslide or washout); and
- Where overuse threatens resource values.

M.G. 3.1 Maintenance Inventory. A yearly inventory of all trail maintenance, including drainage, vegetation clearing, signing, surfacing, need for graffiti removal and repair of structures, gates, fences and barriers shall be done in early spring, prior to the heavy summer use period. Based on maintenance reports done yearly at the end of summer for winterizing trails, trails shall be subject to seasonal closures or repair as warranted.

M.G. 3.3 Vegetation Management. Vegetation growth should be cleared and obstacles should be removed where necessary. Good pruning practices along trails should be followed. Ground cover plants and low shrubs should not be cleared beyond the original construction stand. The construction stand shall be defined as the trail tread width plus 1-2 feet from each side of edge of the trail tread. Invasive plants should be controlled along the trail in a timely manner.

M.G. 3.4 Vegetation Removal. Within the trail clearing limit, understory grasses and herbaceous annuals should be controlled. Mechanical removal of undesirable vegetation from the trail path shall be employed whenever possible. Mechanical removal can include hand removal or grazing. If herbicides must be used, they shall be applied, handled, and disposed of according to applicable regulation and manufacturing instructions. These chemicals shall be applied by an individual who is properly trained in their application.

M.G. 3.5 Erosion Control and Damage Repair. Corrective work for drainage or erosion problems shall be performed within a reasonable period of time. Trails shall be closed if corrective work cannot be accomplished within a reasonable time frame. If monitoring reveals that undesirable soil compaction is occurring in sensitive habitats adjacent to trails, erection of barriers or other appropriate measures (such as trail rerouting) will be employed as needed to discourage off-trail use.

M.G. 3.8 Monitoring. Periodic monitoring of known sensitive habitats near trails will be conducted to determine if unacceptable soil compaction is occurring.

M.G. 3.9 Maintenance. Maintain trails in a manner that meets defensible space and fuel modification standards. The level of maintenance should be commensurate with the level of surrounding fuel loads/topography and adjacent values at risk and meet relevant standards in effect for the specific locale.

2.3.6 Streams and Watershed Protection

San Mateo County Watershed Protection Program. (2004)
This document provides a large amount of information regarding Best Management Practices to employ throughout the County during maintenance activities to prevent water quality impairment within watersheds. The outcomes (goals) are given below for each of the maintenance activities prescribed in the document which relate to vegetation and/or natural resources.

Maintenance Activity 8.15: Stream Crossings.

- Preserve surface and sub-surface drainage characteristics.
- Minimize culvert and road-related sedimentation.
- Preserve or enable fish passage.
- Reduce sedimentation to watercourses.
- Reduce stormwater pollution.
- Reduce potential for flooding of roadways, thereby reducing potential for vehicle accidents and water pollution.

Maintenance Activity 8.17: Watercourses and Streams.

- Protect habitat and vegetation.
- Minimize damage to stream banks and adjacent facilities.
- Reduce potential sedimentation to watercourses.
- Preserve or improve habitat for aquatic species.
- Reduce potential for flooding of roadways, thereby reducing potential for vehicle accidents and water pollution.

Maintenance Activity 8.21: Vegetation Management.

- Minimize the introduction of organic material to water bodies.
- Recycle/reuse vegetative matter where practicable.
- Reduce fire hazard.
- Protect endangered and sensitive plant species.
- Protect water quality by preserving native vegetation, thereby reducing erosion/sedimentation.

- Contribute to restoration of sensitive habitats by reducing erosion/sedimentation and revegetating disturbed areas.
- Preserve and/or enhance visual resources.
- Preserve and/or enhance traffic safety by improving sight distances.

2.3.7 CEQA Categorical Exemptions Related to Vegetation Management

The following section describes California Environmental Quality Act (CEQA) Categorical Exemptions that may apply to common vegetation management activities in the County Parks. Actions listed under the exemptions would not require separate review under CEQA.

Section 15301. Existing Facilities

Class 1 exemptions apply to the operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing public or private structures, facilities, mechanical equipment, or topographical features, involving negligible or no expansion of use beyond that existing at the time of the lead agency's determination. The types of "existing facilities" itemized below are not intended to be all-inclusive of the types of projects which might fall within Class 1. The key consideration is whether the project involves negligible or no expansion of an existing use.

Examples include but are not limited to:

(c) Existing highways and streets, sidewalks, gutters, bicycle and pedestrian trails, and similar facilities (this includes road grading for the purpose of public safety).

(h) Maintenance of existing landscaping, native growth, and water supply reservoirs (excluding the use of pesticides , as defined in Section 12753, Division 7, Chapter 2, Food and Agricultural Code).

Section 15304. Minor Alterations to Land

Class 4 exemptions apply to minor public or private alterations in the condition of land, water, and/or vegetation which do not involve removal of healthy, mature, scenic trees except for forestry or agricultural purposes.

Examples include, but are not limited to:

(b) New gardening or landscaping, including the replacement of existing conventional landscaping with water efficient or fire resistant landscaping.

(i) Fuel management activities within 30 feet of structures to reduce the volume of flammable vegetation, provided that the activities will not result in the taking of endangered, rare, or threatened plant or animal species or significant erosion and sedimentation of surface waters. This exemption shall apply to fuel management activities within 100 feet of a structure if the public agency having fire protection responsibility for the area has determined that 100 feet of fuel clearance is required due to extra hazardous fire conditions.

Section 15307. Actions by Regulatory Agencies for Protection of Natural Resources

Class 7 exemptions apply to actions taken by regulatory agencies as authorized by state law or local ordinance to assure the maintenance, restoration, or enhancement

of a natural resource where the regulatory process involves procedures for protection of the environment. Examples include but are not limited to wildlife preservation activities of the State Department of Fish and Game. Construction activities are not included in this exemption.

Section 15308. Actions by Regulatory Agencies for Protection of the Environment

Class 8 exemptions apply to actions taken by regulatory agencies, as authorized by state or local ordinance, to assure the maintenance, restoration, enhancement, or protection of the environment where the regulatory process involves procedures for protection of the environment. Construction activities and relaxation of standards allowing environmental degradation are not included in this exemption.

Section 15333. Small Habitat Restoration Projects

Class 33 exemptions apply to projects not to exceed five acres in size designed to assure the maintenance, restoration, enhancement, or protection of habitat for fish, plants, or wildlife provided that:

(a) There would be no significant adverse impact on endangered, rare or threatened species or their habitat pursuant to Section 15065.

(b) There are no hazardous materials at or around the project site that may be disturbed or removed.

(c) The project will not result in impacts that are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.

(d) Examples of small restoration projects may include, but are not limited to:

(1) revegetation of disturbed areas with native plant species;

(2) wetland restoration, the primary purpose of which is to improve conditions for waterfowl or other species that rely on wetland habitat;

(3) stream or river bank revegetation, the primary purpose of which is to improve habitat for amphibians or native fish;

(4) projects to restore or enhance habitat that are carried out principally with hand labor and not mechanized equipment.

(5) stream or river bank stabilization with native vegetation or other bioengineering techniques, the primary purpose of which is to reduce or eliminate erosion and sedimentation; and

(6) culvert replacement conducted in accordance with published guidelines of the Department of Fish and Game or NOAA Fisheries, the primary purpose of which is to improve habitat or reduce sedimentation.

CHAPTER 3. EXISTING CONDITIONS

3.1 OVERVIEW OF THE SAN MATEO COUNTY PARKS SYSTEM

This chapter provides a brief qualitative overview of the conditions in San Mateo County Parks. Information is drawn from multiple sources, including planning documents; general site information presented in park brochures and the County of San Mateo web site; interviews with park rangers and other key staff; and information presented in the San Mateo County Parks Vegetation Resources report (Rana, 2002).

3.1.1 Locations of San Mateo County Parks

County Parks operates 16 separate parks, three regional trails, and numerous other county and local trails encompassing approximately 15,680 acres. Refer to Figure 3.1 in Appendix F for the locations of parks covered in this report.

3.2 CRYSTAL SPRINGS REGIONAL TRAIL

Visited by approximately 300,000 people a year, Crystal Springs Regional Trail (also referred to as Sawyer Camp Trail, one section of the larger trail) is one of the most popular trails in San Mateo County. This trail is made up of a variety of sections:

- San Andreas (paved multi-use);
- San Andreas hiking and riding (unpaved);
- Sawyer Camp Trail, one section of the larger trail (paved);
- southern extension (paved); southern hiking and riding (unpaved);

Located in the scenic Crystal Springs Watershed, the Park includes existing trails that are proposed for expansion and is envisioned to provide an uninterrupted, non-motorized, multi-use route from the City of San Bruno to the Town of Woodside. Today's visitors to Crystal Springs Regional Trail (Sawyer Camp Trail) find scenery expected only in far more remote rural settings. The trail parallels picturesque Crystal Springs Lake and the San Andreas Lake.

3.2.1 General Site Conditions

Over 180 different species of birds have been identified at Crystal Springs Regional Trail. Deer, squirrels, bobcats, coyotes and rattlesnakes are often spotted. Recent sightings of mountain lions have also occurred. This pristine watershed area surrounding the trail is recognized by the California Department of Fish and Game as a Fish Wildlife Refuge and is considered a Biosphere Reserve.

Crystal Springs Regional Trail supports a variety of sensitive and common plant communities, as well as numerous sensitive plant and wildlife species (Rana, 2002). Refer to Table 3.2.1 below for the sensitive species that pertain to the development of The Vegetation Management Guidelines. The information provided in the following table was taken from Rana (2002) and May 2006 information from the Department of Fish and Game's online California Natural Diversity Database, at www.nrdb.org.

Table 3.2.1 Summary of Park Biological Resources- Crystal Springs Regional Trail

Plant Communities	
Coast live oak woodland* Mixed evergreen forest Mixed exotic forest Mixed exotic forest/coast live oak woodland Coyote brush scrub Non-native grassland Non-native grassland with some natives	Needlegrass grassland (non-serpentine)* Serpentine needlegrass grassland* Arroyo willow riparian woodland* Mixed willow riparian woodland* Freshwater marsh* Seasonal freshwater marsh*
Sensitive Plants Known to Occur on Park Lands	
Western leatherwood (*Dirca occidentalis*)* Crystal Springs lessingia (*Lessingia arachnoidea*)*	White-rayed pentachaeta (*Pentachaeta bellidiflora*)* Crystal Springs flax (*Hesperolinon spergulinum*)*
Other Species of Local Interest	
Gumplant (*Grindelia camporum*) Psoralea (*Hoita orbicularis*) Fremont cottonwood (*Populus fremontii*) Box elder (*Acer negundo*)	Chia (*Salvia columbariae*) Silk tassel (*Garrya elliptica*) Pacific ninebark (*Physocarpus capitatus*)
Sensitive Plants Reported Near the Park	
Fragrant fritillary (*Fritillaria liliaceae*) Fountain thistle (*Cirsium fontinale*)	Marin dwarf flax (*Hesperolinon congestum*) San Mateo wooly sunflower (*Eriophyllum latilobum*)
Sensitive-Wildlife Species Known to Occur on Park Lands	
Edgewood blind harvestman (*Calcina minor*)* San Francisco garter snake (*Thamnophis sirtalis tetrataenia*)* Western pond turtle (*Clemmys marmorata*)* Mission blue butterfly (*Icaricia icarioides missionensis*)*	Purple martin (*Progne subis*)* Loggerhead shrike (*Lanius ludovicianus*)* Sharp-shinned hawk (*Accipiter striatus*)* Olive-sided flycatcher (*Contopus copperi*)* White-tailed kite (*Elanus leucurus*)*
Sensitive Wildlife Species reported nearby or with potential to occur in the Park	
California tiger salamander (*Ambystoma tigrinum californiense*)* California red-legged frog (*Rana aura draytoni*)*	Cooper's hawk (*Accipiter cooperii*)*
Invasive Plants **	
Acacias (*Acacia* sp.) Blackwood acacia *(Acacia melanoxylon)* Bull thistle *(Cirsium vulgare)* Bailey's acacia (*Acacia baileyana)* Cape ivy/German ivy (*Delairea odorata / Senicio mikanioides)* Cotoneaster *(Cotoneaster* sp.) English ivy (*Hedera helix)* Fennel *(Foeniculum vulgare* French broom *(Genista monspessulana* Fuller's teasel *(Dipsacus sativus)*	Harding grass *(Phalaris aquatica)* Iceplant/hottentot fig (Carpobrotus edulis) Italian thistle *(Carduus pycnocephalus)* Leptospermum/Australian tea *(Leptospermum laevigatum)* Monterey cypress *(Cupressus macrocarpa)* Blue gum Eucalyptus (*Eucalyptus globulus)* Monterey pine *(Pinus radiata)* Pampas grass (*Cortaderia selloana)* or jubata grass (*Cortaderia jubata)* Poison hemlock (*Conium maculatum)* Periwinkle *(Vinca major)* Scotch broom (*Cytisus scoparius)* Yellow star-thistle *(Centaurea solstitialis)*

* Indicates a biological resource that is considered sensitive, locally rare, or protected under the state or federal Endangered Species Act.

** There may be more invasive species present in the park since the last weed inventory (Rana 2002).

The following information was developed based on interviews with San Mateo County Park staff and information excerpted from the County of San Mateo Park's Department website.

This Park includes the Sawyer Camp and San Andreas trails that are approximately 8 miles long located next to the Crystal Springs and San Andreas Lakes. These trails are for non-motorized use only. The trails are surrounded by the San Francisco Public Utilities Commission's Crystal Springs watershed that is recognized by the CDFG as an important Wildlife use area.

All management activities along the trail, including updating culverts, landslide cleanup, etc. must be closely coordinated with the SFPUC. Also, due to the nearby reservoir, any projects that may potentially impact the reservoir, must either have the appropriate wetland permits or must be in conjunction with SFPUC existing permits.

The Jepson Laurel is one of the most famous landmarks along Sawyer Camp Trail. It is now the oldest and largest known laurel in California, estimated at over 600 years old. In 1923, this tree was named in honor of Willis Linn Jepson, one of California's most noted botanists. The San Francisco Water Department, on whose property it is located, assumed the tree's preservation and protection. In 1981, the San Mateo County Parks and Recreation Division, on permit from the Water Department, opened the area near the tree and constructed a new picnic area (Source: San Mateo County website at: http://www.eparks.net

California Oak Mortality disease, formerly known as Sudden Oak Death disease, was found on at least one tree within the Park. More information on this disease can be found in Section 5 and Appendix A.

3.2.2 Park-Specific Policies, Goals, Management Objectives.

Based on an examination of the available documents pertaining to this Park, the vegetation and natural resource management policies, goals, and management objectives that were found pertaining specifically to this Park are presented below in Table 3.2.3; general policies and goals for the County Parks system as a whole are discussed in Chapter 2.

Table 3.2.2 Summary of Park-Specific Policies, Goals and Management Objectives - Crystal Springs Regional Trail

Source document	Policy, Goal, or Objective
San Mateo County Parks Vegetation Resources (2002)	Control California Oak mortality disease (formerly sudden oak death) reported from park.
SFPUC Crystal Springs Vegetation Management Guidelines	Coordinate vegetation management actions with SFPUC. Comply with SFPUC Crystal Springs Vegetation Management Guidelines.
CDF – Guidance on Fire Break Perimeter 100 foot clearance area	Requires a 100-foot fire break area to be established and maintained between wildlands and urban interface areas.

3.2.3 Summary of Park-Specific Vegetation Management Actions.

There are several sensitive plants known to occur in the Crystal Springs Regional Trail, some occurring not far off of the main trail. Because the areas along the trail are mowed annually to keep vegetation growth off of the trail and to reduce fire hazards, rangers must be extremely diligent in avoiding impact to sensitive plants. Park rangers also must direct their mowing operations to control invasive species and poison oak. Mowing is usually accomplished in June using a tractor; however hand mowing along the dirt trails is also done where necessary. Refer to Section 5 and Appendix A for more information on mowing procedures.

Identifying and removing hazardous trees is another priority for park staff and is done on an annual basis. Due to the presence of California Oak Mortality Disease in the Park, all vegetation is cut, chipped, and left onsite to prevent spreading the disease to other parks. (P. Noyer, Ranger IV, pers. comm.). Refer to Section 5 and Appendix A for more information on hazard tree detection and tree disease detection and removal procedures.

Table 3.2.3 below presents current and ongoing vegetation management at Crystal Springs Regional Trail.

Table 3.2.3. Current and Ongoing Vegetation Management Activities, Crystal Springs Regional Trail

Vegetation Management Actions*	Implementation	Rational/ Requirement	Schedule	Special Considerations
Control spread of California Oak Mortality Disease (formerly known as Sudden Oak Death). At least one oak has been found to have California Oak Mortality Disease in the park (52)	See Section 5 and Appendix A for Park protocol.	Prevent spread of Oak Mortality Disease to uninfected oaks.	Year round as needed.	Caution must be taken when controlling disease to not inadvertently spread it to other oaks and parks. Infected woody debris should be left onsite. Boots and equipment should be cleaned before moving from or to an infected area to prevent spread.
Mowing	Tractors, hand mowers (June). See Section 5 and Appendix A and for recommended changes to Park protocol.	Landscaping, invasive plant control, fuel reduction, visitor safety (poison oak, rattlesnakes)	Refer to suggestions in Chapter 5 & Appendix A.	Caution should be taken to prevent special status plants & wildlife from being mowed. Implement timing and mowing height restrictions recommended in Section 5. Recommend installation of "NO MOWING" signs near western leatherwood along trail.
Hazardous trees detection and assessment, pruning, and removal along trail and road.	Access trails and roads are assessed on a daily basis, trees are visually inspected at the same time. See Section 5 and Appendix A and for Park protocol.	Visitor safety and prevention of access interruptions.	Rangers access trails daily for restroom & Litter maintenance Refer to Appendix A & D on "How to ID & Assess Hazardous Trees"	Caution should be taken to prevent special status plants/shrubs (i.e. western leatherwood) to be pruned mistakenly; or that hazardous trees are felled on/in special status species/habitat. Recommend installation of "NO MOWING" signs near western leatherwood along trail.
Trail and road inspection (including culverts prior to rainy season).	Visual inspection of trails, roads, and culverts for safety hazards and potential clogging before the rainy season.	Visitor safety and to prevent flooding, erosion, and drainage issues.	Quarterly.	All activities must comply with SFPUC requirements and require a wetland permits.

Vegetation Management Actions*	Implementation	Rational/ Requirement	Schedule	Special Considerations
Fuel load/fire reduction in areas bordering the watershed.	County Parks conducts annual mowing and when SFPUC expresses concern in fuel load. See Section 5 and Appendix A for Park protocol.	To prevent fire and ensure visitor and neighborhood safety.	Annually and when requested by the SFPUC.	Land bordered by the San Francisco Public Utilities Commission.
Maintain fuel reduction area along 100 foot property perimeter for fire protection.	Ongoing. Cut back brush Refer to Section 5 and Appendix A for more information.	CDF requirement for fire safety zone between wildlands and urban interface	Annual	
* Numbers in ( ) refer to the reference document that the action was taken from. See Extended Bibliography in Appendix E for more information on Action Item.				

3.3 COYOTE POINT RECREATION AREA

The following information was developed based on interviews with San Mateo County Park staff and information excerpted from the County of San Mateo Park's Department website.

Coyote point offers many forms of recreation for its visitors including windsurfing, kite surfing, swimming, kayaking, picnicking, play grounds, and walking along the Bay trail. Facilities include a marina, firing range, environmental science museum, and an animal center, along with several other visitor amenities.

In the 1800's the marsh between the main land and the island was filled in. Also, Eucalyptus, Monterey cypress and Monterey pine were planted, but most have been stunted due to the wind and poor soil. The most prominent feature of the Park today is the large stand of Eucalyptus trees located on the Point. Also, remnants of the salt marsh still exist at the southeastern corner of the Park near the Marina. All of the plant and animal species are protected in the Coyote Point Recreation Area.

3.3.1 General Site Conditions

Coyote Point Recreation Area supports a variety of common and sensitive biological resources. There are several areas of ecological importance at this Park, including wetlands and arroyo willows. The following section summarizes Park resources of interest to Vegetation Management guideline development (Rana, 2002). Refer to Table 3.3.1. The information provided in the following table was taken from Rana (2002) and May 2006 information from the Department of Fish and Game's online California Natural Diversity Database, at www. nrdb.org.

Table 3.3.1. Summary of Park Resources- Coyote Point Recreation Area

Plant Communities	
Coastal Salt Marsh* Seasonal Wetland* Arroyo Willow Riparian Woodland* Freshwater Marsh * Non-native Grassland	Eucalyptus Landscaped Areas Developed Areas Sand Beach

Table 3.3.1. Summary of Park Resources- Coyote Point Recreation Area

Sensitive Plants Known to Occur on Park Lands	
Monterey Manzanita (*Arctostaphylos montereyensis)**	
Sensitive Wildlife Species Known to Occur on Park Lands	
San Francisco garter snake *(Thamnophis sirtalis tetrataenia)*	Monarch butterfly *(Danaus plexippus)*
Harbor seal *(Phoca vitulina)*	
Sensitive Wildlife Species reported nearby or with potential to occur in the Park	
California black rail *(Laterallus jamaicensis coturniculus)* California clapper rail *(Rallus longitostris obsoletus)*	Salt-marsh harvest mouse *(Reithrodontomys raviventris)*
Invasive Plants **	
Smooth cordgrass *(Spartina alterniflora*) Aacacias *(Acacia* sp.) ***Australian tea tree *(Leptospermum laevigatum)* Blue gum Eucalyptus *(Eucalyptus globulus)* Bull thistle *(Cirsium vulgare)* Cape ivy *(Delairea odorata)* Fennel *(Foeniculum vulgare)* Vinca *(Vinca major)* Cotoneaster *(Cotoneaster sp.)*	French broom (*Genista monspessulana)* Iceplant/hottentot fig *(Carpobrotus edulis)* Mustard *(Brassica nigra)* ***Myoporum *(Myoporum laetum)* Pampas grass (reported by Rana 2002 *as Cortaderia maculatum, probably C. selloana or C. jubata)* Radish *(Raphanus sativus)* Smooth cord grass hybrid *(Spartina alterniflora* x *S. foliosa)* Yellow star-thistle *(Centaurea solstitialis)*
*Indicates a biological resource that is considered sensitive, locally rare, or protected under the state or federal Endangered Species Act. ** There may be more invasive species present in the park since the last weed inventory (Rana 2002). *** Australian tea tree and myoporum are planted landscaping features at this park. They are only considered invasive if and when they spread from the planted areas into the wild land areas of the park. Planted specimens are to remain.	

Because Coyote Point is directly adjacent to the Bay, it supports coastal salt marsh, a plant community that is sensitive and of local, state, and federal concern. Coastal salt marsh habitat is typically dominated by a suite of plants that are adapted to brackish water conditions, including saltgrass *(Spartina* spp.) and pickleweed *(Salicornia* spp.). This community is home to several sensitive plant and wildlife species, including state and federally listed species. An invasive plant, smooth cordgrass (*Spartina alterniflora*) has recently invaded coastal salt marsh habitat throughout the greater Bay Area, and is rapidly displacing and interbreeding with native cordgrass. Smooth cordgrass is considered a major threat to the salt marsh in this Park (Rana 2002). This invasive plant is currently being treated by the Spartina Project.

3.3.2 Park-Specific Policies, Goals, Management Objectives.

Based on an examination of the available documents pertaining to this Park, the vegetation and natural resource management policies, goals, and management objectives that were found pertaining specifically to this Park are presented below in Table 3.3.2. General policies and goals for the County Parks system as a whole are discussed in Chapter 2.

Table 3.3.2. Summary of Park-Specific Policies, Goals and Management Objectives - Coyote Point Recreation Area

Source document	Policy, Goal, or Objective
Coyote Point Recreation Area Master Plan (2002)	Continue to implement a tree restoration program on the Knoll (removing Eucalyptus and replacing with redwoods and oaks).
	Restore native habitats in the marsh shoreline habitat area.
San Mateo County Parks Vegetation Resources (2002)	Control smooth cord grass, *Spartina alterniflora* to protect sensitive salt marsh habitat.
CDF – Guidance on Fire Break Perimeter 100 foot clearance area	Requires a 100-foot fire break area to be established and maintained between wildlands and urban interface areas.

3.3.3 Summary of Park-Specific Vegetation Management Actions

The following information was developed based on interviews with San Mateo County Park staff. There are no sensitive plant species known from the Park and most of the vegetated areas are landscaped, disturbed, or invasive (i.e. Eucalyptus groves). Ideally, park staff would like to convert certain lawn areas into native habitats, which require less maintenance.

An invasive shrub, cotoneaster (*Cotoneaster* spp.), is overgrown and taking over the area behind the rifle range and Captain's house, creating a fire hazard. There is currently no plan in place to manage the cotoneaster; however park staff would like to convert the area into native oak woodland habitat.

Lawns are mowed on a weekly basis as necessary and herbicides are used around landscaped areas, roadways, parking lots, and for bristly ox tongue and poison oak control. (pers. com. P. Noyer, Ranger IV, and B. Crawford, Lead Gardener). The invasive smooth cordgrass (*Spartina alterniflora*), mentioned previously, is actively being controlled by the Spartina Project, a non-profit organization working throughout the Bay Area. Approximately nine acres of *Spartina alterniflora* was sprayed with herbicide in 2005, in cooperation with the San Mateo Mosquito Abatement District. Follow up procedures are scheduled for 2006. Depending on the efficacy of the treatment, follow up will continue as needed and monitoring for resprouts and new populations will continue annually. (E. Grijalva, pers. comm).

Table 3.3.3 Current and Ongoing Vegetation Management Activities – Coyote Point

Vegetation Management Action	Implementation	Reason	Schedule	Special Considerations
Incorporate plants into landscaping that help hold soils to minimize erosion, prevent invasive weeds from encroaching into the activity areas, and emphasize the use of natives. (74)	Currently inactive. When/if planting occurs, this action will be considered	Minimize wind and water erosion and restore natural areas to native state.	On as needed basis.	Cotoneaster populations that require control.
Ongoing invasive Spartina control (in partnership with the Spartina Project). (52)	.	Reduce the spread of the invasive spartina in marsh habitat	2005 & 2006 herbicide treatment. Annual ongoing monitoring.	Spartina is a threat to salt marsh habitat. (Rana 2002)
Remove asphalt trail near Castaway Restaurant.	Remove asphalt & replace with compacted earth.	Enhance natural area.	Current project (2006).	
Manage for invasives, including cotoneaster, acacia, and others. Control poison oak.	Currently Active	Habitat restoration, fuel load reduction, health and safety.	Annually	None.
Maintain fuel reduction area along 100 foot property perimeter for fire protection.	Ongoing. Cut back brush Refer to Section 5 and Appendix A for more information.	CDF requirement for fire safety zone between wildlands and urban interface	Annual	
* Numbers in () refer to the reference document that the action was taken from. See Extended Bibliography in Appendix E for more information on Action Item.				

3.4 EDGEWOOD PARK AND PRESERVE

Edgewood is a 467 acre nature preserve consisting of woodlands and grasslands that are relatively undeveloped, as well as picnic areas, group use areas, and a ranger residence. An interpretive center is planned in the near future. The serpentine grasslands in the Park are known for their wildflowers in the spring and support several sensitive plant communities and special status plants. Visitors can utilize the Parks trails, day-camping, picnicking, nature observation, and docent-led tours (Edgewood Nature Preserve Master Plan, 1997).

3.4.1 General Site Conditions

The following section summarizes Park resources of interest to Vegetation Management Guideline development (Rana, 2002). Refer to Table 3.4.1 below. The information provided in the following table was taken from Rana (2002) and May 2006 information from the Department of Fish and Game's online California Natural Diversity Database, at www. nrdb.org

Table 3.4.1. Summary of Park Resources- Edgewood Park and Preserve

Plant Communities	
Serpentine chaparral*	Non-native grassland
Chamise chaparral	Non-native grassland, with natives,
Coastal scrub	Native grassland*
Coyote bush scrub	Eucalyptus tree groves
Coastal sagebrush scrub	Redwood tree grove*
French broom scrub	California bay forest
Coast live oak woodland	Wet meadow/seasonal wetland*
Mixed oak woodland	Willow riparian woodland*
Serpentine bunchgrass grassland*	
Sensitive Plants known to Occur on Park Lands	
San Mateo thornmint *(Acanthomintha duttonii)**	Wooly headed lessingia (*Lessingia hololeuca)**
Serpentine linanthus *(Linanthus ambiguus)*	King's mountain manzanita *(Arctostaphylos regismontana)**
Marin dwarf flax *(Hesperolinom congestum)**	Arcuatebush mallow *(Malacothamnus arcuatus)**
White-rayed pentachaeta *(Pentachaeta bellidiflora)**	Western leatherwood *(Dirca occidentalis)**
	Fountain thistle *(Cirsium fontinale)** (Not found recently in park)
Fragrant fritillary *(Fritillaria liliacea)**	
San Francisco onion *(Allium peninsulare var. franciscanum)**	San Francisco collinsia *(Collinsia multicolor)**
California black walnut *(Juglans californica var. hindsii)**	Robust coyote mint (*Monardella villosa ssp. globosa*)*
Sensitive Plants With Potential to Occur	
Blasdale's bentgrass *(Agrostis blasdalei)**	Gairdner's yampah *(Perideridia gairdneri ssp. gairdneri)**
Coast lily *(Lilium maritimum)**	San Francisco campion *(Silene verecunda ssp. verecunda)**
San Francisco popcorn flower *(Plagiobothyrys diffusus)**	San Francisco owl's clover *(Tryphysaria floribunda)**
	Artist's popcorn flower *(Plagiobothyrs chorisianus var. chorisianus)**
Kellogg's horkelia *(Horkelia cuneata ssp. sericea)**	
	Fountain thistle *(Cirsium fontinale)** (previously present in park)
Marin checkerbloom *(Sidalcea hickmanii ssp. viridis)**	
Pt. Reyes horkelia *(Horkelia marinensis)**	
Sensitive Wildlife Species Known to Occur on Park Lands	
Bay checkerspot butterfly *(Euphydryas editha bayensis)** MAY NO LONGER BE PRESENT	Cooper's Hawk *(Accipiter cooperii)**
Edgewood blind harvestman spider *(Calicina minor)**	Sharp-shinned hawk *(Accipiter striatus)**
Edgewood Park micro-blind harvestman *(Microcina edgewoodensis)**	White-tailed kite *(Elanus caeruleus)**
Northern harrier *(Circus cyaneus)**	

Table 3.4.1. Summary of Park Resources- Edgewood Park and Preserve

Invasive Plants **	
Yellow star-thistle *(Centaurea solstitialis)*	Bull thistle *(Cirsium vulgare)*
Italian thistle *(Carduus pycnocephalus)*	Pampas grass (*C. Selloana or C. Jubata)*
Blue gum Eucalyptus*(Eucalyptus globulus)*	French broom (*Genista monspessulana)*
Vinca *(Vinca major)*	Other thistles (Bristly ox tongue and teasel)

*Indicates a biological resource that is considered sensitive, locally rare, or protected under the state or federal Endangered Species Act.

** There may be more invasive species present in the park since the last weed inventory (Rana 2002).

California Oak Mortality disease may be potentially a factor within the oak woodland of the preserve. The opportunity to inform preserve managers and visitors on proper prevention and control measures of this disease may be necessary (Rana, 2002). Refer to Section 5 and Appendices B and C for detection and treatment options.

Wetland, grassland, oak woodland, and chaparral plant communities offer varied habitats for a wide variety of wildlife. Deer, coyote, bobcat, raccoon, and other small animals are frequently sighted. The cool, wooded gullies of the eastern slope of the Park are rich in ferns and mosses, and a thick layer of woody and herbaceous plants. The central portion of the Park is dominated by a prominent ridge about 800 feet in elevation, affording outstanding views of Skyline Ridge, Huddart Park, the San Andreas Gulf Zone, the Crystal Springs Lakes and the San Francisco Bay. This ridge typically supports chaparral on its warm western slope, and oak woodland on its less exposed cool eastern slopes.

Because of the presence of serpentine-derived soil, the Park is home to many sensitive plant and wildlife species that are listed under federal and state protection. Ten rare or endangered plant species have been identified in the Park, including the San Mateo thornmint, a species that once graced the hills of the San Francisco Bay Area before development destroyed most of its habitat. The California Native Plant Society's Flora of Edgewood Park (Corelli, T. 1993 (rev 1996)) lists the remarkable diversity of plant species found here.

Sensitive serpentine habitats in the preserve also support a variety of sensitive animal species including the bay checkerspot butterfly (*Euphydryas editha bayensis*), a species that has not been seen at the Park recently, but historically was reported as present. The San Mateo County Parks Department is awaiting a Memorandum of Understanding from the U.S. Fish and Wildlife Service to reintroduce the bay checkerspot in the Park, and therefore has not done so yet. All of these sensitive plant and animal species are protected in the Park and Preserve.

3.4.2 Park-Specific Policies, Goals, Management Objectives.

Based on an examination of the available documents pertaining to this Park, the vegetation and natural resource management policies, goals, and management objectives that were found pertaining specifically to this Park are presented below in Table 3.4.2; general policies and goals for the County Parks system as a whole are discussed in Chapter 2.

Table 3.4.2. Summary of Park-Specific Policies, Goals and Management Objectives - Edgewood Park and Preserve

Source document	Policy, Goal, or Objective
Edgewood Natural Preserve Master Plan (1997)	Compile comprehensive inventory of all resources at Park including soils, plants, and animal species.
	Maximize resource protection operations as outlined in master plan including increase of signage and erecting barriers.
Final report for NFWS grant for habitat restoration (2002)	Reintroduction of bay checkerspot butterfly.
	Long-term monitoring activity of butterfly and habitat.
	Seed farming and seeding of natives.
	Continue existing experiments to evaluate effectiveness of mowing and grazing.
Draft negative declaration (2004)	Restore Cordilleras Creek including removal of invasives and planting natives. (Scheduled for implementation in 2006)
Memorandum of Understanding, Weed Management Area	Establish a weed management area and decide the terms and conditions under which the San Mateo County Weed Management Area will cooperate and coordinate activities necessary to prevent and remove weeds (MOU in place).
	Survey of western grove of Eucalyptus trees then removal of these trees.
	Remove vinca near west kiosk of Park.
	Restore wetland including invasives removal and monitoring of area.
CDF – Guidance on Fire Break Perimeter 100 foot clearance area	Requires a 100-foot fire break area to be established and maintained between wildlands and urban interface areas.

3.4.3 Summary of Park-Specific Vegetation Management Actions

The following information was developed based on interviews with San Mateo County Park staff. As mentioned above, Edgewood Park visitors come to enjoy the many wildflowers (several are sensitive species), serpentine habitats and views of the area. Also, the Audubon society provides nesting boxes for the western bluebird (*Sialia mexicana*). Challenges for park rangers include keeping visitors on designated trails, protecting the special status species and habitats, protecting nesting birds, reducing fire hazards, and maintaining visitor safety. (P. Alvarez, Ranger IV, pers. comm.).

Mowing the grassland area provides one of the biggest challenges for park staff. On an annual basis, rangers mow a buffer of grassland area along the main trails and a 1.5 acre area adjacent to existing service buildings. The nesting western bluebirds require a special mowing procedure (i.e. birds feed on areas where grasses are only a few inches tall) in order to find food for their young. Western bluebird eggs are laid in April, therefore mowing must be timed to allow a few inches of new growth when the eggs hatch (approximately in May). However, this mowing must also be timed to avoid sensitive annual plants before they have bloomed and set seed. In conflict with the above mowing schedules, is the fact that rangers must reduce the occurrence of rattlesnakes on the trails to protect visitors, and mowing a buffer along the trail is the most effective way to discourage rattlesnakes from lingering on the trail. (P. Alvarez, Ranger IV, pers. comm.). Refer to Section 5 and Appendix A for procedures to address mowing in sensitive species areas.

The invasive plant, yellow star-thistle (*Centaurea solstitialis*) is a problem at Edgewood Park and control of the species is a priority. Park staff introduced the Yellow star-thistle hairy weevil (*Eustenopus villosus*), Yellow star-thistle peacock fly (*Chaetorellia australis*), and the yellow star-thistle false peacock fly *(Chaetorellia succinea*) to help biologically control the plant. Currently the yellow star-thistle false peacock fly has been the most successful in controlling yellow star-thistle.

Edgewood Park has a well established volunteer group, the Friends of Edgewood, as well as consistent volunteer weed removal from the California Native Plant Society (CNPS). The Friends of Edgewood works in close coordination with park rangers while the CNPS volunteer works more autonomously. (P. Alvarez, Ranger IV, & J. Trewin, Ranger III, pers. comm.).

Table 3.4.3 Current and Ongoing Vegetation Management Activities – Edgewood

Vegetation Management Action	Implementation	Rational/ Requirement	Schedule	Special Considerations
Continue long-term monitoring of Bay checkerspot butterfly and its habitat. (77)	Monitoring scheduled to resume May 2006. Species may no longer be present in Park.			Federally endangered species.
Continue to perform existing experiments to evaluate effectiveness of mowing and grazing. (77)	Monitoring scheduled to resume May 2006. Refer to App B and C for Park procedures		Ongoing	Presence of sensitive species
Reconsider the practical and political aspects of using fire as a habitat management technique and possibly implement new policies and techniques. (77)	**Currently inactive.**			
Continue to rely on other agencies to provide fire suppression. (77)	**Currently inactive.**			
Use seed farming and seeding of natives to improve bay checkerspot butterfly habitat. (77)	**Currently inactive.**			
Support volunteer resource protection programs. (26)	Active		Ongoing.	
Continue weed eradication efforts	Active		Ongoing	
Develop a scheduled trail maintenance program for trimming of plants and trees after blooming of flowers and plants (late summer to fall).	See Mowing schedule in Appendix A & Chapter 4		Ongoing.	
Implement Cordilleras Creek restoration including invasives removal and planting of native species in conjunction with the construction of an interpretive center. (75)	Initiated in fall 2005. This is a 3 year program		Fall 2005	
Maintain a fuel reduction area along 100 foot of property perimeter for fire protection.	Ongoing. Cut back brush Refer to Section 5 and Appendix A for more information.	CDF requirement for fire safety zone between wildlands and urban interface	Annual	Caution should be taken to prevent special status plants & wildlife from being mowed.

* Numbers in ( ) refer to the reference document that the action was taken from. See Extended Bibliography in Appendix E for more information on Action Item.

3.5 FITZGERALD MARINE RESERVE

The Fitzgerald Marine Reserve includes 35 acres of terrestrial area along the coastline and 370 acres of inter-tidal areas. It provides for passive recreational uses including inter-tidal exploration, picnicking, surf access, and hiking. It hosts a variety of inter-tidal communities that make it popular with community and school groups for its educational value. The majority of the reserve is undeveloped. As stated in the Fitzgerald Marine Reserve Master Plan (Brady/LSA, 2002), the mission of the Reserve is to preserve, protect, and interpret the resources within the Reserve for the people of the State of California. The reserve is a state designated "State Marine Park" below high tide and has been designated by the state as an "Area of Special Biological Significance". The San Mateo County Parks system is responsible for park management above mean high tide. The state of California Department of Fish and Game is responsible for site management below mean high tide, and the federal government regulates all aquatic areas. This Reserve is also part of the "Gulf of the Farallons National Marine Sanctuary".

This Marine Reserve includes a large area of tidal reefs. This provides the opportunity for a variety of educational features at this Park that are unique. At present, access to the tidal areas is unrestricted for groups under 20, and on low tides that occur on weekends, more than 2000 visitors per day may visit the reefs.

3.5.1 General Site Conditions

The following section summarizes Park resources of interest to Vegetation Management Guideline development (Rana, 2002). Refer to Table 3.5.1 below. The information provided in the following table was taken from Rana (2002) and May 2006 information from the Department of Fish and Game's online California Natural Diversity Database, at www. nrdb.org

Table 3.5.1 Summary of Park Resources- Fitzgerald Marine Reserve

Plant Communities	
Mixed riparian woodland*	Coastal bluff scrub
Landscape tree groves	Coastal salt marsh*
Coastal scrub	Freshwater marsh*
Sensitive Plants known to Occur on Park Lands*	
Coast yellow linanthus *(Linanthus croceus)*	
Sensitive Plants With Potential to Occur on Park Lands*	
Blasdale's bentgrass *(Agrostis blasdalei)*	Pt. Reyes horkelia *(Horkelia marinensis)*
Coast lily *(Lilium maritimum)*	Gairdner's yampah *(Perideridia gairdneri ssp. Gairdneri)*
Coast wallflower *(Erysimum ammophilium)*	San Francisco gumplant *(Grindelia hirsutula var. Maritima)*
San Francisco popcorn flower *(Plagiobothrys diffusus)*	San Francisco campion *(Silene verecunda ssp. Verecunda)*
Fragrant fritillary *(Fritillaria liliacea)*	San Francisco owl's clover *(Triphysaria floribunda)*
Hickman's cinquefoil *(Potentilla hickmanii)*	Santa Cruz clover (*Trifolium buckwestiorum)*
Marin checkerbloom *(Sidalcea hickmanii ssp. Viridis)*	Santa Cruz microseris *(Stebbinososeris decipiens)*
Sensitive Wildlife Species Known to Occur on Park Lands*	
Double-crested cormorant *(Phalacrocorax autitus)*	California horned lark *(Eremophila alpestris actia)*
American bittern *(Botaurus lentiginosus)*	Common yellowthroat *(Geothlypis trichas sinuosa)*
California gull *(Larus californicus)*	Yellow warbler *(Dendroica petechia)*
Elegant tern *(Thalasseus elegans)*	Bank swallow *(Riparia riparia)*
Golden eagle *(Aquila chrysaetoes)*	Black swift *(Cypseloides niger)*
Osprey *(Pandion haliaetus)*	Vaux's swift *(Chaetura vauxi)*
American peregrine falcon *(Falco peregrinus anatum)*	White-throated swift *(Aeronautes saxatalis)*
Cooper's hawk *(Accipiter cooperii)*	Purple martin (*Progne subis)*
Sharp-shinned hawk *(Accipiter striatus)*	Rufous hummingbird *(Selasphorus rufus)*

Table 3.5.1 Summary of Park Resources- Fitzgerald Marine Reserve

White-tailed kite *(Elanus caeruleus)*	Loggerhead shrike *(Lanius ludovicianus)*
Northern harrier *(Circus cyaneus)*	California sea lion *(Zalophus californianus)*
Short-eared owl *(Asio flammeus)*	California red-legged frog *(Rana aura draytoni)*
Tri-colored blackbird *(Agelaius tricolor)*	San Francisco garter snake *(Thamnophis sirtalis tetrataenia)*
Olive-sided flycatcher *(Nuttallornis borealis)*	Southern sea otter *(Enhydra lutris)*
Harbor seal *(Phoca vitulina)*	Steller's sea lion *(Eumetopias jubatus)*
Northern elephant seal *(Mirounga angustirostris)*	Monarch butterfly *(Danaus plexippus)* (roosting site)
Sensitive Wildlife With Potential to Occur *	
Myrtle's silverspot butterfly *(Speyeria zerene myrtleae)*	Merlin *(Falco columbarius)*
Mission blue butterfly *(Icaricia icarioides missionensis)*	Long-eared owl *(Asio otus)*
Western pond turtle *(Clemmys marmorata)*	Willow flycatcher *(Empidonax traillii)*
	Townsend's western big-eared bat *(Corynorhinus (=Plecotus) townsendii townsendii)*
California black rail *(Laterallus jamaicensis coturniculus)*	
California clapper rail *(Rallus longirostris obsoletus)*	Salt-marsh harvest mouse (*Reithrodontomys raviventris)*
	San Francisco dusky-footed woodrat *(Neotoma fuscipes annectens)*
Western snowy plover *(Charadrius alexandrinus nivosus)*	
Invasive Plants **	
Poison hemlock (*Conium maculatum)*	Harding grass *(Phalaris aquatica)*
Cape ivy *(Delairea odorata)*	Velvet grass *(Holcus lanatus)*
Periwinkle *(Vinca major)*	Garden nasturtium *(Nasturtium sp.)*
Yellow star-thistle *(Centaurea solstitialis)*	Monterey cypress *(Cupressus macrocarpa)*
Pampas grass *(Cortaderia selloana, C. Jubata)*	

*Indicates a biological resource that is considered sensitive, locally rare, or protected under the state or federal Endangered Species Act.

** There may be more invasive species present in the park since the last weed inventory (Rana 2002).

The majority of the upland part of the Reserve is comprised of non-native vegetation including Monterey cypress grove(s), invasive species (i.e., German ivy, pampas grass or jubata grass), weedy species, ornamental plantings, and garden escapes. However, three sensitive plant communities are also present: northern coastal bluff scrub, central coast arroyo willow riparian forest, and freshwater marsh. The adjacent coastal bluffs are mostly devoid of vegetation due to soil erosion and human use. There are 129 different algae species alone that live in the Park.

3.5.2 Park-Specific Policies, Goals, Management Objectives.

Based on an examination of the available documents pertaining to this Park, the vegetation and natural resource management policies, goals, and management objectives that were found pertaining specifically to this Park are presented below in Table 3.5.2; general policies and goals for the County Parks system as a whole are discussed in Chapter 2.

Table 3.5.2 Summary of Park-Specific Policies, Goals and Management Objectives - Fitzgerald Marine Reserve

Source document	Policy, Goal, or Objective
Local Coastal Program (1998)	7.9 Permitted Uses in Riparian Corridors: a. Within corridors, permit only the following uses: (1) education and research, (2) consumptive uses as provided for in the Fish and Game Code and title 14 of the California Administrative Code, (3) fish and wildlife management activities, (4) trails and scenic overlooks on public land(s), and (5) necessary water supply projects. b. When no feasible or practicable alternative exists, permit the following uses: (1) stream dependent aquaculture…(2) flood control projects…(3) bridges…(4) pipelines, (5) repair or maintenance of roadways or road crossings, (6) logging operations which are limited to temporary skid trails, stream crossings…(7) agricultural uses, provided no existing riparian vegetation is removed and no soil is allowed to enter stream channels.
	7.12 Establishment of Buffer Zones for Riparian Corridors: a. On both sides of riparian corridors, from the "limit of riparian vegetation" extend buffer zones 50 feet outward for perennial streams and 30 feet outward for intermittent streams. b. Where no riparian vegetation exists along both sides of riparian corridors, extend buffer zones 50 feet from the predictable high water point for perennial streams and 30 feet from the midpoint of intermittent streams. c. Along lakes, ponds, and other wet areas, extend buffer zones 100 feet from the high water point except for manmade ponds and reservoirs used for agricultural purposes for which no buffer zone is designated.
	7.12 Permitted Uses in Buffer Zones for Riparian Corridors: (same as for riparian corridors, with limitation on development, agriculture, etc.).
	7.16 Permitted Uses in Wetlands: • Nature education and research; • Fishing; • Fish and wildlife management; • Mosquito abatement; and • Diking, dredging and filling only if for restoration or enhancement of biological productivity.
	7.18 Establishment of Buffer Zones for Wetlands: Minimum 100 feet landward from the outermost line of wetland vegetation.
	7.19 Permitted Uses in Buffer Zones for Wetlands: Same as those allowed for within wetlands, but also allows public trails, scenic overlooks.
	7.23 Permitted Uses in Marine and Estuarine Habitats: In marine and estuarine habitats, permit only the following uses: (1) nature education and research, (2) consumptive uses as provided for in the Fish and Game Code and Title 14 of the California Administrative Code, (3) fishing and (4) fish and wildlife management.
	7.30 Permitted Uses – Sea Cliffs: a. where nesting or roosting exists, permit only education and research activities. b. Where nesting or roosting does not exist, permit only the following uses: (1) education and research, (2) limited foot paths.
	7.52 Public Agency Requirements: Require public agencies, to the point feasible, to remove the undesirable pampas grass (or jubata grass) and French, Scotch, and other invasive brooms from their lands.
Fitzgerald Marine Preserve Master Plan (2002)	Water quality improvements in San Vicente Creek and Pillar Point Marsh will be undertaken.
	Prepare water quality plan to improve water quality in drainages and reduce erosion.
	The Moss beach reef and the Frenchman's reef will be monitored over a minimum 10 year period to develop base line information including effectiveness of master plan policies limiting visitor usage.

Table 3.5.2 Summary of Park-Specific Policies, Goals and Management Objectives - Fitzgerald Marine Reserve

	Portions of the Moss beach reef may be closed to visitors as due to environmental conditions, research, and monitoring.
	Feasibility of restoring tidal action to freshwater marsh will be determined.
	Develop vegetation management program to restore and protect native plant communities.
	Seek marine life reserve status.
	Prepare San Vicente Creek Restoration Plan.
	Implement a marsh restoration study.
	Special status wildlife and plant species will be protected and habitat management plans will be created including red-legged frog.
	Evaluate how fishing, gathering, and visitation are impacting resources and develop management plans to lessen these impacts.
	Many new policies will be enforced including no hunting, no picnicking on beach, dog-walking, etc.
CDF – Guidance on Fuel Reduction Area 100 foot clearance area	Requires a 100-foot fuel reduction area to be established and maintained between wildlands and urban interface areas.
Weed Abatement Standards for Coastal Development Permit for City of Half Moon Bay (2006)*	**Specific Guidelines for weed abatement (in order to comply with City of Half Moon Bay permit):** • Shall not be performed by discing or blading the ground surface. • Shall be performed by mowing only. • Shall be performed no closer than 4" from the ground. • Shall be performed by a "flail" mower or a "rotary" mower – where mounted on and operated by a medium sized tractor. • Shall not be performed in low-lying areas of parcels where ponding of water may occur during the rainy season **For parcels over one (1) acre in size:** • Should consist on mowing a swath 25 to 40 feet wide, along the perimeter boundary line of parcels. • Mowing should be done as close to the fence lines as possible. • Equipment operation and turn around should be confined to the 25 to 40 feet wide swath where weed abatement is being performed.

* This management objective is a result of a Coastal Development Permit that was issued for properties within the City of Half Moon Bay Fire Protection District, and is applicable to all properties within the District. For more information, contact the Half Moon Bay Planning Department Atten Don Dakins, (650) 726-8250.

3.5.3 Summary of Park-Specific Vegetation Management Actions.

The following information was developed based on interviews with San Mateo County Park staff. As mentioned above, most Park visitors come to Fitzgerald Marine Reserve for the tide pools and extensive reef system. The biggest management issue for park rangers is minimizing visitor impact to the natural resources while maximizing the visitor educational experience. Vegetation issues include erosion of the bluffs above the reserve, iceplant, and weed infestation of San Vicente Creek with pampas grass (or jubata grass), broom, cape ivy, bristly ox-tongue, hemlock, English ivy, and Eucalyptus. Coastal instability and associated upkeep of nearby facilities is also a key issue. Because of wetland permitting issues, San Vicente Creek is not actively managed for invasive weed species that require herbicide application for removal (i.e. cape ivy). However, removal of English ivy is underway. Hand-pulling of radish, hemlock, and pampas grass (or jubata grass) is also ongoing. (M. Del Carlo, Ranger IV and S. Durkin, Ranger III, Pers. comm.).

Table 3.5.3 Current and Ongoing Vegetation Management Activities – Fitzgerald Marine Reserve

Vegetation Management Actions	Implementation	Rational/ Requirement	Schedule	Special Considerations
Invasive species removal near San Vicente Creek	Removing English ivy, pampas grass (or jubata grass), broom, cape ivy, bristly ox-tongue, radish, hemlock.	Restore for steelhead and native plants.	Ongoing	No herbicide can be used and wetlands permits must be acquired if action has potential to impact wetlands.
Manage access to user groups of 10 or more.	Require reservations of groups (underway)	Protection of marine life and habitat.	Ongoing	Coastal erosion, damage to tide pools.
Maintain a fuel reduction area along 100 foot of property perimeter for fire protection.	Ongoing. Cut back brush Refer to Section 5 and Appendix A for more information.	CDF requirement for fire safety zone between wildlands and urban interface	Annual	Caution should be taken to prevent special status plants & wildlife from being mowed.
* Numbers in ( ) refer to the reference document that the action was taken from. See Extended Bibliography in Appendix E for more information on Action Item.				

3.6 FLOOD PARK

Flood Park is one of the smaller Parks in the system at 21-acres. The Park contains a baseball field, softball field, and play area (lawn), tennis courts which add to the other recreational activities at this Park including picnicking, volleyball, and horseshoes. It is located in an urban area with many recreational facilities that make it a resource for the community. Most of this Park is developed or landscaped, however there are large native heritage coast live oaks, valley oaks, and California bays.

3.6.1 General Site Conditions

The following section summarizes Park resources of interest to Vegetation Management Guideline development (Rana, 2002). Refer to Table 3.6.1 below. The information provided in the following table was taken from Rana (2002) and May 2006 information from the Department of Fish and Game's online California Natural Diversity Database, at www. nrdb.org

Table 3.6.1 Summary of Park Resources- Flood Park

Plant Communities	
Coast live oak/or valley oak	Monterey pine woodland
Mixed valley oak/coast live oak/California bay	Redwood woodland
Mixed California bay and redwood	Landscaped/developed
Mostly landscaped/scattered oaks and California bays	Restoration area
Sensitive Plants Known to Occur on Park Lands*	
California black walnut (*Juglans californica var. hindsii*)*	Engelmann/Mesa Oak (*Quercus engelmannii*)
Sensitive Wildlife Species Known to Occur on Park Lands*	
There are no special status wildlife known from within the Park.	
Invasive plants**	
Glossy privet *(Ligustrum japonica)*	Cotoneaster *(Cotoneaster* spp.)
Heavenly bamboo *(Nandina domestica)*	Himalayan blackberry *(Rubus discolor)*
English ivy *(Hedera helix)*	Mustard *(Brassica* sp.)
Acacia *(Acacia retinodes)*	

*Indicates a biological resource that is considered sensitive, locally rare, or protected under the state or federal Endangered Species Act.
** There may be more invasive species present in the park since the last weed inventory (Rana 2002).

The following was excerpted from the County of San Mateo's web site: www.eparks.net

The Park is relatively flat with only an eight-foot variation in elevation. The most significant natural features in the Park are the heritage oaks (Q*uercus lobata* and *Quercus agrifolia*) and the bay trees *(Umbellularia californica*). A number of these have reached significant proportions and are outstanding examples of these species. The Park has undergone heavy use over the years and a large number of exotic (non-native) species have been planted.

3.6.2 Park-Specific Policies, Goals, Management Objectives

Based on an examination of the available documents pertaining to this Park, the vegetation and natural resource management policies, goals, and management objectives that were found pertaining specifically to this Park are presented below in Table 3.6.2; general policies and goals for the County Parks system as a whole are discussed in Chapter 2.

Table 3.6.2 Summary of Park-Specific Policies, Goals and Management Objectives - Flood Park

Source document	Policy, Goal, or Objective
Flood Park Master Plan (1983)	Consider installation of an interior storm drainage system especially in paved area of Park.
	Revegetate the heritage oak and bay tree areas. Monitor of this area after changes are done.
	Limit visitor use, development, and irrigation in heritage tree area.
	Develop specific management plan of heritage trees.
	Monitor wildlife.
	Remove exotics where they threaten heritage trees.
SFPUC Easement Right Of Way	Comply with terms of SFPUC Easement Right Of Way
SFPUC Pesticide Use Reporting for Easement Area	Requires the County staff to report annually on pesticide use within the SFPUC Right of Way at Flood Park.
IPMP Guidelines	Comply with Integrated Pest Management Guidelines developed for this site.
CDF – Guidance on Fuel Reduction Area 100 foot clearance area	Requires a 100-foot reduction area to be established and maintained between wildlands and urban interface areas.

3.6.3 Summary of Park-Specific Vegetation Management Actions.

The following information was developed based on interviews with San Mateo County Park staff. Flood Park originally belonged to the Flood Estate resulting in many disturbed and developed landscaped areas. However, as mentioned previously, there is a large population of heritage trees, oaks and bays that inhabit the Park. The trees are of concern to park staff, because approximately five trees die annually due to root rot fungus. Park rangers would like to be able to better identify the signs of dying trees and how to actively promote the health of the heritage trees. Rangers presently manage the trees against root rot fungus by regularly raking wood chips away from their bases to prevent water from pooling. Refer to Appendix A and C for more information on tree disease detection and management.

The baseball fields and other irrigated turf areas are mowed regularly and the baseball field is managed for gophers to prevent injury to park visitors. Herbicide is used to manage vegetation in the general landscaped areas, baseball field, roadways, and parking lots. (P. Alvarez, Ranger IV, & B. Crawford, Lead Gardener, Pers. comm.). Refer to Section 5 and Appendix A for more information on mowing procedures.

Table 3.6.3 Current and Ongoing Vegetation Management Activities – Flood Park

Vegetation Management Actions	Implementation	Rational/ Requirement	Schedule	Special Considerations
Remove exotics where they threaten heritage trees.	Spread wood chips to cover weeds, but not around base of tree. Refer to Appendix A and C for more information.		Ongoing	
Assessment of all Heritage trees for hazardous conditions - Trim or remove as necessary.	Ongoing. Refer to Section 5 and Appendices B and C for more information.		Annual	All picnic areas are located among the heritage trees, It is a high priority to reduce danger to visitors and reduce spread of the root rot fungus.
Maintain fuel reduction area along 100 foot property perimeter for fire protection.	Ongoing. Cut back brush Refer to Section 5 and Appendix A for more information.	CDF requirement for fire safety zone between wildlands and urban interface	Annual	Neighbors to the north and south do not want trees to be removed.
* Numbers in ( ) refer to the reference document that the action was taken from. See Extended Bibliography in Appendix E for more information on Action Item.				

3.7 HUDDART PARK

Huddart Park is a 974-acre park with diverse native plant communities including a redwood forest, oak woodlands, mixed evergreen forest, and chaparral areas. It provides many recreational facilities for picnics, horseback riding, and hiking. It is also linked to the Crystal Springs Riding and Hiking Trail as well as Wunderlich Park via the Skyline trail.

3.7.1 General Site Conditions

The following section summarizes Park resources of interest to Vegetation Management Guideline development (Rana, 2002). Refer to Table 3.7.1 below. The information provided in the following table was taken from Rana (2002) and May 2006 information from the Department of Fish and Game's online California Natural Diversity Database, at www. nrdb.org

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Table 3.7.1 Summary of Park Resources-Huddart

Plant Communities	
Live oak woodland Mixed evergreen forest Redwood forest	Chaparral Landscaped/developed
Sensitive Plants known to Occur on Park Lands*	
There are no special status plants known from within the Park.	
Sensitive Plants With Potential to Occur*	
Western leatherwood *(Dirca occidentalis)* California bottle-brush grass *(Elymus californicus)* Diablo helianthella *(Helianthella castanea)* Dudley's lousewort *(Pedicularis dudleyi)*	White-flowered rein orchid *(Piperia candida)* Michael's rein orchid *(Piperia michaelii)* Santa Cruz manzanita *(Arctostaphylos andersonii)* Wooly headed lessingia (*Lessingia hololeuca)**

Table 3.7.1 Summary of Park Resources-Huddart

Sensitive Wildlife Species Known to Occur on Park Lands*	
Steelhead-Central CA Coast ESU *(Oncorhynchus mykiss)* Breeding	
Sensitive Wildlife With Potential to Occur*	
California tiger salamander *(Ambystoma tigrinum californiense)* California red-legged frog *(Rana aura draytoni)* San Francisco garter snake *(Thamnophis sirtalis tetrataenia)* Cooper's hawk *(Accipiter cooperii)*	Sharp-shinned hawk *(Accipiter striatus)* Rufous hummingbird *(Selasphorus rufus)* Loggerhead shrike *(Lanius ludovicianus)* Lawrence's goldfinch *(Carduelis lawrencei)*
Invasive Plants **	
Monterey pine *(Pinus radiata)* French broom *(Genista monspessulana)* Thistle *(Carduus pycnocephalus or Cirsium vulgare)*	Yellow star-thistle *(Centaurea solstitialis)* Pampas grass (*Cortaderia selloana)* or jubata grass (*Cortaderia jubata)*

*Indicates a biological resource that is considered sensitive, locally rare, or protected under the state or federal Endangered Species Act.
** There may be more invasive species present in the park since the last weed inventory (Rana 2002).

The following was excerpted from the County of San Mateo's web site at: www.eparks.net

Several different plant communities offer a varied habitat for the creatures found in the Park. Along the streams and in gullies, the majestic coast redwoods provide a cool, well-shaded environment. Here sword fern and redwood sorrel provide luxuriant cover for large, yellow banana slugs that inch slowly on their way. In contrast, the chaparral areas are hot and dry. Few trees exist here. Shrubs, such as manzanita, chamise, chaparral pea, and yerba santa form a thick, almost impenetrable mass of brush. Here the visitor can see jackrabbits, brush bunnies, chipmunks, and lizards scurrying through the underbrush. Birds that are often seen and heard are quail, scrub jays, and wrentits.

Bordering the chaparral and the redwood forest is the mixed evergreen forest, which covers most of the Park. Here trees, such as tanbark oak, madrones, California laurel, coast live oak, and Douglas fir are dominant. Beneath the trees are many shrubs, including sticky monkey flower, wild lilac, toyon, wood rose, and poison oak. Brilliant wildflowers, such as western hound's tongue, Indian warrior, and Fremont's star lily (zygadene lily) are found along with the graceful wood fern. Black-tailed deer, raccoons, black squirrels and, less commonly, bobcats, coyotes and grey foxes may be seen. Common birds include acorn woodpeckers, chickadees, towhees, and stellar jays. Integrating with the other plant communities in the extreme lower part of the Park is the foothill woodland characterized by large white (valley) oaks, black oaks and bay trees. The Park contains remnants of old growth redwood forest.

3.7.2 Park-Specific Policies, Goals, Management Objectives

Based on an examination of the available documents pertaining to this Park, the vegetation and natural resource management policies, goals, and management objectives that were found pertaining specifically to this Park are presented below in Table 3.7.2; general policies and goals for the County Parks system as a whole are discussed in Chapter 2.

Table 3.7.2 Summary of Park-Specific Policies, Goals and Management Objectives – Huddart

Source document	Policy, Goal, or Objective
Huddart and Wunderlich Parks Master Plan (2005)	Reduce sedimentation arising from various sources including road and trail erosion, creek bank erosion due to horse crossing, human use, and natural sources.
	Many detailed instructions to reduce fire load including mechanical removal, landscaping and revegetation, grazing and education.
	Independent watershed assessment to locate all sediment sources.
	Improvements to steelhead habitat including new bridges, culverts and erosion control of creek habitat.
CDF – Guidance on Fule Reduction 100 foot clearance area	Requires a 100-foot fuel reduction area to be established and maintained between wildlands and urban interface areas.

3.7.3 Summary of Park-Specific Vegetation Management Actions

The following information was developed based on interviews with San Mateo County Park staff. Huddart Park is unique in that only 80 of the 974 acres that make up the Park are developed. The rest of the Park is kept in a natural state, including the trail system. It has redwood trees, two creeks, and provides the feeling of being out in the wilderness.

Huddart's primary vegetation management challenge is staying on top of invasive weed infestations including, yellow-star thistle, bull thistle, Italian thistle, acacia, and Scotch and French broom. There is an active volunteer group, the Friends of Huddart and Wunderlich, which works once or twice a week pulling Scotch and French broom.

Fire hazard reduction is managed by cutting away tree branches over established picnic areas. Lawns are mowed on a weekly basis and other grassland areas are mowed once annually. Herbicide is used in high public use areas, along fences, parking lots, and for exotic plant and poison oak control. (P. Alvarez, Ranger IV, & B. Crawford, Lead Gardener, Pers. comm.).

Table 3.7.3 Current and Ongoing Vegetation Management Activities – Huddart Park

Vegetation Management Actions	Implementation	Rationale/ Requirement	Schedule	Special Considerations
Reduce sedimentation arising from various sources including road and trail erosion, creek bank erosion due to horse crossing, human use, and natural sources.	Installing split rail fence to prevent short cuts on trail and prevent erosion.	STOPP Program	Unknown	Watershed improvement/fisheries habitat improvements.
Maintain access roads, fire roads, equestrian trails and pedestrian trails on an annual basis. In addition, inspect major access roads and fire trails after every major storm event during the winter and spring months.	Mowing within 12 inches of trails. Refer to Section 5 and App B.	Visitor safety & Fire hazard reduction.	Unknown	Avoid sensitive species when mowing. Refer to App B and Section 5.

Vegetation Management Actions	Implementation	Rationale/ Requirement	Schedule	Special Considerations
Work with PG&E to maintain the right-of-way throughout the parks and develop guidelines for trailside trimming procedures that preserve habitat and aesthetics as well as fire safety.	Trimming or removing woody vegetation		Ongoing	
Continue to employ current methods and practices to reduce the risk of ignition.	Removing branches over BBQ grills, mowing grassland.	Visitor safety & Fire hazard Reduction.	Summer season.	
Continue to work with volunteers to remove French broom, scotch broom, bull thistle.	Friends of Huddart & Wunderlich.	Maintain & restore native habitats for wildlife & visitor experience.	3 times per month	Neighbors that border Park boundary have infestations of broom that do not get removed.
Ensure key onsite personnel, including Park Rangers, maintenance staff, are trained in basic fire prevention.	Rangers trained by CDF. Ranger staff would be used for information more than fire suppression.			
Include information regarding fire ecology and prevention at entrance and trail staging area kiosks, and in interpretive and educational materials.	Smokey The Bear sign at park entrance stating fire danger (i.e. Low, High, or Extreme). On high fire danger, trails are closed and posted.			
Meet with neighboring homeowner associations to collaborate on fire safety projects.				

Vegetation Management Actions	Implementation	Rationale/ Requirement	Schedule	Special Considerations
Survey annually for tree hazards and poison oak in use areas (campgrounds/ picnic areas).	Park staff visually inspects for hazardous trees and removes branches in close proximity to BBQ grills. Refer to Section 5 and Appendix A.	Visitor safety & Fire hazard reduction.	May - August	Recent report of Sudden Oak Death syndrome at Huddart (S. Herzberg, pers. comm.). If present, follow guidelines in Section 5 and Appendices B and C. Do not move woody debris from site.
Maintain a fuel reduction area along 100 foot of property perimeter for fire protection.	Ongoing. Cut back brush Refer to Section 5 and Appendix A for more information.	CDF requirement for fire safety zone between wildlands and urban interface.	Annual	Caution should be taken to prevent special status plants & wildlife from being mowed.

3.8 JUNIPERO SERRA PARK

Junipero Serra Park is a foothill park that provides for many recreational activities including picnicking, playgrounds, hiking, nature trails, youth day camping, and a panoramic view of the Bay Area. The Park is 108 acres which includes a 58-acre coast live oak woodland and the El Zanjon Creek which together provide a valuable wildlife corridor (Rana, 2002). The Park is bounded on its eastern side by the Serra Fault, while the much larger San Andreas Fault lies ¼ mile to west.

3.8.1 General Site Conditions

The following section summarizes Park resources of interest to Vegetation Management Guideline development (Rana, 2002). Refer to Table 3.8.1 below. The information provided in the following table was taken from Rana (2002) and May 2006 information from the Department of Fish and Game's online California Natural Diversity Database, at www. nrdb.org

Table 3.8.1. Summary of Park Resources - Junipero Serra Park

Plant Communities	
Coast live oak woodland	Redwood
Coast live oak woodland with some Monterey pine	Coyote brush scrub
Arroyo willow riparian woodland	Non-native grassland
Eucalyptus	Non-native grassland with elements of coastal prairie
Monterey pine	Exotic landscaping species
Eucalyptus/Monterey pine	Landscaped/developed
Sensitive Plants known to Occur on Park Lands*	
There are no special status plants that occur on Park lands.	

Table 3.8.1. Summary of Park Resources - Junipero Serra Park

Sensitive Plants With Potential to Occur*	
Western leatherwood *(Dirca occidentalis)*	White-flowered rein orchid *(Piperia candida)*
California bottle-brush grass *(Elymus californicus)*	Michael's rein orchid *(Piperia michaelii)*
Diablo helianthella *(Helianthella castanea)*	Santa Cruz manzanita *(Arctostaphylos andersonii)*
Dudley's lousewort *(Pedicularis dudleyi)*	Bolander's horkelia *(Horkelia bolanderi)**
San Mateo tree lupine *(Lupinus eximius)*	
Sensitive Wildlife Species Known to Occur on Park Lands*	
There are no special status wildlife species that occur on Park lands.	
Sensitive Wildlife With Potential to Occur*	
California Tiger Salamander *(Ambystoma tigrinum californiense)*	Sharp-shinned Hawk *(Accipiter striatus)*
California Red-legged Frog *(Rana aura draytoni)*	Rufous Hummingbird *(Selasphorus rufus)*
San Francisco Garter Snake *(Thamnophis sirtalis tetrataenia)*	Loggerhead Shrike *(Lanius ludovicianus)*
Cooper's Hawk *(Accipiter cooperii)*	Lawrence's Goldfinch *(Carduelis lawrencei)*
Invasive Plants **	
Acacia species (*Acacia* spp.)	Harding grass *(Phalaris aquatica)*
Blue gum Eucalyptus (*Eucalyptus globulus)*	Italian thistle *(Carduus pycnocephalus)*
Bull thistle *(Cirsium vulgare)*	Monterey cypress *(Cupressus macrocarpa)*
Cape ivy/German ivy *(Delairea odorata /Senecio mikanioides)*	Monterey pine *(Pinus radiata)*
English ivy *(Hedera helix)*	Pampas grass (*Cortaderia selloana)* or jubata grass (*Cortaderia jubata)*
Fennel *(Foeniculum vulgare)*	Scotch broom *(Cytisus scoparius)*
French broom *(Genista monspessulana)*	Yellow star-thistle *(Centaurea solstitialis)*

*Indicates a biological resource that is considered sensitive, locally rare, or protected under the state or federal Endangered Species Act.
** There may be more invasive species present in the park since the last weed inventory (Rana 2002).

The following was excerpted from the County of San Mateo's web site: http://www.eparks.net

Junipero Serra Park contains valuable remnants of the foothill plant communities that existed in the Bay Area before the coming of the European explorers and settlers. These communities are well suited to the climate, soils and topography of the area. Common trees found in the Park are the coast live oak, arroyo willow, California bay laurel, madrone, California buckeye, Eucalyptus, Monterey cypress, and Monterey pine. Animals seen in abundance are scrub jays, towhees, banana slugs, raccoons, red-tailed hawks and turkey vultures. An abundance of spring wildflowers are found throughout the Park, both on the grassy hillsides and in the wooded areas. The flowers include Douglas iris, miner's lettuce, hounds tongue, California buttercup, soap plant, and owl clover. Poison oak grows abundantly throughout the Park. All of the plant and animal species are protected in the Park.

Many of the pines have pitch canker, a disease caused by the fungus *Fusarium circinatum.* This fungus may increase the potential of a fire in the oak woodland by killing pines. (Source: UC Berkeley Department of Forestry, Pine pitch canker treatment guidelines available online at: forestry.berkeley.edu/comp_proj/pnpitchcanker.pdf.

3.8.2 Park-Specific Policies, Goals, Management Objectives

Based on an examination of the available documents pertaining to this Park, the vegetation and natural resource management policies, goals, and management objectives that were found pertaining specifically to this Park are presented below in Table 3.8.2; general policies and goals for the County Parks system as a whole are discussed in Chapter 2.

Table 3.8.2 Summary of Park-Specific Policies, Goals and Management Objectives – Junipero Serra Park

Source document	Policy, Goal, or Objective
Junipero Serra Natural Resources Master Plan (1979)	Stabilize erosion of Crystal Springs Drive. By constructing two check dams and willow plantings.
	Remove all invasive trees and shrubs from grassland including invasive native shrubbery.
	Replacement of stream course in riparian areas and erosion control in this area.
Junipero Serra County Recreation Area Master Plan (1981)	Stabilize erosion processes including El Zanjon Creek.
	Re-establish native plant associations.
	Redesign El Zanjon Creek Channel.
	Encourage diversity of wildlife, including quail.
	Gradually remove invasive plants especially the Monterey pine and Eucalyptus, first removing Eucalyptus near private residences on area boundary as they pose a liability problem.
CDF – Guidance on Fuel Reduction 100 foot clearance area	Requires a 100-foot fuel reduction area to be established and maintained between wildlands and urban interface areas.

3.8.3 Summary of Park-Specific Vegetation Management Actions

The following information was developed based on interviews with San Mateo County Park staff. Junipero Serra Park is a heavily disturbed park dominated by Eucalyptus trees and non-native grassland, with one perennial creek and few natural areas. The Park is bordered by houses, an interstate freeway, and a city park, and fuel load management is a concern. Management of fire and fuel load consists of dead trees being removed and chipped on site. Eucalyptus trees are currently only being managed and not removed from the Park. Park staff resources are primarily spent on cleaning up Eucalyptus duff on the trails. The lawn area is mowed on a regular basis and the non-native grassland, mostly composed of rattle-snake grass, is mowed twice a year. Certain Park sites are highly erodable and containing slumps and slides. Herbicide is used to control vegetation in picnic areas, shelter buildings, parking lots, fire control areas, trails, and used to control poison oak, and invasive ivy and broom. (P. Noyer, Ranger IV, Pers. com.).

Table 3.8.3 Current and Ongoing Vegetation Management Activities – Junipero Serra

Vegetation Management Actions	Implementation	Rationale/ Requirement	Schedule	Special Considerations
Gradually remove invasive plants especially the Monterey pine and blue gum Eucalyptus. Remove Eucalyptus near private residences on area boundary first, as they pose a liability problem. (35)	Hazardous trees are trees are removed, all other invasive plants are only managed.	Public safety.	As needed.	
Mow or green chop grasslands annually during the months of May-July for fire suppression. (35)	Fields are mowed by maintenance crew.	Fire suppression & control of non-native grassland.	Twice a year.	Mow before rattlesnake grass sets it seed.
Maintain a fuel reduction area along 100 foot of property perimeter for fire protection.	Ongoing. Cut back brush Refer to Section 5 and Appendix A for more information.	CDF requirement for fire safety zone between wildlands and urban interface.	Annual	Caution should be taken to prevent special status plants & wildlife from being mowed.
Reseed/restore native plants	Ongoing	Following removal of vegetation.	As needed	
Control invasive plants and problem species such as poison oak and Scotch broom. (35)	Mow fields. Refer to Section 5 and Appendix A for mowing procedures.	Enhance native habitat.	As time allows	
Remove all invasive trees and shrubs from grassland including invasive native shrubbery (34). To be done every five years (35).	Removal is done as volunteer groups come in, no organized schedule.	Maintain grassland habitat.	As resources become available (i.e. volunteer groups).	
* Numbers in ( ) refer to the reference document that the action was taken from. See Extended Bibliography in Appendix E for more information on Action Item.				

3.9 MEMORIAL

Memorial Park is part of the Pescadero Park Complex that includes Memorial, Sam McDonald, and Pescadero Park as well as the Heritage Grove area. All together the Pescadero Complex consists of 8,020 acres, of which Memorial is 499 acres. Recreational activities in this Park include hiking, equestrian trails, bike trails, and camping. It is connected to Pescadero Creek Park. In addition, the Pompino Trail connects Memorial to Portola State Park. One of Memorial's unique features are its old-growth redwoods. The oldest tree in this grove is over 1,600 years old. Pescadero Creek flows through this area and is a major spawning stream for steelhead and salmon.

3.9.1 General Site Conditions

The following section summarizes Park resources of interest to Vegetation Management Guideline development (Rana, 2002). Refer to Table 3.9.1 below. The information provided in the following table was taken from Rana (2002) and May 2006 information from the Department of Fish and Game's online California Natural Diversity Database, at www. nrdb.org

Table 3.9.1 Summary of Park Resources-Pescadero Park Complex (including Memorial)

Plant Communities	
Live oak woodland Mixed evergreen forest Redwood forest Santa Cruz cypress (one in native garden)	Alder/willow riparian Coyote brush scrub Coastal prairie Non-native grassland with elements of coastal prairie developed
Sensitive Plants With Potential to Occur*	
Santa Cruz manzanita *(Arctostaphylos andersonii)* Diablo helianthella *(Helianthella castanea)* Western leatherwood *(Dirca occidentalis)* California bottle-brush grass *(Elymus californicus)*	White-flowered rein orchid *(Piperia candida)* Michael's rein orchid *(Piperia michaelii)* Dudley's lousewort *(Pedicularis dudleyi)* White-rayed pentachaeta *(Pentachaeta bellidiflora)*
Sensitive Wildlife Species Known to Occur on Park Lands*	
Steelhead-Central CA Coast ESU *(Oncorhynchus mykiss)* Breeding Coho Salmon-Central CA Coast ESU *(Oncorhynchus kisutch)* Breeding California Red-legged Frog (*Rana aura draytoni)* Foothill Yellow-legged Frog *(Rana boylei)* Northern Harrier *(Circus cyaneus)* Cooper's Hawk *(Accipiter cooperii)* Sharp-shinned Hawk *(Accipiter striatus)*	Ferruginous Hawk *(Buteo regalis)* Marbled Murrelet *(Brachyramphus marmoratum)* Breeding. Olive-sided Flycatcher*(Contopus cooperi)* Loggerhead Shrike *(Lanius ludovicianus)* California Horned Lark *(Eremophila alpestris actia)* Purple Martin *(Progne subis)* Yellow Warbler *(Dendroica petechia)*
Sensitive Wildlife Species with Potential to Occur*	
California Tiger Salamander *(Ambystoma tigrinum californiense)* San Francisco Garter Snake *(Thamnophis sirtalis tetrataenia)* Long-eared owl *(Asio otus)* Vaux's Swift *(Chaetura vauxi)* Lawrence's Goldfinch *(Carduelis lawrencei*)	Western Pond Turtle *(Clemmys marmorata)* Golden Eagle *(Aquila chrysaetos)* California Spotted Owl *(Strix occidentalis occidentalis)* Rufous Hummingbird *(Selasphorus rufus)*
Invasive Plants**	
Cape ivy/German ivy *(Delairea odorata/Senecio mikanioides)*	Bull thistle (*Cirsium vulgare)* Pampas grass (*Cortaderia selloana)* or jubata grass (*Cortaderia*

Table 3.9.1 Summary of Park Resources-Pescadero Park Complex (including Memorial)

Himalayan blackberry *(Rubus discolor)*	*jubata)*
French broom *(Genista monspessulana)*	Harding grass *(Phalaris aquatica)*
Poison hemlock *(Conium maculatum)*	Periwinkle *(Vinca major)*
Italian thistle *(Carduus pycnocephalus)*	Fennel (*Foeniculum vulgare)*
Yellow star-thistle *(Centaurea solstitialis)*	

*Indicates a biological resource that is considered sensitive, locally rare, or protected under the state or federal Endangered Species Act.
** There may be more invasive species present in the park since the last weed inventory (Rana 2002).

The following information was developed based on interviews with San Mateo County Park staff and information excerpted from the County of San Mateo Park's Department website.
Common plants found here are huckleberry, poison oak, ferns, redwood sorrel, azalea, and horsetail. Animals seen in abundance are Steller's jays, acorn woodpeckers, western grey squirrels, raccoons, skunks, and banana slugs. The summer temperature is pleasant and occasionally a cool fog drifts in from the ocean. In winter, the air is crisp and the ground and plants are moist. The yearly rainfall averages 40 inches and frosts are frequent. All of the plant and animal species are protected in the Park.

Pescadero Creek is a winter home for steelhead trout as they migrate upstream to spawn and then move back to the sea in the spring. This stream is viewed as a very significant part of the local watershed and riparian corridor system. Bloomquist, Hoffman, McCormick, and Peterson Creeks join Pescadero Creek within the Park boundaries.

The Park's old growth redwood trees provide nesting habitat for the federally threatened marbled murrelet (*Brachyramphus marmoratus*). Memorial Park presently has a grant to reduce corvid populations in the Park in order to protect marbled murrelet nests from predation. New dumpsters and trash cans will be placed onsite in order to restrict access to food waste, ideally resulting in fewer corvids. (M. Del Carlo, Ranger IV, pers. comm.).

3.9.2 Park-Specific Policies, Goals, Management Objectives

Based on an examination of the available documents pertaining to this Park, the vegetation and natural resource management policies, goals, and management objectives that were found pertaining specifically to this Park are presented below in Table 3.9.2; general policies and goals for the County Parks system as a whole are discussed in Chapter 2.

Table 3.9.2. Summary of Park-Specific Policies, Goals and Management Objectives – Memorial

Source document	Policy, Goal, or Objective
Sediment assessment for Pescadero Park complex (2003)	To reduce sediment delivery into the watersheds stream systems. This document lists specifically which areas need erosion control, prioritizes these sites and lists best methods and costs for implementing the improvements. Important to keep in mind that this document only lists those area that will directly affect stream habitat.
Water supply alternatives, fish passage and use, and streambed conditions at Memorial Park (2003)	Grant was prepared for the removal of dam to improve flow in creek for improved salmonid habitat.
CDF – Guidance on Fuel Reduction 100 foot clearance area	Requires a 100-foot fuel reduction area to be established and maintained between wildlands and urban interface areas.

3.9.3 Summary of Park-Specific Vegetation Management Actions

The following information was developed based on interviews with San Mateo County Park staff. Memorial Park has 156 family campsites and visitors to the Park are primarily comprised of campers and hikers. Some of the Park's trails are in poor condition, limiting site access to certain areas in the Park. Extreme weather in recent years (possibly resulting from El Niño weather patterns) washed out one main trail. This trail has not been reconstructed due to staff and funding limitations, and permitting issues.

Due to the proximity of Pescadero Creek in certain areas, most construction and invasive plant control projects may require wetland permits, a limiting factor in conducting work at this Park. In addition to access and permitting issues, invasive broom species and hazardous trees near campgrounds are vegetation management challenges that Park staff face.

Fire prevention efforts are accomplished by annual mowing and brushing trails, meadows and roads. Fire control by use of controlled burns is no longer permitted due to permit constraints (M. Del Carlo, Ranger IV, Pers. comm.).

Table 3.9.3 Current and Ongoing Vegetation Management Activities – Memorial

Vegetation Management Actions	Implementation	Rationale/ Requirement	Schedule	Special Considerations
Provide a hazardous tree inspection in campgrounds, picnic areas, and trails.	Park staff visually inspects public use areas. Refer to Section 5 and Appendices B and C.	Visitor safety.	Annually and when park staff accesses campground areas.	Marbled murrelet nests in redwood trees.
Remove invasive plants.	French & Scotch broom are hand pulled.	Maintain native habitats.	As resources become available.	No herbicide is used to protect Pescadero watershed.
Develop a scheduled mowing cycle for grass areas.	Grass areas accessible to Park vehicles are mowed. Refer to Section 5 and Appendix A for mowing information.	Maintain meadows and vistas.	Annually.	See timing restrictions in Section 5 and Appendix A.
Maintain a fuel reduction area along 100 foot of property perimeter for fire protection.	Ongoing. Cut back brush Refer to Section 5 and Appendix A for more information.	CDF requirement for fire safety zone between wildlands and urban interface.	Annual	Caution should be taken to prevent special status plants & wildlife from being mowed.

Vegetation Management Actions	Implementation	Rationale/ Requirement	Schedule	Special Considerations
Implement the erosion control projects that were recommended and prioritized for the Pescadero/ Memorial/ Sam McDonald County Park Complex. These projects will reduce the amount of sedimentation reaching the Pescadero Creek Watershed system. (79)	Initiated in 2006. Partial funding provided, Bridges have been installed.	Water quality and habitat for steelhead and salmon as well as their prey.	Complete as funding becomes available.	
* Numbers in ( ) refer to the reference document that the action was taken from. See Extended Bibliography in Appendix E for more information on Action Item.				

3.10 MIRADA SURF EAST AND WEST

Mirada Surf is comprised of two parcels, east and west of Highway 1. This park has been previously identified as open space on the Local Coastal Plan, but only recently was added to the County Park system. In 2002, San Mateo County acquired the eastern of the two parcels of Mirada Surf.

3.10.1 General Site Conditions

Mirada surf west (15 acres) encompasses grasslands to the coast of Highway 1. This park also has a large infestation of French broom and bristly ox tongue that is being treated. Mirada surf east (34 acres) encompasses a large eucalyptus forest on a slope, and a native riparian area. Residents and visitors alike have enjoyed walking along the bluffs, and viewing the ocean as they drive by.

Mirada Surf is a relatively new Park, therefore there is little known about the vegetation resources as the Park was not included in the previous vegetation survey of all Park lands (Rana, 2002; S. Herzberg pers. comm.).

3.10.2 Park-Specific Policies, Goals, Management Objectives

Based on an examination of the available documents pertaining to this Park, the vegetation and natural resource management policies, goals, and management objectives that were found pertaining specifically to this Park are presented below in Table 3.10.3; general policies and goals for the County Parks system as a whole are discussed in Chapter 2.

Table 3.10.2 Summary of Park-Specific Policies, Goals and Management Objectives – Mirada Surf

Source document	Policy, Goal, or Objective
Mirada surf west coastal trail extension (2005)	Control bristly ox-tongue infestations through mowing, hoeing, weed whipping, solarization, and herbicides.
Bio impact form for Mirada surf trail project (2005)	Obtain streambed alteration agreement from CDFG and revegetation area.
	Implement 5-year maintenance and monitoring program for willow riparian woodland revegetation with yearly monitoring report submitted to CDFG.
	Follow construction recommendations for work done in creek area and other sensitive habitats.
	Permanent installation of fencing to restrict off-trail use and interpretive signs for seasonally wet grasslands.

Table 3.10.2 Summary of Park-Specific Policies, Goals and Management Objectives – Mirada Surf

Local Coastal Program (1998)	7.9 Permitted Uses in Riparian Corridors: a. Within corridors, permit only the following uses: (1) education and research, (2) consumptive uses as provided for in the Fish and Game Code and title 14 of the California Administrative Code, (3) fish and wildlife management activities, (4) trails and scenic overlooks on public land(s), and (5) necessary water supply projects. b. When no feasible or practicable alternative exists, permit the following uses: (1) stream dependent aquaculture…(2) flood control projects…(3) bridges…(4) pipelines, (5) repair or maintenance of roadways or road crossings, (6) logging operations which are limited to temporary skid trails, stream crossings…(7) agricultural uses, provided no existing riparian vegetation is removed and no soil is allowed to enter stream channels.
	7.13 Establishment of Buffer Zones for Riparian Corridors: d. On both sides of riparian corridors, from the "limit of riparian vegetation" extend buffer zones 50 feet outward for perennial streams and 30 feet outward for intermittent streams. e. Where no riparian vegetation exists along both sides of riparian corridors, extend buffer zones 50 feet from the predictable high water point for perennial streams and 30 feet from the midpoint of intermittent streams. f. Along lakes, ponds, and other wet areas, extend buffer zones 100 feet from the high water point except for manmade ponds and reservoirs used for agricultural purposes for which no buffer zone is designated.
	7.12 Permitted Uses in Buffer Zones for Riparian Corridors: (same as for riparian corridors, with limitation on development, agriculture, etc.).
	7.16 Permitted Uses in Wetlands: • Nature education and research; • Fishing; • Fish and wildlife management; • Mosquito abatement; and • Diking, dredging and filling only if for restoration or enhancement of biological productivity.
	7.18 Establishment of Buffer Zones for Wetlands: Minimum 100 feet landward from the outermost line of wetland vegetation.
	7.19 Permitted Uses in Buffer Zones for Wetlands: Same as those allowed for within wetlands, but also allows public trails, scenic overlooks.
	7.23 Permitted Uses in Marine and Estuarine Habitats: In marine and estuarine habitats, permit only the following uses: (1) nature education and research, (2) consumptive uses as provided for in the Fish and Game Code and Title 14 of the California Administrative Code, (3) fishing and (4) fish and wildlife management.
	7.30 Permitted Uses – Sea Cliffs: a. where nesting or roosting exists, permit only education and research activities. b. Where nesting or roosting does not exist, permit only the following uses: (1) education and research, (2) limited foot paths.
	7.52 Public Agency Requirements: Require public agencies, to the point feasible, to remove the undesirable pampas grass (or jubata grass) and French, Scotch, and other invasive brooms from their lands.

Table 3.10.2 Summary of Park-Specific Policies, Goals and Management Objectives – Mirada Surf

Weed Abatement Standards for Coastal Development Permit for City of Half Moon Bay (2006)*	**Specific Guidelines for weed abatement (in order to comply with City of Half Moon Bay permit):** • Shall not be performed by discing or blading the ground surface. • Shall be performed by mowing only. • Shall be performed no closer than 4" from the ground. • Shall be performed by a "flail" mower or a "rotary" mower – where mounted on and operated by a medium sized tractor. • Shall not be performed in low-lying areas of parcels where ponding of water may occur during the rainy season **For parcels over one (1) acre in size:** • Should consist on mowing a swath 25 to 40 feet wide, along the perimeter boundary line of parcels. • Mowing should be done as close to the fence lines as possible. • Equipment operation and turn around should be confined to the 25 to 40 feet wide swath where weed abatement is being performed

* This management objective is a result of a Coastal Development Permit that was issued for properties within the City of Half Moon Bay Fire Protection District, and is applicable to all properties within the District. For more information, contact the Half Moon Bay Planning Department Atten Don Dakins, (650) 726-8250.

3.10.3 Summary of Park-Specific Vegetation Management Actions

The following information was developed based on interviews with San Mateo County Park staff. Mirada Surf Park was added to the County Park system in a highly disturbed condition. The Park was being used as a dump site by the public. Park staff removed over 100 tires from the site and fenced off the area. Dominant vegetation in the west side of the Park consists of invasive weeds such as bristly ox-tongue (*Picris echioides*) and on the east side, Eucalyptus. Removing the weeds and restoring the Park to native habitat is the primary goal for park staff at Mirada Surf. (pers. comm., M. Del Carlo, Ranger IV).

Table 3.10.3 Current and Ongoing Vegetation Management Activities – Mirada Surf

Vegetation Management Actions	Implementation	Rationale/ Requirement	Schedule	Special Considerations
Control bristly ox-tongue infestations through mowing, hoeing, weed whipping, solarization, and herbicides.(88) Develop a mowing schedule for bristly ox tongue in grass areas with times of the year to mow.	Bristly ox-tongue is mowed (no herbicides are used).	Restore to native habitat.	1-2 times annually; once in July.	See mowing timing restrictions in Section 5 and Appendix A.
Remove coyote brush from grasslands on Mirada Surf West to maintain open grassland habitat.	Grassland is mowed, including coyote brush.	Maintain grassland habitat.	1-2 times annually; once in July.	Avoid mowing coyote brush during nesting bird season. There are no established trails on site.

Vegetation Management Actions	Implementation	Rationale/ Requirement	Schedule	Special Considerations
Maintain a fuel reduction area along 100 foot of property perimeter for fire protection.	Ongoing. Cut back brush Refer to Section 5 and Appendix A for more information.	CDF requirement for fire safety zone between wildlands and urban interface.	Annual	Caution should be taken to prevent special status plants & wildlife from being mowed.
Continue to follow construction recommendations for work done in creek area and other sensitive habitats. (89).		Restore to native habitat.	Annually.	
* Numbers in ( ) refer to the reference document that the action was taken from. See Extended Bibliography in Appendix E for more information on Action Item.				

3.11 PESCADERO PARK

The Pescadero Creek Park Complex includes Pescadero Creek, Sam McDonald, and Memorial Parks as well as the Heritage Grove area. All together this Park consists of 8,020 acres. Pescadero Creek flows year-round through this area, and is a major spawning stream for steelhead and salmon. Recreational activities in this Park include hiking, equestrian trails, and camping. Pescadero Creek is situated in the coastal fog zone and is dominated by redwood forest which was logged from the late 1850's until and 1970's. At present, the forest resources of the site are largely unmanaged, resulting in high regeneration of redwood, and heavy development of brush and trees which pose a significant fire hazard. Access to the interior of the Park Complex is limited, and park staffing minimal.

3.11.1 General Site Conditions

The following section summarizes Park resources of interest to Vegetation Management Guideline development (Rana, 2002). Refer to Table 3.11.1 below. The information provided in the following table was taken from Rana (2002) and May 2006 information from the Department of Fish and Game's online California Natural Diversity Database, at www. nrdb.org

Table 3.11.1. Summary of Park Resources- Pescadero Complex (including Pescadero Park)

Plant Communities	
Live oak woodland	Alder/willow riparian
Mixed evergreen forest	Coyote brush scrub
Redwood forest	Coastal prairie
Santa Cruz cypress grove	Non-native grassland with elements of coastal prairie
Knobcone pine forest	Developed
Sensitive Plants known to Occur on Park Lands*	
Santa Cruz cypress (*Cupressus abramsiana*)	
Sensitive Plants With Potential to Occur*	
Santa Cruz manzanita *(Arctostaphylos andersonii)*	White-flowered rein orchid *(Piperia candida)*
Diablo helianthella *(Helianthella castanea)*	Michael's rein orchid *(Piperia michaelii)*
Western leatherwood *(Dirca occidentalis)*	Dudley's lousewort *(Pedicularis dudleyi)*
California bottle-brush grass *(Elymus californicus)*	White-rayed pentachaeta *(Pentachaeta bellidiflora)*

Table 3.11.1. Summary of Park Resources- Pescadero Complex (including Pescadero Park)

Sensitive Wildlife Species Known to Occur on Park Lands*	
Steelhead-Central CA Coast ESU *(Oncorhynchus mykiss)* Breeding	Ferruginous Hawk *(Buteo regalis)*
Coho Salmon-Central CA Coast ESU *(Oncorhynchus kisutch)* Breeding	Marbled Murrelet *(Brachyramphus marmoratum)* Breeding.
California Red-legged Frog *(Rana aura draytoni)*	Olive-sided Flycatcher*(Contopus cooperi)*
Foothill Yellow-legged Frog *(Rana boylei)*	Loggerhead Shrike *(Lanius ludovicianus)*
Northern Harrier *(Circus cyaneus)*	California Horned Lark *(Eremophila alpestris actia)*
Cooper's Hawk *(Accipiter cooperii)*	Purple Martin *(Progne subis)*
Sharp-shinned Hawk *(Accipiter striatus)*	Yellow Warbler *(Dendroica petechia)*
Sensitive Wildlife Species with Potential to Occur*	
California Tiger Salamander *(Ambystoma tigrinum californiense)*	Western Pond Turtle *(Clemmys marmorata)*
San Francisco Garter Snake (*Thamnophis sirtalis tetrataenia)*	Golden Eagle *(Aquila chrysaetos)*
Long-eared owl *(Asio otus)*	California Spotted Owl *(Strix occidentalis occidentalis)*
Vaux's Swift *(Chaetura vauxi)*	Rufous Hummingbird *(Selasphorus rufus)*
Lawrence's Goldfinch *(Carduelis lawrencei)*	
Invasive Plants**	
Cape ivy/German ivy *(Delairea odorata/Senecio mikanioides)*	Pampas grass (*Cortaderia selloana)* or jubata grass (*Cortaderia jubata)*
Himalayan blackberry *(Rubus discolor)*	Bull thistle *(Cirsium vulgare)*
French broom *(Genista monspessulana)*	Harding grass *(Phalaris aquatica)*
Poison hemlock (*Conium maculatum)*	Periwinkle *(Vinca major)*
Italian thistle *(Carduus pycnocephalus)*	Fennel *(Foeniculum vulgare)*
Yellow star-thistle *(Centaurea solstitialis)*	

*Indicates a biological resource that is considered sensitive, locally rare, or protected under the state or federal Endangered Species Act.
** There may be more invasive species present in the park since the last weed inventory (Rana 2002).

The following was excerpted from the County of San Mateo's web site: http://www.eparks.net

The Park contains a significant amount of forest and watershed related resources. In addition to coast redwoods and Douglas fir, there is a fairly large grove of endangered Santa Cruz cypress *(Cupressus abramsinana*) along Butano Ridge. Other major tree species include California wax myrtle, tan oak (once commercially harvested for tan bark), madrone, California bay laurel, big leaf maple, canyon live oak, coast live oak, and knobcone pine. As mentioned above, the forest resources of the site were logged from the 1850's until the 1970's but are presently largely unmanaged, resulting in regeneration of redwood, and heavy development of brush and trees which pose a significant fire hazard. Access to the interior of the Park complex is limited. Pescadero Creek and Alpine Creek both contain steelhead trout (S*almo gairdneri*). Pescadero Creek also has a small and variable run of silver salmon (*Oncorhynchus kitsutch*). The steelhead (a sea run rainbow trout) is by far the most significant of these species. Both are listed as endangered by the state and federal agencies. The Park also provides nesting for the endangered marbled murrelet. Feral pigs are becoming a significant pest, causing erosion damage.

3.11.2 Park-Specific Policies, Goals, Management Objectives

Based on an examination of the available documents pertaining to this Park, the vegetation and natural resource management policies, goals, and management objectives that were found pertaining

specifically to this Park are presented below in Table 3.11.2; general policies and goals for the County Parks system as a whole are discussed in Chapter 2.

Table 3.11.2. Summary of Park-Specific Policies, Goals and Management Objectives – Pescadero

Source document	Policy, Goal, or Objective
Natural Resources Management Program for Pescadero Creek County Park (1983)	Encourage riparian growth to stabilize banks.
	Reduce hazard through controlled burns and hand and mechanical clearing.
	Accelerate return of forest to natural condition leading to an increase in redwoods and a decrease in Douglas fir.
	To encourage new growth of forest conifers to reduce dominance of hardwoods and brush.
	Implement vegetation monitoring program..
	Implement monitoring program to measure ecological changes.
	Implement wildlife monitoring program.
	Implement a program to monitor sediment in the creek and numbers of steelhead using the creek.
	A one time survey of each tributary stream named on the base map within the study area and map the extent of steelhead upstream migration.
	Install stream gage.
	Annual spring gravel permeability tests.
	Annual juvenile steelhead population estimates.
	Water-quality monitoring.
	Implement watershed monitoring program
	Remove weeds and restore grasslands.
Recovery plan for the Santa Cruz cypress (1998)	Develop and implement Best Management Practices for Santa Cruz Cypress.
Natural Resources management program; Implementation Concept Plan: Pescadero Creek County Park (1995)	Erosion control to reduce non-point sources of sedimentation reaching Pescadero Creek and its tributaries.
	Reduction of fire hazards within the resource management area.
	Consider creating an ordinance that sets aside all funds from forest products within Memorial/Pescadero Parks be put into trust fund for ongoing management.
	Implement selective harvest and forest rehabilitation plan, and restoration, and monitor the results.
	Restoration of redwood forest to a state approximating that of an old-growth appearance at the earliest time possible.
	Enhancement of steelhead trout and Coho salmon habitat through watershed improvement and in-stream habitat projects.
Sediment Assessment for Pescadero Park Complex (2003)	To reduce sediment delivery into the watersheds stream systems. This document lists specifically which areas need erosion control, prioritizes these sites and lists best methods and costs for implementing the improvements. Important to keep in mind that this document only lists those area that will directly affect stream habitat.
CDF – Guidance on Fuel Reduction100 foot clearance area	Requires a 100-foot fuel reduction area to be established and maintained between wildlands and urban interface areas.

3.11.3 Summary of Park-Specific Vegetation Management Actions

The following information was developed based on interviews with San Mateo County Park staff. Pescadero is the largest Park in the County Park system but many trails are single track trails that are currently used for vehicle access. In order to maintain vehicle access on these trails, ongoing maintenance is required. The main access road between Pescadero and Sam MacDonald Park is

closed part of the year due to steepness and trail conditions. One area of the Park, the Butano Ridge Trail, is only accessible through the private property neighboring the Park, owned by a lumber company. Many of the old logging roads are unmarked and the forests are overly dense with secondary growth (particularly in the southern portion of the Park).

Park staff and Equipment Operators mow accessible grasslands (i.e. Worley Flat, Tarwater, Jack Brook Horse Camp, and Town Ridge areas) annually to help control invasive weeds and for fire protection. French broom is a problematic weed in the Park, and due to the sensitive Pescadero watershed, no pesticides or herbicides may be applied in the Complex. (M. Del Carlo, Ranger IV, pers. comm.)

Table 3.11.3 Current and Ongoing Vegetation Management Activities – Pescadero Creek

Vegetation Management Actions	Implementation	Rationale/ Requirement	Schedule	Special Considerations
Stabilize banks by encouraging riparian growth. (55)	Using native seed and erosion control measures.	Reduce erosion and sediment load.	As needed	
Utilize burns and hand and mechanical clearing to reduce fire hazards. (55)	Vegetation along fire road is cleared.	Increase access, reduce fire hazard.	Annual	
Implement watershed monitoring program. (55)	Scheduled to begin in 2006, additional funding needed to complete.	Water quality and habitat for native species.	Scheduled to begin in 2006	
Remove weeds and restore the grasslands. (55)	Grasslands are mowed.	Restore/ maintain native habitat.	Annual	
Maintain a fuel reduction area along 100 foot of property perimeter for fire protection.	Ongoing. Cut back brush Refer to Section 5 and Appendix A for more information.	CDF requirement for fire safety zone between wildlands and urban interface	Annual	Caution should be taken to prevent special status plants & wildlife from being mowed.
* Numbers in ( ) refer to the reference document that the action was taken from. See Extended Bibliography in Appendix E for more information on Action Item.				

3.12 SAM MCDONALD

Sam McDonald Park comprises 850 acres of the Pescadero Park Complex. It is also connected to Portola State Park and Memorial Park through a network of trails. Recreational facilities include camps for organized youth, Sierra Club Hikers, the Jack Brook Horse Camp, and the Sierra Club Hiker's Hut.

3.12.1 General Site Conditions

The following section summarizes Park resources of interest to Vegetation Management Guideline development (Rana, 2002). Refer to Table 3.12.1 below. The information provided in the following table was taken from Rana (2002) and May 2006 information from the Department of Fish and Game's online California Natural Diversity Database, at www. nrdb.org

Table 3.12.1 Summary of Park Resources- Pescadero Complex (including Sam McDonald)

Plant Communities	
Live oak woodland	Alder/willow riparian
Mixed evergreen forest	Coyote brush scrub
Redwood forest	Coastal prairie
Knobcone pine forest	Non-native grassland with elements of coastal prairie
	Developed
Sensitive Plants With Potential to Occur*	
	White-flowered rein orchid *(Piperia candida)*
Diablo helianthella *(Helianthella castanea)*	Michael's rein orchid *(Piperia michaelii)*
Western leatherwood *(Dirca occidentalis)*	Dudley's lousewort *(Pedicularis dudleyi)*
California bottle-brush grass *(Elymus californicus)*	White-rayed pentachaeta *(Pentachaeta bellidiflora)*
Sensitive Wildlife Species Known to Occur on Park Lands*	
Steelhead-Central CA Coast ESU *(Oncorhynchus mykiss)* Breeding	Ferruginous Hawk *(Buteo regalis)*
Coho Salmon-Central CA Coast ESU *(Oncorhynchus kisutch)* Breeding	Marbled Murrelet *(Brachyramphus marmoratum)* Breeding.
California Red-legged Frog *(Rana aura draytoni)*	Olive-sided Flycatcher*(Contopus cooperi)*
Foothill Yellow-legged Frog *(Rana boylei)*	Loggerhead Shrike *(Lanius ludovicianus)*
Northern Harrier *(Circus cyaneus)*	California Horned Lark *(Eremophila alpestris actia)*
Cooper's Hawk *(Accipiter cooperii)*	Purple Martin *(Progne subis)*
Sharp-shinned Hawk *(Accipiter striatus)*	Yellow Warbler *(Dendroica petechia)*
Sensitive Wildlife Species with Potential to Occur*	
California Tiger Salamander (*Ambystoma tigrinum californiense*)	Western Pond Turtle *(Clemmys marmorata)*
San Francisco Garter Snake *(Thamnophis sirtalis tetrataenia)*	Golden Eagle *(Aquila chrysaetos)*
Long-eared owl *(Asio otus)*	California Spotted Owl *(Strix occidentalis occidentalis*)
Vaux's Swift *(Chaetura vauxi)*	Rufous Hummingbird *(Selasphorus rufus)*
Lawrence's Goldfinch *(Carduelis lawrencei)*	
Invasive Plants**	
Cape ivy/German ivy *(Delairea odorata/Senecio mikanioides)*	Bull thistle *(Cirsium vulgare)*
	Pampas grass (*Cortaderia selloana)* or jubata grass (*Cortaderia jubata)*
Himalayan blackberry *(Rubus discolor)*	Harding grass *(Phalaris aquatica)*
French broom *(Genista monspessulana)*	Periwinkle *(Vinca major)*
Poison hemlock *(Conium maculatum)*	Fennel *(Foeniculum vulgare)*
Italian thistle *(Carduus pycnocephalus)*	
Yellow star-thistle *(Centaurea solstitialis)*	

*Indicates a biological resource that is considered sensitive, locally rare, or protected under the state or federal Endangered Species Act.

** There may be more invasive species present in the park since the last weed inventory (Rana 2002).

The following was excerpted from the County of San Mateo's web site: http://www.eparks.net

Much of the Park is very steep, running from 400 ft. along Alpine Creek to over 1300 ft. in elevation at the highest point on Towne Ridge. This wide range of elevation accounts for some rather interesting natural features. In the lower elevations along moist ravines, many fern varieties are found, including the graceful five finger fern, sword fern, lady fern, gold back fern, polypody, and woodwardia ferns. Also to be found along the moister slopes in great abundance are trillium, redwood violet, red claytonia and wild strawberry. In the more shady areas, carpets of redwood sorrel cover the redwood floor, and during the spring rainy season, beautiful mosses and mushroom shapes appear throughout the Park in glorious array.

Trees common to the redwood forest include the coastal redwood, Douglas fir, various varieties of oak and California bay trees. Trees found on the edge of the redwood forest in drier areas include madrone, California buckeye, and big leaf maple. The drier open areas abound in the springtime with a colorful display of beautiful wildflowers. Some of the prevalent types include sticky monkey flower, wood rose, sun cup and of course California poppy.

3.12.2 Park-Specific Policies, Goals, Management Objectives

Based on an examination of the available documents pertaining to this Park, the vegetation and natural resource management policies, goals, and management objectives that were found pertaining specifically to this Park are presented below in Table 3.12.2; general policies and goals for the County Parks system as a whole are discussed in Chapter 2.

Table 3.12.2 Summary of Park-Specific Policies, Goals and Management Objectives – Sam McDonald

Source document	Policy, Goal, or Objective
Sediment assessment for Pescadero Park Complex (2003)	To reduce sediment delivery into the watersheds stream systems. This document lists specifically which areas need erosion control, prioritizes these sites and lists best methods and costs for implementing the improvements. Important to keep in mind that this document only lists those area that will directly affect stream habitat.
CDF – Guidance on Fuel reduction 100 foot clearance area	Requires a 100-foot fuel reduction area to be established and maintained between wildlands and urban interface areas.

3.12.3 Summary of Park-Specific Vegetation Management Actions

The following information was developed based on interviews with San Mateo County Park staff. Sam McDonald borders Pescadero Park to the north and is similar to Pescadero in many ways. Some trails are unnamed and vandals have been known to remove trail signs. Also, many trails are single-track and inaccessible to Park vehicles. Vegetation management has been reduced significantly in recent years due to the loss of the Honor Camp workforce (volunteer county prisoners). The Honor Camp in the past maintained vegetation 30 feet on either side of the main access road and would cut hazardous trees (that were then sold to campers as firewood, generating income for the Park).

There are a few large grassland areas (over 200 acres) that are mowed once or twice a year depending on time availability. Some shrubs are mowed in order to maintain the meadow habitat and discourage scrub habitat from taking over.

Table 3.12.3 Current and Ongoing Vegetation Management Activities – Sam McDonald

Vegetation Management Actions	Implementation	Rationale/ Requirement	Schedule	Special Considerations
Provide a hazardous tree inspection in campgrounds and picnic areas	Visual inspection for hazardous trees. Refer to Section 5 and Appendices B and C.	Staff and public safety.	Annually and when staff accesses area.	
Remove invasive plants	Hand pulling	Maintain native habitats.	As resources allow.	No herbicide is used to protect Pescadero watershed.
Develop a scheduled mowing cycle for grass areas	Mow invasive grasses before they set seed. Refer to Section 5 and Appendix A for mowing restrictions.	Reduce invasive grasses.	Annual	
Maintain a fuel reduction area along 100 foot of property perimeter for fire protection.	Ongoing. Cut back brush Refer to Section 5 and Appendix A for more information.	CDF requirement for fire safety zone between wildlands and urban interface.	Annual	Caution should be taken to prevent special status plants & wildlife from being mowed.
Implement the erosion control projects that were recommended and prioritized for the Pescadero/Memorial/Sam McDonald County Park Complex. (79)	Recommended treatments for road-related & trail-related sites underway include: critical dips, install/replace/clean, corrugated metal, pipes (CMPs), excavate soil, down spouts, wet crossings, install bridges, outslope road and remove ditch, install rolling dips, rock road drains, rock road surfaces	These projects will reduce the amount of sedimentation reaching the Pescadero Creek Watershed system.	Ongoing	
Control feral pig population		Reduces erosion and recruitment of invasive plants.	Regularly as needed to control population.	
* Numbers in ( ) refer to the reference document that the action was taken from. See Extended Bibliography in Appendix E for more information on Action Item.				

3.13 SAN BRUNO MOUNTAIN

San Bruno Mountain is a State and County Park that contains 2,326 acres. With over 11 miles of trails present, hiking is one of the major recreational activities on San Bruno Mountain, along with biking, and picnicking. Many visitors to the Park come to see its rare and endangered species including the endemic San Bruno Mountain manzanita; and to enjoy the spectacular views of the Bay Area. Additionally, local school groups utilize a ropes course on the Mountain for teambuilding activities. Some of the threats to this park include habitat conversion (both natural sucessional changes and changes induced by invasive plants)(see Table 3.13.1 & list below).

3.13.1 General Site Conditions

The following section summarizes Park resources of interest to Vegetation Management Guideline development (Rana, 2002). Refer to Table 3.13.1 below. The information provided in the following table was taken from Rana (2002) and May 2006 information from the Department of Fish and Game's online California Natural Diversity Database, at www. nrdb.org

Table 3.13.1 Summary of Park Resources- San Bruno Mountain

Plant Communities	
Coast live oak woodland	Gorse infested areas
Eucalyptus	Coastal prairie
Mixed exotic forest	Needlegrass grassland
Northern coastal scrub	Non-native grassland
Blue blossom chaparral	Non-native grassland with elements of coastal prairie
Northern maritime chaparral	Non-native grassland with some needlegrass
Central coast riparian scrub	Freshwater marsh
Central dune scrub	Seasonal wetland
Sensitive Plants known to Occur on Park Lands*	
Coast rock cress *(Arabis blepharophylla)*	San Francisco wallflower (*Erysimum franciscanum)*
San Bruno Mountain manzanita *(Arctostaphylos imbricata)*	San Francisco gum plant (*Grindelia hirsutula var. Maritima)*
Montara manzanita *(Arctostaphylos montarensis)*	Diablo helianthella *(Helianthella castanea)*
San Francisco Bay spineflower *(Chorizanthe var. Cuspidata)*	Choris's popcorn flower *(Plagiobothrys chorisianus var. Chorisianus)*
San Francisco collinsia *(Collinsia multicolor)*	San Francisco campion *(Silene verecunda ssp. Verecunda)*
San Francisco lessingia *(Lessingia germanorum)*	San Francisco owl's clover *(Triphysaria floribunda)*- not seen since 1960's
Larval Host Plants/Nectar Plants for Endangered Butterflies	
Lupine *(Lupinus albifrons, L. formosus, & L. variicolor)*	California plantain *(Plantago erecta)*
Stonecrop *(Sedum spathulifolium)*	Owl's clover *(Castilleja densiflora)*
Johnny jump-up *(Viola pedunculata)*	
Sensitive Plants With Potential to Occur*	
None.	
Sensitive Wildlife Species Known to Occur on Park Lands*	
Northern Harrier *(Circus cyaneus)* Breeding	Coast Range Newt *(Taricha torosa torosa)*
Burrowing Owl *(Athene cunicularia)*	California Red-legged Frog *(Rana aura draytoni)*
Rufous hummingbird*(Selasphorus rufus)*	Mission Blue Butterfly *(Icaricia icarioides missionensis)*
Olive-sided flycatcher *(Contopus copperi)* Breeding	San Bruno Elfin Butterfly (*Incisalia mossii bayensis)*
Loggerhead Shrike (*Lanius ludovicianus*)	Callippe Silverspot butterfly *(Speyeria callippe callippe)*
California Horned Lark (*Eremophila alpestris actia*)	

Table 3.13.1 Summary of Park Resources- San Bruno Mountain

Sensitive Wildlife With Potential to Occur*	
San Francisco Garter Snake (*Thamnophis sirtalis tetrataenia*)	Bay Checkerspot Butterfly *(Euphydryas editha bayensis)* Reported in 1982, but not seen in Park since this date
Invasive Plants**	
Acacia *(Acacia* spp.)	Single-seed hawthorn *(Crataegus monogyna)*
Bull thistle (*Cirsium vulgare)*	Himalayan blackberry (*Rubus discolor)*
Cape ivy *(Delairea odorata)*	Ice plant *(Carpobrotus edulis)*
Cotoneaster *(Cotoneaster sp.)*	Italian thistle *(Carduus pycnocephalus)*
Ehrharta *(Ehrharta erecta)*	Monterey cypress *(Cupressus macrocarpa)*
English ivy *(Hedera helix)*	Mustard *(Brassica rapa)*
Blue gum Eucalyptus *(Eucalyptus globulus)*	Ox-eye daisy *(Leucanthemum vulgare)*
French broom *(Genista monspessulana)*	Oxalis/Bermuda buttercup *(Oxalis pes-caprae)*
Fennel *(Foeniculum vulgare)*	Pampas grass (*Cortaderia selloana)* or jubata grass (*Cortaderia jubata)*
Australian fireweed *(Erechtites minima)*	Poison hemlock *(Conium maculatum)*
Gorse *(Ulex europaeus)*	Purple loosestrife *(Lythrum salicaria)*

*Indicates a biological resource that is considered sensitive, locally rare, or protected under the state or federal Endangered Species Act.
** There may be more invasive species present in the park since the last weed inventory (Rana 2002).

In addition to the invasive species that Rana reported (Table 3.13.1), land managers working on the mountain have also been controlling the following species (M. Heath, M. Forbert, pers. Comm.):

- Bristly ox-tongue (*Picris echioides*)
- Common cat's ear *(Hypochaeris radicata)*
- Curly dock (*Rubus crispus*)
- Fox-glove (*Digitalis* sp.)
- Harding grass (*Phalaris stenoptera*)
- Italian wild rye (*Lolium multiflorum*)
- Lamb's quarter (*Chenopodium album*)
- Licorice plant (*Helichrysum petiolare*)
- Lobularia (*Lobularia maritima*)
- Milk thistle (*Silybum marianum*)
- Monterey pine (*Pinus radiata*)
- Mustard (*Brassica nigra*)
- Mustard (*Hirschfeldia incana*)
- Myoporum (*Myoporum laetum*)
- Napa thistle (*Centaurea melitensis*)
- New Zealand fireweed (*Erechtites arguta*)
- Nightshade (*Solanum* sp.)
- Pincushion flower (*Scabiosa atropurpurea)*
- Portuguese broom (*Cytisus striatus*)
- Bristly lettuce (*Lactuca serriola*)
- Purple star thistle (*Centaurea calcitrapa*)
- Purple velvet grass (*Holcus lanatus*)
- Pyrocantha (*Pyrocantha crenato-serrata*)
- Rattlesnake grass (*Briza maxima*)
- Red valerian (*Centranthus ruber*)
- Redstem filaree (*Erodium cicutarium*)
- Sheep sorrel (*Rumex acetosella*)
- Soft chess (*Bromus hordeaceus*)
- Wild lettuce (*Lactuca virosa*)
- Wild oat (*Avena* spp.)
- Wild radish (*Raphanus sativus, R. raphinastrum*)

Western tussock moth has also been identified as infesting one area of San Bruno Mountain manzanita (Rana, 2002). Refer to Section 5 and Appendices B and C for more information on this species and its detection and control.

3.13.2 Park-Specific Policies, Goals, Management Objectives

Based on an examination of the available documents pertaining to this Park, the vegetation and natural resource management policies, goals, and management objectives that were found pertaining specifically to this Park are presented below in Table 3.13.2; general policies and goals for the County Parks system as a whole are discussed in Chapter 2.

Table 3.13.2 Summary of Park-Specific Policies, Goals and Management Objectives – San Bruno Mountain

Source document	Policy, Goal, or Objective
San Bruno Mountain Area Habitat Conservation Plan (1982)	Research: habitat succession and brush advance, species composition changes, habitat enhancement strategies
	Monitoring: Mitigation areas, endangered species populations, research and pilot study progress, conserved habitat enhancement programs
	Habitat enhancement for endangered mission blue, Callipe silverspot, and San Bruno elfin butterflies: Seeding/propagation, Chaining/scraping, Burning, Soil modification (rock spreading), Exotic Species and Brush management, Re-introduction of grazing, Vandalism/fire control
San Bruno Mountain Area Habitat Conservation Plan Administration; Monterey Pine (1998)	Recommends that Monterey Pine be treated as a sensitive species as well as using it to revegetate Brisbane Quarry with Monterey Pine.
San Bruno Mountain Community Wildfire Protection and Fire Use Plan (2005)	Identify and implement activities within the HCP and adjacent areas that reduce hazardous fuel loads, prevent wildfires, and limit the likelihood of the extension of a wildfire.
	No planned grassland burns at this time, but may be needed in future.
	"Let burn" policy during proper time of year for most areas.
	Establish buffers.
	Maintain roads for maintenance activities as well as emergency response.
	Restore grassland habitat for the federally endangered butterflies covered by the HCP while maintaining historic prairies, grasslands, and scrub communities.
	Use manual treatments with pile burning as a vegetation management tool, in conjunction with other management techniques.
Colma Creek Headwaters Restoration Project (2005)	To increase the summer and fall flows of upper Colma Creek by removing Eucalyptus trees in and directly adjacent to the creek.
	Priorities for invasive removal: 1-Riparian corridor along and adjacent to creek
San Bruno Mountain Master Plan	Take steps to remove or restore unneeded trails, service roads, and fire breaks.
	Address erosion, drainage, and public use issues caused by undesignated trails.
	Employ the use of barriers such as posts and cable to keep visitors on designated trails.
	Promote the use of integrated vegetation management to control invasive species.
	Identify priority areas and phasing for removal of invasive vegetation.
	Grassland communities are in the greatest danger of being lost on San Bruno. Therefore institute experimental programs to assess the effectiveness of controlled burning, grazing, and other techniques. Assess this data and then implement program.
	Monitor sensitive habitats that may be impacted by visitor use and implement trail and area closures as conditions warrant.
	Increase removal of invasives.
	Explore new methods of removal such as chemical application and controlled grazers.

Table 3.13.2 Summary of Park-Specific Policies, Goals and Management Objectives – San Bruno Mountain

Source document	Policy, Goal, or Objective
	Preserve certain stands of Eucalyptus that have significance and continue to remove other stands.
Post-burn restoration plan for wax myrtle ravine (2004)	Restore and create habitat for the endangered mission blue, Callipe silverspot, and San Bruno elfin butterflies.
	Control exotic species infestations of gorse, Eucalyptus, and others utilizing the following techniques herbicide, hand work, reseeding, planting, and burning/grazing.
Fire and fire suppression policy report: Southeast Ridge unplanned burn (2005)	Expand HCP to include fire as management tool.
	Further restoration of areas that were burned in Sept. 2002.
CDF – Guidance on Fuel Reduction 100 foot clearance area	Requires a 100-foot fuel reduction area to be established and maintained between wildlands and urban interface areas.

3.13.3 Summary of Park-Specific Vegetation Management Actions

The following information was developed based on interviews with San Mateo County Park staff. As mentioned previously, San Bruno Mountain is home to several sensitive species, as well as several invasive species that threaten the sensitive habitat. Habitat restoration, protection, and invasive species removal are ongoing (see Table 3.13.3.a below for a list of ongoing actions). There are several projects ongoing at San Bruno Mountain, incorporating not just San Mateo County Park staff, but other contractors as well. San Bruno Mountain has a Habitat Conservation Plan (HCP) that is managed by Thomas Reid & Associates (TRA). Actions carried out under the HCP by TRA are contracted out to qualified firms including Shelterbelt Builders, Inc., West Coast Wildlands, and May & Associates, Inc. Because so many entities are actively working at San Bruno Mountain, one of the challenges for park staff is keeping in touch with the various projects taking place. Park staff must coordinate closely with TRA before and after projects on the mountain in order to follow HCP guidelines. All reporting is submitted to TRA. (P. Noyer, Ranger IV, pers. comm.).

San Bruno Mountain also has an active volunteer stewardship base. There are three volunteer stewardship programs on the mountain – Heart of the Mountain, Friends of San Bruno Mountain, and San Bruno Mountain Watch, in addition to the San Mateo County Volunteer Coordinator's efforts, all of which bring volunteers to assist with planting, monitoring, and invasive species removal.

Because numerous habitat restoration projects are underway at San Bruno Mountain, the requests for collection of seed and vegetation materials from this park are challenging. Refer to Section 5 and Appendix A for guidelines on procedures to follow for seed (and other vegetation collection), and for suggested limits on collection activities to help safeguard source populations.

Table 3.13.3.a Current and Ongoing Vegetation Management Activities – San Bruno Mountain

Vegetation Management Actions	Implementation	Rationale/ Requirement	Schedule	Special Considerations
Actions managed by San Mateo County Parks				
Control exotic species infestations of gorse, Eucalyptus, and others. (81)	A pilot gorse project is underway.		A pilot gorse project is underway. 2004-2007.	Must be carefully timed to protect several sensitive species, including: bird nesting periods, rare plant population locations/ bloom times, endangered butterfly host plant locations/flight times, etc. See table 3.13.3.b below.
Monitor sensitive habitats that may be impacted by visitor use and then implement trail and area closures as conditions warrant.	Areas are closed during high fire season.		Annually	See table 3.13.3.b below.
Promote the use of integrated vegetation management to control non-native species. (78)				Must be carefully timed to protect several sensitive species, including: bird nesting periods, rare plant population locations/ bloom times, endangered butterfly host plant locations/flight times, etc. See table 3.13.3.b below.
Monitor and prevent over – collection of seed and plant cuttings by implementing Scientific Collector's permit Program.	Ongoing	Prevent over-collection. Vegetation materials are in demand at this park.	Ongoing	Follow instructions in Seed Collection Permit application. Limit number of collectors in each year. Limit areas that each collector can access. Limit amount of vegetation/seeds collected in any one area to no more than 10% of each population.
Remove or restore unneeded trails, service roads, and fire breaks by re-grading and revegetating with native species (if necessary). Conduct a detailed study of all existing trails, service roads, and fire breaks and make recommendations. Assess these areas for endangered species habitat before rebuilding any trails. (78)			Ongoing	Must be carefully timed to protect several sensitive species, including: bird nesting periods, rare plant population locations/ bloom times, endangered butterfly host plant locations/flight times, etc. See table 3.13.3.b below.

Vegetation Management Actions	Implementation	Rationale/ Requirement	Schedule	Special Considerations
Remove remaining, mature gorse that is adjacent to the Gorse Removal Project area in the Saddle.	Pilot project underway. Initiated in 2004-2007. Remaining gorse removal should be undertaken as soon as funds are available.		Pilot project underway. Initiated in 2004-2007.	Must be carefully timed to protect several sensitive species, including: bird nesting periods, rare plant population locations/ bloom times, endangered butterfly host plant locations/flight times, etc. See table 3.13.3.b below.
Identify and implement activities within the HCP and adjacent areas that reduce hazardous fuel loads, prevent wildfires, and limit the likelihood of the extension of a wildfire. (4)			Ongoing	See table 3.13.3.b below.
Address erosion, drainage, and public use issues caused by undesignated trails. (78)	Park staff is actively managing erosion and drainage issues on an as-needed basis.	Protect sensitive species habitat.	Ongoing	Must be carefully timed to protect several sensitive species, including: bird nesting periods, rare plant population locations/ bloom times, endangered butterfly host plant locations/flight times, etc. See table 3.13.3.b below.
Actions managed by outside sources under the San Bruno Mountain Habitat Conservation Plan (Thomas Reid & Associates , West Coast Wildlands, Shelterbelt Builders, Inc. etc.)				
Control exotic species infestations of gorse, Eucalyptus, and others. (81)	Contractors implemented invasive species control efforts in the Saddle, Northeast Ridge, Wax Myrtle Ravine, and Upper Tank Ravine, treating fennel, gorse, French broom, Eucalyptus, cotoneaster, and oxalis. In 2006, follow up treatment of these species in areas where work has already begun will be the focus. Additional treatment areas may include *Erharta* in Owl Canyon and pampas grass (or jubata grass) below Pacific rock, as well as the recent expansion of pincushion plant populations.	Control the spread of invasive species into sensitive species habitat.	2005 & 2006.	Must be carefully timed to protect several sensitive species, including: bird nesting periods, rare plant population locations/ bloom times, endangered butterfly host plant locations/flight times, etc. See table 3.13.3.b below.

Vegetation Management Actions	Implementation	Rationale/ Requirement	Schedule	Special Considerations
Monitor the (offsite) mitigation areas, endangered species populations, research and pilot study progress, and conserved habitat enhancement programs. (90)	Monitoring efforts focus on the following sensitive species: Mission blue butterfly, Callippe silverspot, San Bruno elfin, and Bay checkerspot butterfly.	Protect Sensitive species.	Annually	See table 3.13.3.b below.
Continue to research and utilize various vegetation management techniques for the preservation and expansion of habitat for the endangered Mission blue, Callippe silverspot, and San Bruno elfin butterflies. (90)				Must be carefully timed to protect several sensitive species, including: bird nesting periods, rare plant population locations/ bloom times, endangered butterfly host plant locations/flight times, etc. See table 3.13.3.b
Restore grassland habitat for the federally endangered butterflies covered by the HCP while maintaining historic prairies, grasslands, and scrub communities. (4)				Must be carefully timed to protect several sensitive species, including: bird nesting periods, rare plant population locations/ bloom times, endangered butterfly host plant locations/flight times, etc. See table 3.13.3.b
Create management plans, which could include pile burning, chipping, or hauling, for biomass that is left following vegetation management practices such as herbicide spraying and hand-pulling.				See table 3.13.3.b below.
Restore and create habitat for the endangered mission blue, callipe silverspot, and San Bruno elfin butterflies. (81)				Must be carefully timed to protect several sensitive species, including: bird nesting periods, rare plant population locations/ bloom times, endangered butterfly host plant locations/flight times, etc. See table 3.13.3.b
Perform ongoing weed abatement on Park lands that are within 100 feet of homes or other structures.	Ongoing implementation by West Coast Wildlands (Mike Forbert).	Fire hazard reduction & control of invasive grass.	Ongoing	Must be carefully timed to protect several sensitive species, including: bird nesting periods, rare plant population locations/ bloom times, endangered butterfly host plant locations/flight times, etc.

Vegetation Management Actions	Implementation	Rationale/ Requirement	Schedule	Special Considerations
Continue to restore areas that were burned in September 2002. (12) Create infrastructure that would allow for the introduction of rotational cattle grazing on the mountain. A potential area for this would be within the saddle, to help control velvet grass *(Holcus lanatus)* that is proliferating following gorse removal.	Ongoing implementation by West Coast Wildlands (Mike Forbert).	Control invasive grass.	Ongoing	Must be carefully timed to protect several sensitive species, including: bird nesting periods, rare plant population locations/ bloom times, endangered butterfly host plant locations/flight times, etc. See table 3.13.3.b below.
Maintain a fuel reduction area along 100 foot of property perimeter for fire protection.	Ongoing. Cut back brush Refer to Section 5 and Appendix A for more information.	CDF requirement for fire safety zone between wildlands/ urban areas.	Annual	Caution should be taken to prevent special status plants & wildlife from being mowed.
Current Restoration Projects				
Colma Creek Headwaters Restoration Project	Remove Eucalyptus trees, control invasive species and plant native plants. Approximately 2 acres of exotic vegetation in the upland sections of the creek have been cleared by CDF Fire Safe Crews and are now being treated with herbicides by TRA	increase the flows of the creek and restore area to native conditions.	**2005-06:** Tree Removal/Chipping, Chipping/Debris Cleanup Wood chip dispersion Seed Collection Other Invasive Plant Removal. **2006-2007:** Outplanting, Hand weed control, Herbicide Weed Control, Seed Collection, Blackberry removal, Other Invasive Plant Removal **2007:** Outplanting, Hand weed control, herbicide weed control, Seed Collection, Blackberry removal, Other Invasive Plants	See table 3.13.3.b below.
San Bruno Mountain Gorse Control and Revegetation Project	Removal of 31 acres of gorse (*Ulex europaeus*), and controlling resprouts and seedlings following initial removal. Following gorse removal, a small pilot revegetation project will be initiated.	Increase the health and size of native vegetation that provides essential habitat for several endangered butterfly species.	**2006:** Retreatment of gorse removal areas, Invasive species control at revegetation site, Seed collection and propagation for revegetation site, Monitoring of gorse sites. **2007:** Retreatment of gorse removal areas, Invasive species control at revegetation site, Installation of native species at revegetation site, Monitoring revegetation site & gorse control sites. **2008:** Retreatment of gorse removal areas, Invasive species control at revegetation site, Monitoring revegetation site & gorse control sites, Infill planting at revegetation site (if necessary).	See table 3.13.3.b below.
* Numbers in ( ) refer to the reference document that the action was taken from. See Extended Bibliography in Appendix E for more information on Action Item.				

All vegetation management activities on San Bruno Mountain must be closely times with sensitive resources on the Mountain. The following table outline sensitive resources, timeframes, and associated best management practices (Table 3.13.3.b).

Table 3.13.3.b Sensitive Resources on San Bruno Mountain and Associated Management Considerations

Sensitive Wildlife Resource	Timeframe	Associated BMP
Raptor Nesting Season	Raptor nesting period is January 1st To August 15th	No trees shall be cut during raptor nesting period. If tree removal occurs, monitoring for active raptor nests will be conducted prior to activity.
Bird Nesting Season	March 15th – August 15th	Restrict mowing and brush removal along trails during bird nesting season (March 1-August 15th). If vegetation must be removed during this timeframe, mow before March 1st. For follow-up mowing, vegetation should be cut to 4", then inspected for nesting birds before remainder is mowed and/or cut. If vegetation must be removed during this time period, pre-construction nesting bird surveys will be conducted. If any nests are found, work will not ensue.
Mission Blue Butterfly (*Icaricia icarioides missionensis*) Flight Period	March – July	Limit activities during flight period (March-July) Restrict vehicles, and speed limits to less than 5mph. Prevent impacts to, and removal of all host and nectar plants year-round.
Callippe Silverspot butterfly (*Speyeria callippe callippe*) Flight Season	Mid-May to late-July	Limit activities during flight period (May-July) Restrict vehicles, and speed limits to less than 5mph. Prevent impacts to, and removal of all host and nectar plants year-round.
Coast Range Newt (*Taricha torosa torosa*)		Restrict activities within 100 feet of suitable wetland habitats.
California Red-legged Frog (*Rana aura draytoni*)		Restrict activities within 100 feet of suitable wetland habitats.
San Bruno Elfin Butterfly (*Incisalia mossii bayensis*) Flight Period	Late February – mid April	Limit activities during flight period (Feb-April) Restrict vehicles, and speed limits to less than 5mph. Prevent impacts to, and removal of all host and nectar plants year-round.
Larval Host Plants/Nectar Plants for Endangered Butterflies	**Blooming Period**	**Notes**
Lupine (*Lupinus albifrons, L. formosus, & L. variicolor*)	March – June	Plants should not be disturbed at any time of the year (i.e. Not just during bloom), as disturbance could affect eggs or pupae living on the plant.
Stonecrop (*Sedum spathulifolium*)	May – August	Plants should not be disturbed at any time of the year (i.e. Not just during bloom), as disturbance could affect eggs or pupae living on the plant.
Johnny jump-up (*Viola pedunculata*)	February – April	Plants should not be disturbed at any time of the year (i.e. Not just during bloom), as disturbance could affect eggs or pupae living on the plant.
California plantain (*Plantago erecta*)	March – June	Plants should not be disturbed at any time of the year (i.e. Not just during bloom), as disturbance could affect eggs or pupae living on the plant.

Sensitive Wildlife Resource	Timeframe	Associated BMP
Owl's clover (*Castilleja densiflora*)	March – May	Plants should not be disturbed at any time of the year (i.e. not just during bloom), as disturbance could affect eggs or pupae living on the plant.

Rare Plant Species	Blooming Period
Coast rock cress (*Arabis blepharophylla*)	February – May
San Bruno Mountain manzanita (*Arctostaphylos imbricata*)	February – May
Montara manzanita (*Arctostaphylos montarensis*)	January – March
San Francisco Bay spineflower (*Chorizanthe cuspidata var. cuspidata*)	April – August
San Francisco collinsia (*Collinsia multicolor*)	March – May
San Francisco lessingia (*Lessingia germanorum*)	June – November
San Francisco wallflower (*Erysimum franciscanum*)	March – June
San Francisco gum plant (*Grindelia hirsutula var. maritima*)	June – September
Diablo helianthella (*Helianthella castanea*)	March – June
Choris's popcorn flower (*Plagiobothrys chorisianus var. chorisianus*)	March – June
San Francisco campion (*Silene verecunda ssp. verecunda*)	March – August
San Francisco owl's clover (*Triphysaria floribunda*)- not seen since 1960's	April – June

3.14 SAN PEDRO VALLEY

3.14.1 General Site Conditions

San Pedro Valley Park encompasses 1,150 acres that include the middle and south forks of the San Pedro Creek and is nestled amongst the Santa Cruz Mountain range and the foothills of Pacifica. This creek provides spawning habitat for steelhead. Approximately 433 acres of the south valley and south fork of San Pedro Creek are leased from the North Coast County Water District. The Park is also closely situated to several other open spaces including Sweeney Ridge owned by the Golden Gate National Recreation Area and McNee Ranch State Park Owned by the California State Parks Department.

The following section summarizes Park resources of interest to Vegetation Management Guideline development (Rana 2002). Refer to Table 3.14.1 below. The information provided in the following table was taken from Rana (2002) and May 2006 information from the Department of Fish and Game's online California Natural Diversity Database, at www. nrdb.org

Table 3.14.1 Summary of Park Resources – San Pedro Valley

Plant Communities	
Mixed riparian woodland	Non-native grassland
Alder/willow riparian woodland scrub	Eucalyptus tree groves
Maritime chaparral	Coastal scrub
Coast live oak woodland	Coyote bush scrub
Coastal terrace prairie	
Sensitive Plants known to Occur on Park Lands*	
Montara manzanita *(Arctostaphylos montaraensis)*	Western leatherwood *(Dirca occidentalis)*
Heart-leaved manzanita *(Arctostaphylos andersonii)*	San Francisco Wallflower (*Erysimum franciscanum*)
San Mateo tree lupine (*Lupinus eximius*)	
Sensitive Plants With Potential to Occur*	
Blasdale's bentgrass *(Agrostis blasdalei)*	Gairdner's yampah *(Perideridia gairdneri ssp. Gairdneri)*

Table 3.14.1 Summary of Park Resources – San Pedro Valley

Coast lily *(Lilium maritimum)*	Pt. Reyes meadowfoam *(Limnanthes douglasii sulphurea)*
San Francisco popcorn flower *(Plagiobothrys diffusus)*	San Francisco campion *(Silene verecunda ssp. Verecunda)*
Fragrant fritillary *(Fritillaria liliacea)*	San Francisco owl's clover *(Triphysaria floribunda)*
	Artists popcornflower (Plagiobothyrs chorisianus var.
Kellogg's horkelia *(Horkelia cuneata ssp. Sericea)*	Chorisianus)
Marin checkerbloom *(Sidalcea hickmanii ssp. Viridis)*	Pt. Reyes horkelia *(Horkelia marinensis)*
Sensitive Wildlife Species Known to Occur on Park Lands*	
Steelhead-Central CA Coast ESU *(Oncorhynchus mykiss)*	
Sensitive Wildlife Species with Potential to Occur *	
California Tiger Salamander *(Ambystoma tigrinum californiense)*	Sharp-shinned Hawk *(Accipiter striatus)*
California Red-legged Frog *(Rana aura draytoni)*	Vaux's Swift *(Chaetura vauxi)*
Western Pond Turtle *(Clemmys marmorata)*	Rufous Hummingbird *(Selasphorus rufus)*
San Francisco Garter Snake *(Thamnophis sirtalis tetrataenia)*	Loggerhead Shrike *(Lanius ludovicianus)*
Northern Harrier *(Circus cyaneus)*	Yellow Warbler *(Dendroica petechia)*
Cooper's Hawk *(Accipiter cooperii)*	Lawrence's Goldfinch *(Carduelis lawrencei)*
Invasive Plants**	
Blue gum Eucalyptus *(Eucalyptus globulus)*	English ivy*(Hedera helix)*
Pampas grass (*Cortaderia selloana)* or jubata grass (*Cortaderia jubata)*	Cape ivy*(Delairea odorata)*
French broom *(Genista monspessulana)*	Poison hemlock*(Conium maculatum)*
Periwinkle (*Vinca major)*	Harding grass *(Phalaris aquatica)*
Italian thistle*(Carduus pycnocephalus)*	Monterey cypress *(Cupressus macrocarpa)*
Wandering Jew (*Tradescantia fluminensis)*	Monterey pine *(Pinus radiata)*
Yellow star-thistle *(Centaurea solstitialis)*	

*Indicates a biological resource that is considered sensitive, locally rare, or protected under the state or federal Endangered Species Act.

** There may be more invasive species present in the park since the last weed inventory (Rana 2002).

The following was excerpted from the County of San Mateo's web site: http://www.eparks.net

This 1,150-acre Park has three fresh-water creeks, which flow year round through lush valleys, the south and middle forks of the San Pedro Creek and Brooks Creek. They are of particular significance because they provide some of the few remaining spawning areas for migratory steelhead in the county. It is the only stream with a steelhead population along a 30 mile reach of coastline between the Golden Gate Bridge and Half Moon Bay (San Pedro Watershed Coalition, 1999). The steelhead spawning season is normally from December to February.

During the rainy, winter months, a special attraction is the beautiful Brooks Falls, which has a drop of 175 feet in three tiers. Among this sensitive streamside habitat common plants such as coast and giant trillium, creek dogwood, arroyo willow, watercress, and several species of ferns thrive. In the springtime, the meadows of the Middle Valley show off an array of wildflowers: California poppies, suncups, buttercups, wild radish and wild mustard. The thick coastal scrub protects some rare plants: giant golden chinaquapin, Montana manzanita, fetid adders-tongue, and California hazelnut.

Wildlife is abundant at San Pedro Valley. Park inhabitants often seen are red-tailed hawks, turkey vultures, quail, scrub jays, and garter snakes. Those observed less frequently include deer, bobcats, grey foxes, raccoons, rabbits and gopher snakes.

3.14.2 Park-Specific Policies, Goals, Management Objectives

Based on an examination of the available documents pertaining to this Park, the vegetation and natural resource management policies, goals, and management objectives that were found pertaining specifically to this Park are presented below in Table 3.14.2; general policies and goals for the County Parks system as a whole are discussed in Chapter 2.

Table 3.14.2 Summary of Park-Specific Policies, Goals and Management Objectives – San Pedro Valley

Source document	Policy, Goal, or Objective
San Pedro Valley County Park Master Plan (1975)	Erosion control utilizing diversion ditch, seeding, and planting.
	Creation of habitat barrier.
	Poison oak control.
San Pedro Valley Natural Resources Management Plan (1979)	Monitor and maintain existing areas of coastal scrub.
	Plant more redwoods in non-riparian area where Eucalyptus is growing. Remove competing Eucalyptus.
	Replace Eucalyptus with Douglas fir in Douglas fir forest.
	Plant and maintain native hardwoods.
	Maintain naturalized grasslands as open fields following the historical grassland boundaries by preventing invasion of woody plants.
	Maintain existing stands of Manzanita.
	Continue erosion control of streambeds for steelhead habitat.
	Continue to monitor for unsanctioned access and elicit removal of fish by checking for unauthorized trails, trash, etc.
San Pedro Creek Watershed Assessment and Enhancement Plan (2002)	Establish long term water quality monitoring program.
	Work with Army Corps to develop restoration plans.
	Possible bird surveys.
	Continue GIS and map development.
	Establish water quality alert network.
	Continue invasive species control with other alliances continue to identify status of these species.
	For andromodous fish, remove impediments to migration and enhance habitat for spawning and rearing. These projects include culverts, construction of large woody debris structures, and feasibility studies.
CDF – Guidance on Fuel Reduction 100 foot clearance area	Requires a 100 foot fuel reduction area to be established and maintained between wildlands and urban interface areas.

3.14.3 Summary of Park-Specific Vegetation Management Actions

The following information was developed based on interviews with San Mateo County Park staff. San Pedro Valley Park is host to Montara manzanita, western leatherwood, and heart-leaved manzanita, all sensitive species. It also has significant stands of invasive blue gum Eucalyptus trees and thistles that crowd out native habitats. Several Eucalyptus trees were logged in 1996 and the area was allowed to re-vegetate. An extensive cape ivy removal effort was conducted in 1999. The San Pedro Creek Watershed Coalition works closely with Parks staff to remove invasive non-native plants and to plant natives along creeks and streams.

Hazardous trees are assessed and removed annually and fuel reduction efforts are focused in the Park that border Rosita and Park Pacifica Roads. San Pedro Valley Park's primary vegetation management issue is removing Eucalyptus trees, and restoring native habitats while keeping sediment out of the sensitive creeks that provide spawning habitat for steelhead. Currently, a volunteer group, the Friends of San Pedro Valley, in coordination with rangers, carries out trail work once a month.

Grassland areas are mowed twice yearly. (M. Del Carlo, Ranger IV, and D. Heisinger, Ranger II, pers. comm.).

Table 3.14.3 Current and Ongoing Vegetation Management Activities – San Pedro Valley

Vegetation Management Actions	Implementation	Rationale/ Requirement	Schedule	Special Considerations
Control poison oak. (7)	Along Trails & Roads.	Staff and public safety	As needed.	
Monitor and maintain existing areas of coastal scrub. (8)	Contain Eucalyptus to existing stands to prevent them from spreading into scrub habitat.	Maintain existing native habitats	As needed.	
Maintain naturalized grasslands as open fields following the historical grassland boundaries and prevent the invasion of woody plants. (8)	Mow grasslands to prevent growth of woody plants.	Maintain grassland habitat.	Twice a year.	Avoid mowing scrub habitat during bird nesting season.
Maintain existing stands of manzanita. (8)	Manzanita is avoided when trees and shrubs are cut back along trails. Friends of San Pedro does trail work.	Protect sensitive species.	Trail work is carried out once a month.	Sensitive manzanitas include: Montara manzanita (*Arctostaphylos montaraensis*) & heart-leaved manzanita (*Arctostaphylos andersonii*).
Continue to implement erosion control of streambeds for enhanced steelhead habitat. (8)	Streambeds are monitored and vegetation is cut to enhance streambed.	Enhance steelhead habitat.	As needed.	
Monitor and patrol for unsanctioned access and elicit removal of fish by checking for unauthorized trails, trash, etc. (8)	Where applicable, however, most poaching occurs outside of Park due to dense growth in Park.	Protection of sensitive steelhead habitat.	Ongoing.	
Conduct invasive species control with other alliances and continue to identify the status of these invasive species. (53)	Hand pulling with volunteers.	Control spread of invasive species.	Ongoing.	

Vegetation Management Actions	Implementation	Rationale/ Requirement	Schedule	Special Considerations
Utilize diversion ditch, seeding, and planting for erosion control. (7)	Where applicable.	Protect habitat.	Ongoing.	
Maintain fuel reduction at interface of property lines.	Trees and brush are cut back along Rosita and Park Pacifica Roads.	Fire hazard reduction.	Ongoing	
Develop a hazardous trees inspection program.	No formal program, but hazardous trees are removed as necessary.	Visitor Safety.	Annual	
Maintain a fuel reduction area along 100 foot of property perimeter for fire protection.	Ongoing. Cut back brush Refer to Section 5 and Appendix A for more information.	CDF requirement for fire safety zone between wildlands and urban interface.	Annual	Caution should be taken to prevent special status plants & wildlife from being mowed.
Remove Eucalyptus that is competing in the non-riparian areas and replant area with redwoods. (8)	Eucalyptus removed in various areas, however there was no replanting.	Restore native habitats.	As resources are available.	
* Numbers in ( ) refer to the reference document that the action was taken from. See Extended Bibliography in Appendix E for more information on Action Item.				

3.15 SANCHEZ ADOBE

Sanchez Adobe Park contains two main attractions. The first is a restored adobe residence from 1848 that is furnished with period pieces. The second attraction is archaeological evidence of the Mission Dolores Outpost.

3.15.1 General Site Conditions

The following was excerpted from the County of San Mateo's web site: http://www.eparks.net

The Sanchez Adobe is located well back in the San Pedro Valley on a flat five-acre parcel adjacent to Linda Mar Boulevard. The site was originally used as a mission outpost in the late 1700's and archeological remains from this outpost are found on the site.

A number of mature trees, including cypress, pines and Eucalyptus trees, are found on the site, but years of intense use have destroyed almost all of the native vegetation. The existing vegetation attracts many birds including starlings, sparrows and humming birds.

A segment of San Pedro Creek exists in the rear (south) part of the site. This stream is important since it is part of a steelhead spawning area. The riparian corridor around the creek contains red alder, big leaf maple, and several species of willow and thimbleberry.

3.15.2 Park-Specific Policies, Goals, Management Objectives

Based on an examination of the available documents pertaining to this Park, the vegetation and natural resource management policies, goals, and management objectives that were found pertaining specifically to this Park are presented below in Table 3.15.2; general policies and goals for the County Parks system as a whole are discussed in Chapter 2.

Table 3.15.2. Summary of Park-Specific Policies, Goals and Management Objectives – Sanchez Adobe

Source document	Policy, Goal, or Objective
Sanchez Adobe Draft Master Plan (2005)	Create and implement creek restoration plan
	Update landscape elements including native garden, creek overlook, etc.
CDF – Guidance on Fuel Reduction 100 foot clearance area	Requires a 100 foot fuel reduction area to be established and maintained between wildlands and urban interface areas.

3.15.3 Summary of Park-Specific Vegetation Management Actions

The following information was developed based on interviews with San Mateo County Park staff. As mentioned, Sanchez Adobe Park is a developed Park with only a few natural areas. There is a small native plant garden and San Pedro Creek runs through the Park. Most of the Park's vegetation is non-irrigated grassy areas that are mowed on a regular basis. Vegetation is cut away from neighboring fences and apartment buildings, and Park staff actively coordinates with property owners regarding trees and brush. (D. Heisinger, Ranger II, pers. comm.).

Table 3.15.3 Current and Ongoing Vegetation Management Activities – Sanchez Adobe

Vegetation Management Actions	Implementation	Rationale/ Requirement	Schedule	Special Considerations
Mow grass areas on schedule to reduce weeds	Park staff mows.	Reduce weeds & for visitor safety.	Weekly basis, as needed.	None
Maintain native plant landscaping once installed	Volunteers and docents maintain garden.	Visual display for visitors/ native seed bank.	As needed.	Used as an aid for school groups and other patrons.
Cut vegetation away from fences & overhanging branches near apartment building. Interact with property owners at common boundary.	Park Staff cuts back hazardous vegetation.	Reduce fire hazard & increase public safety.	As needed basis.	None

Vegetation Management Actions	Implementation	Rationale/ Requirement	Schedule	Special Considerations
Maintain a fuel reduction area along 100 foot of property perimeter for fire protection.	Ongoing. Cut back brush Refer to Section 5 and Appendix A for more information.	CDF requirement for fire safety zone between wildlands and urban interface.	Annual	Caution should be taken to prevent special status plants & wildlife from being mowed.
* Numbers in ( ) refer to the reference document that the action was taken from. See Extended Bibliography in Appendix E for more information on Action Item.				

3.16 WOODSIDE STORE

The Woodside store is a fully restored wooden building once used by Dr. Tripp as a general store, post office and dental office during the era of the Redwood Lumber industry in Woodside. The store is now a house museum displaying artifacts and fashion form that time period.

3.16.1 General Site Conditions

The following was excerpted from the County of San Mateo's web site: http://www.eparks.net

The Woodside Store is situated on a level one-acre parcel adjacent to Kings Mountain and Tripp Road where it was originally built. It is surrounded on two sides with native oaks and Redwoods. Years of use have created open field or dirt areas around the Store with a few native trees nearby.

3.16.2 Park-Specific Policies, Goals, Management Objectives

Based on an examination of the available documents pertaining to this Park, no vegetation and natural resource management policies, goals, and management objectives were found pertaining specifically to this Park; general policies and goals for the County Parks system as a whole are discussed in Chapter 2.

3.16.3 Summary of Park-Specific Vegetation Management Actions

The following information was developed based on interviews with San Mateo County Park staff. As mentioned above, the Woodside Store has minimal vegetation management needs due to its small size encompassing dirt paths and oak trees. Herbicide is used in high use areas to prevent weed growth. (B. Crawford, Lead Gardener)

3.17 WUNDERLICH

Wunderlich Park, a hillside area of redwood forest, open meadows, and beautiful oaks and madrones, was once the Hazelwood Farm and was donated to the County by Martin Wunderlich. The Park is largely open space, with a system of scenic trails. The Parks recreational activities include hiking and equestrian trails.

3.17.1 General Site Conditions

The following section summarizes Park resources of interest to Vegetation Management Guideline development (Rana, 2002). Refer to Table 3.17.1. The information provided in the following table was taken from Rana (2002) and May 2006 information from the Department of Fish and Game's online California Natural Diversity Database, at www. nrdb.org

Table 3.17.1 Summary of Park Resources-Wunderlich

Plant Communities	
Coyote crush scrub	Mixed evergreen forest (disturbed)
Developed	Non-native grassland with elements of coastal prairie
Eucalyptus	Oak woodland
Mixed evergreen forest	Redwood forest
Sensitive Plants known to Occur on Park Lands*	
Santa Cruz manzanita *(Arctostaphylos andersonii)*	
Sensitive Plants With Potential to Occur*	
California bottle-brush grass *(Elymus californicus)*	Kellogg's horkelia *(Horkelia cuneata ssp. Sericea)*
Diablo helianthella *(Helianthella castanea)*	Michael's rein orchid *(Piperia michaelii)*
Dudley's lousewort *(Pedicularis dudleyi)*	Western leatherwood *(Dirca occidentalis)*
Franciscan onion *(Allium peninsulare var. Franciscanum).*	White-flowered rein orchid (*Piperia candida)*
Sensitive Wildlife Species Known from the Park*	
There are no known special status wildlife species that exist within the Park.	
Sensitive Wildlife With Potential to Occur*	
California Tiger Salamander *(Ambystoma tigrinum californiense)*	Cooper's Hawk *(Accipiter cooperii)*
California Red-legged Frog *(Rana aura draytoni)*	Sharp-shinned Hawk *(Accipiter striatus)*
San Francisco Garter Snake *(Thamnophis sirtalis tetrataenia)*	Lawrence's Goldfinch *(Carduelis lawrencei)*
Invasive Plants**	
Blue gum Eucalyptus *(Eucalyptus globulus)*	French broom *(Genista monspessulana)*
Acacia *(Acacia decurrens)*	Yellow star-thistle *(Centaura solstitialis)*
Spanish broom *(Cytisus multiflorus)*	

*Indicates a biological resource that is considered sensitive, locally rare, or protected under the state or federal Endangered Species Act.

** There may be more invasive species present in the park since the last weed inventory (Rana 2002).

The following information was excerpted from the County of San Mateo's' web site: http://www.co.sanmateo.ca.us/smc/department/home/0,,5556687_12313324_12368249,00.html

Wunderlich Park comprises 942 acres of steep mixed forest and meadowland. It consists of four general areas: a lower area of boarding stables, riding facilities, and a horse ring that was the Folger Ranch complex; an open meadow midway up the slope of the Park; and open space with trails extending along canyons, running stream and numerous springs through dense second growth redwood groves, an upper meadow area at a general elevation of 2,000 ft. Exceptional vistas are found in all directions.

Several different plant communities offer a varied habitat for native plants and wildlife found in the Park. Along the streams and in gullies, the majestic coast redwoods provide a cool, well-shaded environment. In contrast, the chaparral areas are hot and dry. Shrubs, such as manzanita, chamise, chaparral pea, and yerba santa form a thick, almost impenetrable mass of brush. Here the visitor can see jackrabbits, brush bunnies, chipmunks, and lizards scurrying through the underbrush. Birds that are often seen and heard are quail, scrub jays, and wrentits.

Bordering the chaparral and the redwood forest is the mixed evergreen forest, which covers most of the Park. Here trees, such as tanbark oak, madrones, California laurel, coast live oak, and Douglas fir are dominant. Beneath the trees are many shrubs, including sticky monkey flower, wild lilac, toyon, wood rose, and poison oak. Brilliant wildflowers, such as western hound's tongue, Indian warrior, and Fremont's star lily (zygadene lily) are found along with the graceful wood fern.

Black-tailed deer, raccoons, black squirrels and, less commonly, bobcats, coyotes and grey foxes may be seen. Common birds include acorn woodpeckers, chickadees, towhees, and stellar jays. Integrating with the other plant communities in the extreme lower part of the Park is the foothill woodland characterized by large white (valley) oaks, black oaks and bay laurel trees.

3.17.2 Park-Specific Policies, Goals, Management Objectives

Based on an examination of the available documents pertaining to this Park, the vegetation and natural resource management policies, goals, and management objectives that were found pertaining specifically to this Park are presented below in Table 3.17.2.

Table 3.17.2 Summary of Park-Specific Policies, Goals and Management Objectives - Wunderlich

Source document	Policy, Goal, or Objective
Huddart and Wunderlich Parks Master Plan (2005)	Complete loop trail fuel reduction program.
CDF – Guidance on Fuel Reduction100 foot clearance area	Requires a 100-foot fuel reduction area to be established and maintained between wildlands and urban interface areas.

3.17.3 Summary of Park-Specific Vegetation Management Actions

The following information was developed based on interviews with San Mateo County Park staff. Wunderlich's priority vegetation management issue is fire fuel reduction. Eucalyptus trees were planted when the property was a private estate and the trees and associated debris have since become a fire hazard. Park staff currently manages fuel reduction once annually. Protocol have been written up and initiated by park staff specific to fuel reduction in Wunderlich Park.

Many roads throughout Wunderlich are not accessible (i.e. too narrow) for traditional fire trucks, and during the rainy season, access can be restricted altogether. Fixing roads to increase access in the Park is a main priority. The Park is bordered by a strong contingent of neighbors, the Bear Gulch Road Association, who are concerned about the potential of fire. They work closely with the San Mateo County rangers to assist in fuel reduction and invasive weed removal. County Parks staff have been conducting fuel reduction by cutting and chipping brush and trees and installing fuel reduction areas along service roads and trails.

Weed species, particularly broom and thistle, are of specific concern. Volunteers and staff also focus on maintaining and restoring open meadow habitat by pulling French broom and cutting back coyote brush. Herbicide is used to prevent Eucalyptus stump resprouting for fire control. (P. Alvarez, Ranger IV, & B. Crawford, pers. comm.).

Table 3.17.3 Current and Ongoing Vegetation Management Activities – Wunderlich

Vegetation Management Actions	Implementation	Rationale/ Requirement	Schedule	Special Considerations
Utilize hand or mechanical removal of exotic species, no controlled burning, and other methods to maintain the grasslands in the central meadow of the Park.	Ongoing		As time allows	
Control acacia and French broom invasive plant populations at Wunderlich.	Ongoing	Necessary to keep invasive plants in check.	As time allows	

Vegetation Management Actions	Implementation	Rationale/ Requirement	Schedule	Special Considerations
Maintain access roads, fire trails, equestrian trails, and pedestrian trails on an annual basis. Inspect major access roads and fire trails after every major storm event during the winter and spring months. Conduct fuel reduction by cutting and chipping brush and trees and installing fuel reduction areas along service roads and trails.	Ongoing		As time allows	
Maintain a fuel reduction area along 100 foot of property perimeter for fire protection.	Ongoing. Cut back brush Refer to Section 5 and Appendix A for more information.	CDF requirement for fire safety zone between wildlands and urban interface.	Annual	Caution should be taken to prevent special status plants & wildlife from being mowed.
Clear service roads of understory, thin trees near service roads, especially in Wunderlich Park along the Loop, Alambique and the Meadows Trail. Dead material should be removed on both sides of the roads. The understory of the forest should be thinned such that a vertical separation between the ground and tree canopy is established and maintained. Shrubs should be thinned to form isolated groupings. Small trees, and those that constitute ladder fuels should be removed. Shrubs around trees that are emerging from the shrub canopy should be removed.	Ongoing		As time allows	
Mow grasslands along roads and selected boundaries (such as Bear Gulch Rd.) for a distance of 30 ft. where applicable.			Annual	
Coordinate with Caltrans, County Department of Public Works, and Town of Woodside to ensure roadside management is conducted along Skyline Blvd., Kings Mountain Road, Woodside Road, and LaHonda Road.			Annual	
Work with PG&E to maintain the right-of-way throughout the parks and develop guidelines for trailside trimming procedures that preserve habitat and aesthetics as well as fire safety.			Annual	
Provide survivable space around each structure of 100 ft by mowing grass, pruning trees, and removing dead and flammable material from roofs, decks, grounds, propane tanks, etc.	Whenever possible, especially around barns and stable.			
Ensure the landscape plan minimizes wildland fire hazards and provides defensible space.	Ongoing			
Install fire-resistant plants in a fire-safe design that consists of groupings isolated by hardscape or mowed grass.	Not active			
Remove invasive and exotic plants that pose a fire hazard.	Ongoing			
Pursue habitat restoration with native plants in the disturbed areas with higher fire hazard.				

Vegetation Management Actions	Implementation	Rationale/ Requirement	Schedule	Special Considerations
Continue horse grazing in Wunderlich Park near stable when possible.	When possible			
* Numbers in ( ) refer to the reference document that the action was taken from. See Extended Bibliography in Appendix E for more information on Action Item.				

CHAPTER 4 PROJECT PRIORITIZATION

4.1 LIST OF PLANNED AND ACTIVE VEGETATION MANAGEMENT PROJECTS AND ACTIONS

This section provides a comprehensive list of the planned and active vegetation management actions for the San Mateo County Parks system. Over 100 separate actions and plans were identified during the review of over 90 planning and other documents, as well as input from staff and interested parties. This list includes projects that are currently underway; projects that were planned, but were never implemented; projects that are no longer relevant and should not be undertaken; and projects that should be undertaken, but were not included in past planning. It is important to note that this list was derived from a review of the documents without assessment of importance or relevance. Parks staff during the next step of this effort must review this list and determine which projects and actions are current and relevant.

At best, the following list can only be considered a "snapshot in time", because projects will constantly be added, deleted, and completed over time. The purpose of developing this list is to provide County Parks with a tool to begin the difficult process of reviewing, ranking and prioritizing, and ultimately selecting the projects that are most important to undertake.

The County Park staff will need to conduct the following actions in order to prioritize future projects and move forward to implementation:

1) **Finalize the list of projects listed in Table 4.1 (update regularly as more projects are added).**

2) **Prioritize the list of Projects presented in Table 4.1 by numerically scoring, then comparing the projects using the methods and selection scoring criteria presented in Section 4.2 and 4.3. A blank scoring form is provided in Appendix B.**

3) **Once the top priority projects are selected, seek funding, staff time, and volunteer support necessary to implement the projects.**

4) **Use the procedures presented in this report to guide implementation in order to ensure effectiveness and standardization of results.**

5) **Repeat project prioritization regularly, typically every year to 5 years. Update the list of priority projects as needed.**

Refer to Table 4.1 for a comprehensive list of projects and actions developed in this report.

Table 4.1 Park Projects and Actions Presented by Individual Park

Action No.	Location
ALL PARKS	
1	Maintain fuel reduction area along 100 foot property perimeter for fire protection.
2	Continue to reduce sedimentation and non-point source pollutants in all watersheds. Inspect culverts, road crossings, waterways. Restore streambanks with native vegetation.
3	Continue invasive control efforts.
4	Continue to manage forests for forest health and fuel load reduction.
5	Monitor hazard trees, tree diseases. Treat accordingly (remove, contain, trim etc).
6	Set mowing schedule based on sensitive biological resource constraints.
7	Continue to protect sensitive species, track populations and use adaptive management to improve habitat values. Monitor rates of habitat conversion and use active management to control (example grassland conversion to shrubland).
8	Maintain roads and trails, remove unauthorized trails.
9	Continue work with Volunteer groups, expand opportunities for site stewardship.
Other projects (Add here)	
10	Obtain Park System-wide permits for routine maintenance activities to allow herbicide application, work in wetlands and streams, etc.
Crystal Springs	
11	Control spread of California Oak Mortality Disease (formerly known as Sudden Oak Death). (52)
12	Continue Mowing.
13	Hazardous trees detection and assessment, pruning, and removal along trail and road.
14	Trail and road inspection (including culverts prior to rainy season).
15	Fuel load/fire reduction in areas bordering the watershed.
Other projects (Add here)	

Coyote Point	
16	Incorporate plants into landscaping that help hold soils to minimize erosion, prevent invasive weeds from encroaching into the activity areas, and emphasize the use of natives. (74)
17	Ongoing invasive Spartina control (in partnership with the Spartina Project). (52)
18	Manage for invasives, including cotoneaster, acacia, and others. Control poison oak.
Other projects (Add here)	
Edgewood	
19	Continue long-term monitoring of Bay checkerspot butterfly and its habitat. (77)
20	Continue to perform existing experiments to evaluate effectiveness of mowing and grazing. (77)
21	Reconsider the practical and political aspects of using fire as a habitat management technique and possibly implement new policies and techniques. (77)
22	Continue to rely on other agencies to provide fire suppression. (77)
23	Use seed farming and seeding of natives to improve bay checkerspot butterfly habitat. (77)
24	Support volunteer resource protection programs. (26)
25	Continue weed eradication efforts.
26	Develop a scheduled trail maintenance program for trimming of plants and trees after blooming of flowers and plants.
27	Implement Cordilleras Creek restoration including invasives removal and planting of native species in conjunction with the construction of an interpretive center. (75)
28	Maintain a fuel reduction area along 100 foot perimeter of property for fire protection.
Other projects (Add here)	

Fitzgerald	
29	Continue invasive species removal near San Vicente Creek.
30	Manage access to user groups of 10 or more.
Other projects (Add here)	
31	Restore creeks, remove invasive species, control erosion by planting natives, stabilize trail at creek crossings.
32	Work with Airport, surrounding landowners to reduce non-point source pollutants.
33	Fuel management in cypress forest and house site- remove non-natives.
Flood	
34	Remove exotics where they threaten heritage trees.
35	Assessment of all Heritage trees for hazardous conditions - Trim or remove as necessary.
36	Maintain fuel reduction along 100 foot property perimeter for fire protection.
Other projects (Add here)	
Huddart	
37	Reduce sedimentation arising from various sources including road and trail erosion and creek bank erosion.
38	Maintain access roads, fire trails, equestrian trails and pedestrian trails on an annual basis. In addition, inspect major access roads and fire trails after every major storm event during the winter and spring months.
39	Work with PG&E to maintain the right-of-way throughout the parks and develop guidelines for trailside trimming procedures that preserve habitat and aesthetics as well as fire safety.
40	Continue to employ current methods and practices to reduce the risk of ignition of fire.
41	Continue to work with volunteers to remove French broom, scotch broom, bull thistle.
42	Ensure key onsite personnel, including park rangers, maintenance staff, caretakers and non-profit organization staffs are trained in basic fire prevention.
43	Include information regarding fire ecology and prevention at entrance and trail staging area kiosks, and in interpretive and educational materials.
44	Meet with neighboring homeowner associations to collaborate on fire safety projects.
45	Survey annually for tree hazards and poison oak in high use areas (campgrounds/ picnic areas).
Other projects (Add here)	

Junipero Serra	
46	Gradually remove invasive plants especially the Monterey pine and blue gum Eucalyptus. Remove Eucalyptus near private residences on area boundary first, as they pose a liability problem. (35)
47	Mow or green chop grasslands annually during the months of May-July for fire suppression. (35)
48	Control invasive plants and problem species such as poison oak and Scotch broom. (35)
49	Remove all invasive trees and shrubs from grassland including invasive native shrubbery (34). To be done every five years (35).
Other projects (Add here)	
Memorial	
50	Provide a hazardous tree inspection in campgrounds, picnic areas, and trails.
51	Remove invasive plants.
52	Develop a scheduled mowing cycle for grass areas.
53	Implement the erosion control projects that were recommended and prioritized for the Pescadero/ Memorial/ Sam McDonald County Park Complex. (79)
Other projects (Add here)	
Mirada Surf	
54	Control bristly ox-tongue infestations.(88) Develop a mowing schedule for bristly ox tongue in grass areas with times of the year to mow.
55	Remove coyote brush from grasslands on Mirada Surf West to maintain open grassland habitat.
56	Continue to follow construction recommendations for work done in creek area and other sensitive habitats. (89).
Other projects (Add here)	

Pescadero Creek	
57	Stabilize banks by encouraging riparian growth. (55)
58	Utilize burns and hand and mechanical clearing to reduce fire hazards. (55)
59	Implement watershed monitoring program. (55)
60	Remove weeds and restore the grasslands. (55)
Other projects (Add here)	
61	Implement the Forest Management Demonstration Project at the Pescadero/Sam McDonald/Memorial Complex.
Sam McDonald	
62	Provide a hazardous tree inspection in campgrounds and picnic areas.
63	Remove invasive plants.
64	Develop a scheduled mowing cycle for grass areas.
65	Maintain a fuel reduction area along 100 foot of property perimeter for fire protection.
66	Implement the erosion control projects that were recommended and prioritized for the Pescadero/Memorial/Sam McDonald County Park Complex. (79)
Other projects (Add here)	
67	Control feral pig population.
San Bruno Mountain	
	Actions managed by San Mateo County Parks
68	Control exotic species infestations of gorse, Eucalyptus, and others. (81)
69	Monitor sensitive habitats that may be impacted by visitor use and then implement trail and area closures as conditions warrant.
70	Promote the use of integrated vegetation management to control non-native species. (78)
71	Monitor and prevent over collection of seed and plant collection.
72	Remove or restore unneeded trails, service roads, and fire breaks by re-grading and revegetating with native species (if necessary). (78)
73	Conduct a detailed study of all existing trails, service roads, and fire breaks and make recommendations. Assess these areas for endangered species habitat before rebuilding any trails. (78)
74	Remove remaining, mature gorse that is adjacent to the Gorse Removal Project area in the Saddle.
75	Identify and implement activities within the HCP and adjacent areas that reduce hazardous fuel loads and prevent wildfires. (4)
76	Address erosion, drainage, and public use issues from undesignated trails. (78)

	Actions managed by outside sources under the San Bruno Mountain Habitat Conservation Plan (Thomas Reid & Associates, West Coast Wildlands, Shelterbelt Builders Inc., etc.)
77	Control exotic species infestations of gorse, Eucalyptus, and others. (81)
78	Monitor the (offsite) mitigation areas, endangered species populations, research and pilot study progress, and conserved habitat enhancement programs. (90)
79	Continue to research and utilize various vegetation management techniques for the preservation and expansion of habitat for the endangered butterflies. (90)
80	Restore grassland habitat for the federally endangered butterflies covered by the HCP while maintaining historic prairies, grasslands, and scrub communities. (4)
81	Create management plans, which could include pile burning, chipping, or hauling, for biomass that is left following vegetation management practices such as herbicide spraying and hand-pulling.
82	Restore and create habitat for the endangered mission blue, callipe silverspot, and San Bruno elfin butterflies. (81)
83	Perform ongoing weed abatement on Park lands that are within 100 feet of homes or other structures.
84	Continue to restore areas that were burned in September 2002. (12) Create infrastructure that would allow for the introduction of rotational cattle grazing on the mountain.
	Current Restoration Projects
85	Colma Creek Headwaters Restoration Project.
86	San Bruno Mountain Gorse Control and Revegetation Project.
Other projects (Add here)	
San Pedro	
87	Control poison oak. (7)
88	Monitor and maintain existing areas of coastal scrub. (8)
89	Maintain naturalized grasslands as open fields following the historical grassland boundaries and prevent the invasion of woody plants. (8)
90	Maintain existing stands of manzanita. (8)
91	Continue to implement erosion control of streambeds for enhanced steelhead habitat. (8)
92	Monitor and patrol for unsanctioned access and elicit removal of fish by checking for social trails, trash, etc. (8)
93	Conduct invasive species control with other alliances and continue to identify the status of these invasive species. (53)
94	Utilize diversion ditch, seeding, and planting for erosion control. (7)
95	Maintain fuel reduction at interface of property lines.
96	Develop a hazardous trees inspection program.
97	Remove Eucalyptus that is competing in the non-riparian areas and replant area with redwoods. (8)
Other projects (Add here)	
98	Replace eucalyptus with Douglas fir, redwood.

Sanchez-Adobe	
99	Mow grass areas on schedule to reduce weeds.
100	Maintain native plant landscaping once installed.
101	Cut vegetation away from fences & overhanging branches near apartment building. Interact with property owners at common boundary.
Other projects (Add here)	
102	Create and implement a creek restoration project.
103	Update landscape elements including native garden, creek overlook, etc.
Wunderlich	
104	Utilize hand or mechanical removal of exotic species, and other methods to maintain the grasslands in the central meadow.
105	Control acacia and French broom invasive plant populations at Wunderlich.
106	Maintain access roads, fire trails, equestrian trails, and pedestrian trails on an annual basis. Inspect major access roads and fire trails after every major storm event during the winter and spring months. Conduct fuel reduction by cutting and chipping brush and trees and installing fuel reduction areas along service roads and trails.
107	Clear service roads of understory, thin trees near service roads, especially in Wunderlich Park along the Loop, Alambique and the Meadows Trail.
108	Mow grasslands along roads and selected boundaries (such as Bear Gulch Rd.) for a distance of 30 ft. where applicable.
109	Coordinate with Caltrans, County Department of Public Works, and Town of Woodside to ensure roadside management is conducted along Skyline Blvd., Kings Mountain Road, Woodside Road, and LaHonda Road.
110	Work with PG&E to maintain the right-of-way throughout the parks and develop guidelines for trailside trimming procedures that preserve habitat and aesthetics as well as fire safety.
111	Provide survivable space around each structure of 100 ft by mowing grass, pruning trees, and removing dead and flammable material from roofs, decks, grounds, propane tanks.
112	Ensure the landscape plan minimizes wildland fire hazards and provides defensible space.
113	Install fire-resistant plants in a fire-safe design that consists of groupings isolated by hardscape or mowed grass.
114	Remove invasive and exotic plants that pose a fire hazard.
115	Pursue habitat restoration with native plants in the disturbed areas with higher fire hazard.
116	Continue horse grazing in Wunderlich Park near stable where possible.
117	Maintain a fuel reduction interface at property lines.
	Other projects (Add here)

4.2 SUGGESTED METHODS FOR PRIORITIZING AND RANKING VEGETATION MANAGEMENT PROJECTS

The next step is to prioritize and rank the list of projects to determine which are priority for immediate action/funding. Many methods exist to prioritize and rank projects. Prioritization systems usually fall into one of two categories: numerical ranking systems, or flow-chart-type sieving systems. There is no ideal method for a given project, and every system has shortfalls and biases. We recommend a system developed by the National Park Service, an organization that must deal with diverse resources, interest groups, and stakeholder groups, and would therefore apply to the San Mateo County Parks system.

The prioritization process described below, referred to as a Modified Delphi Technique, would allow stakeholders and experts to collectively discuss, refine, and produce a prioritization list for vegetation management projects in County Parks. The Delphi technique was developed by the RAND Corporation in the late 1960s as a forecasting tool. Later, the U.S. government enhanced it as a group decision-making tool in which a group of experts could come to some consensus of opinion when the decisive factors were subjective, and not knowledge-based. The Delphi technique is particularly appropriate when decision-making is required in the context of a political or emotional environment, and works formally or informally, in large or small contexts. It reaps the benefits of group decision making while insulating the process from the limitations of group decision-making such as over-dominant group members, skewing results towards one interest, or lobbying. This approach has the added advantage that it works as an informal, subjective model when the decisions are based on opinion, and can be directly converted to a formal model, when the data is more knowledge-based. For the purposes of assessing San Mateo Vegetation Management priorities, this methodology can be combined with a data-driven (i.e. numerical project scoring system) to allow for the inclusion of both subjective and objective information.

Using the Delphi method, a group of knowledgeable individuals who know park resources intimately and who have differing backgrounds are recruited to participate in the process. For example, participants could be a gardening crew member, park historian, fisheries expert, recreationist, or park naturalist. Once the group is selected, the group would develop an inclusive list of park projects to consider. Refer to Chapter 4 above for a list of park projects that can be used as a starting place for this process.

The group should be allowed to conduct planning sessions whereby the objectives, importance, and possible results of a project are freely discussed. Maps and aerial photography are important tools when discussing the location and the size and scope of a project. Having such a broad base of experts can help flush out critical issues, and also can help the group reach consensus on issues of concern before a project moves towards implementation.

Modified Delphi Prioritization Procedure

1. **Select Facilitation Leader.**
   Select a facilitator for the meetings that is NOT a stakeholder, and therefore can participate objectively.

2. Create a Panel Representing Stakeholders and Experts.

The stakeholders and experts should be selected to represent various aspects of County Parks, the individual park, and the stakeholders. Participants should be selected because of their intimate knowledge of the San Mateo County Park system, planning process, individual park, and/or familiarity with technical subject matter that is considered important to the projects (e.g., trail planning, landscape architecture, hydrology, wildlife biology, historical and archaeological studies). Member selection should be based largely on the participant's "real-world" experience that will enable them to prioritize the project actions effectively.

3. Synthesize Existing Resource Data Into a Visual Format.

Relevant natural, cultural and visitor use data should be synthesized and compiled into a visual format that can be readily manipulated. We recommend a GIS database as an excellent format for this planning exercise, but printed aerial photographs, vegetation maps, with clear overlays can also be used. A series of mapping layers representing similar resources or subject matter should be created as clear acetate overlays for a common base map. The participants will use the various resource layers to identify where there are overlapping areas of concern (e.g. weeds on a cultural resource site, bird nests near hazard trees to be removed) or areas of high resource values and restoration opportunities (e.g. areas with wetland resources, important wildlife areas, major trails).

4. Identify an Initial List of Selection Criteria.

During a brainstorming session, the participants should develop a list of criteria that all participants agree are important to the project goals and objectives. Sample goals and objectives are presented below, but should be developed to be specific to the project.

i. Projects that stabilize the existing trail system and reduce overall maintenance costs;
ii. Projects that increase visitor safety (e.g., hazard tree removal, reduced fire risk, improved trail conditions, reducing inaccessible areas, problem areas);
iii. Projects that improve the visitor experience (e.g., creating viewsheds, interpretive opportunities, trail and circulation improvements, better signage);
iv. Projects that maintain the rugged and wild character of the park(s);
v. Projects that restore native habitats and increased wildlife and wetland habitat values;
vi. Projects that control target invasive plant species; and provide sustainable restoration opportunities;
vii. Projects that reduce fuel load or improve the health of the forest;
viii. Projects that offer opportunities for increased community involvement;
ix. Projects that can easily be sequenced with other planned project activities; and
x. Projects that create wildlife corridors and enhanced wildlife habitat values.

Additional criteria should be added as applicable to prioritize and sequence the list of projects.

5. Conduct Planning Session to Discuss Possible Selection Criteria for Projects.

Once the initial list of criteria is developed, the panel then should conduct a free- form discussion of what projects might meet the suggested criteria. The visual aids (maps) should be available for reference throughout the discussion so that all resource issues can be accurately considered.

The group should then reach full or partial consensus on both the selection criteria and on the types of projects that the group thought should be considered. The following types of projects may be found by the group to be important:

xi. Projects that stabilize the existing trail system and reduce overall maintenance costs;
xii. Projects that increase visitor safety (e.g., hazard tree removal, reduced fire risk, improved trail conditions, reducing inaccessible areas, problem areas);
xiii. Projects that improve the visitor experience (e.g., creating viewsheds, interpretive opportunities, trail and circulation improvements, better signage);
xiv. Projects that maintain the rugged and wild character of the park(s);
xv. Projects that restore native habitats and increased wildlife and wetland habitat values;
xvi. Projects that control target invasive plant species and provide sustainable restoration opportunities;
xvii. Projects that reduce fuel load or improve the health of the forest;
xviii. Projects that offer opportunities for increased community involvement;
xix. Projects that can easily be sequenced with other planned project activities; and
xx. Projects that create wildlife corridors and enhance wildlife habitat values.

6. **Prepare Revised List of Selection Criteria, Initial List of Project Priorities.** Following the free-form discussion, the panel should reach consensus on some, but not all ranking criteria and projects. The intent of the first meeting is not to reach complete agreement on all issues and projects, but rather to "flush out" those projects and issues that will or will not be acceptable to all participants. This allows the group to focus on those projects and issues that require more consideration and discussion to reach consensus. Based on the results of the first meeting, the list of initial selection criteria should be refined, and a list of possible project priorities developed that reflect the revised selection criteria. This list should then be circulated to the panel in advance of a second planning session meeting.

7. **Conduct Second Planning Session.**
At the second planning session, the participants should discuss the project priorities that were generated from applying the revised selection criteria. The project boundaries, objectives, and timing of each of the various proposed projects should be considered, as well as new projects and modified projects. As a result of the second planning session, the participants should come to agreement on most of the major issues, and reach agreement on most, but not all of the project priorities.

8. **Assess Capacity, Capabilities, and Planning Timeframe, Adjust Projects Accordingly.**
The projects that are selected as a result of the second planning session should then be screened to see if they could be accomplished within the specified timeframe, and if Parks and other stakeholder groups have sufficient oversight staff, and other capacities to successfully implement the selected project with available staff, contractors, or both. A smaller group of senior managers with extensive experience implementing projects should be involved with this assessment. As a result of input from these senior managers, the list of projects under consideration will be reduced to those that are considered reasonable to implement within the planning timeframe.

9. **Gather Any Remaining Technical Data Necessary to Finalize Decisions.**
   As the proposed project actions are further refined, technical questions will surface that require additional data collection and assessment efforts. Additional information gathering should be conducted to help develop a greater understanding about the feasibility and appropriateness of the proposed projects.

10. **Prepare List of Project Priorities.**
    Based on the initial list of projects, the capabilities and timeframe assessment, and the additional technical data, a list of "final" project priorities should be developed and circulated to the participants for review and comment. The group should be encouraged to view the projects in the field, and then submit any final comments, suggestions, changes, or approvals.

11. **Finalize List of Projects.**
    After receiving final input from participants, a final list of projects will be developed that meet project selection criteria. These will be the projects that are considered by the group to be technically sound, feasible to undertake, and possible to coordinate within the planned project timeframe.

4.3 SELECTING PRIORITY PROJECTS

Once the prioritization process described above is complete, the projects should be ranked (in this case, numerically scored) in order of importance. This process is typically conducted once, and updated annually. Monitoring data is used to determine success, and adaptive management results usually feed into selecting or modifying selection criteria. The data sheet below provides a suggested numerical ranking system.

Suggested Ranking Criteria

Rankings within each criteria category should be between 3 and 0 with 3 being the highest possible ranking.

3 - this project meets all the applicable criteria for this category
2 - this project meets most of the applicable criteria for this category
1 - this project meets a few of the applicable criteria for this category
0 - this project does not meet any of the criteria for this category
n/a - this project does not have any relevance to this criteria category (e.g. a polygon that includes invasive plant removal only, would receive an n/a for the trails criteria).

Proposed Project	Ranking (0,1,2,3, N/A)	TOTAL
Protects And Enhances The Park's Most Sensitive Natural Areas		
a. Sensitive species, locally rare species		
b. Wetlands		
c. Special Ecological Area, rare or sensitive vegetation communities, and/or unique geologic feature		
	Sum	
Controls And Reduces Threats To Natural Resources And/Or Cultural Resources And/Or Restores Natural Processes		
a. Controls and/or removes targeted invasive plant material		
b. Controls non-natural erosion & restores natural hydrology/drainage		
	Sum	
Trail and Visitor Use Improvements		
a. Trail and Visitor Use Improvements		
b. Project reduces need for trail maintenance		
c. Improves the integrity and circulation of the trail system		
i. Clear logical main trail		
ii. "Rib" connectors to destinations and communities		
iii. Trail heads and loops etc.		
d. Removes non-designated unauthorized trails		
e. Reduces sedimentation, erosion and resource trampling disturbance		
f. Enhances visitor experience (destinations, circulation, linkages)		
g. Improves Public Safety		
	Sum	
Public Engagement and Support		
a. Provides interpretive opportunities		
b. Provides for increased volunteer/stewardship opportunities		
c. Demonstrated or potential to garner significant public interest and support		
d. Improves intrinsic visitor and recreational experiences		
e. Increases understanding and support for natural resource values of park		
	Sum	
Potential for Funding		
a. Funding available (in part) through other programs/projects		
b. Funding potential		
c. Future leverage "quotient"		

Proposed Project	Ranking (0,1,2,3, N/A)	TOTAL
	Sum	
Potential for Implementation Success, Project Feasibility		
a. Project can be accomplished within projected timeline Including permitting and CEQA ("project readiness")		
b. High level of outcome for resources expended		
	Sum	
Integrates With Existing Projects		
	Sum	
Consistency with Internal Programs and Staff Capacity		
a. Adds support to existing park programs		
b. San Mateo County Park staff capacity/in line with park values		
c. Reduces maintenance crises		
d. Compatible with internal organizational priorities		
	Sum	
TOTAL RANKING FOR PROPOSED PROJECT		

CHAPTER 5 VEGETATION MANAGEMENT TECHNIQUES AND APPROACHES

This Chapter provides a summary of current vegetation management techniques and approaches, and identifies processes required to achieve these desired conditions (i.e. the what, where, and why's of vegetation management). Practical "How To" guidance is provided for vegetation management practitioners in Appendix A. Related "Brochures and Handouts" are provided in Appendix C, and a list of resources that can be contacted for more information is provided in Appendix D.

Vegetation management requires coordination on many fronts, including determining if work should be conducted by staff, volunteers, and/or contractors; identifying current and future funding sources; developing and maintaining volunteer resources to support park projects; balancing ongoing park maintenance needs with special projects; and proactively addressing other park needs that are not strictly related to vegetation (e.g., homeless encampments and other trespasses, ensuing fire protection along park perimeters, balancing recreation needs of various user groups, etc.). This section is intended to provide options to park staff when they are determining the best course of action to pursue to achieve successful vegetation management.

This section is closely tied to the vegetation management goals and objectives that are described in Chapter 1. The vegetation management objectives **(not presented in order of importance)** described in Chapter 1 are:

- **Objective 1: Maintain Sensitive Species Habitat.**
- **Objective 2: Maintain Diverse Recreational Uses of Park Natural Areas.**
- **Objective 3: Maintain Trails for Visitor Use and Safety.**
- **Objective 4: Manage for 'Sustained Control' of Invasive Plants Over Time.**
- **Objective 5: Maintain Healthy Native Plant Communities to Discourage Invasive Plant Establishment.**
- **Objective 6: Encourage Park Stewardship.**
- **Objective 7: Plant Site-Appropriate Native Species, Emphasizing Local Diversity.**
- **Objective 8: Maintain Revegetation Sites Until Plantings are Established.**
- **Objective 9: Actively Manage Forests to Reduce Fire Fuels and Increase Forest Health.**
- **Objective 10: Protect Watersheds from Erosion and Non-Point Source Pollution.**
- **Objective 11: Use Integrated Pest Management.**
- **Objective 12. Manage Habitat Conversion in Sensitive Species Habitat**

The following table provides a summary of the link between vegetation management guidelines and vegetation management actions currently being implemented at County Parks **(not presented in order of importance)**.

Table 5.0 Summary of Vegetation Management Objectives and Corresponding Vegetation Management Activities.
(Not presented in order of importance)

	VEGETATION MANAGEMENT OBJECTIVES											
VEGETATION MANAGEMENT ACTIVITIES	**1. Maintain Sensitive Species Habitat**	**2. Maintain Multiple Recreational Uses**	**3. Maintain Trails for Visitor Use and Safety**	**4. Manage for 'Sustained Control' of Invasive Plants Over Time**	**5. Maintain Healthy Native Plant Communities To Discourage Invasive Plant Establishment**	**6. Encourage Park Stewardship**	**7. Plant Site-Appropriate Native Species, Emphasizing Local Diversity**	**8. Maintain Revegetation Sites Until Plantings are Established**	**9. Actively Manage Forests to Reduce Fire Hazards and Increase Forest Health**	**10. Protect Watersheds From Erosion and Non- Point Source Pollution**	**11. Implement Integrated Pest Management**	**12. Manage Habitat Conversion in Sensitive Species Habitat**
Watershed Protection/ NPS Pollution Control	X		X						X	X		
Erosion and Sediment Control	X		X						X	X		
Public Health and Safety	X	X	X			X			X	X		
Forest Health	X	X	X		X		X	X	X	X	X	X
Fuel Load and Fire Management		X	X		X				X			X
Maintain 100 Foot Fuel Reduction Zones at Urban Interface			X		X		X		X			
Mowing		X	X	X								
Sensitive Resource Management	X				X		X	X	X	X		X
Recycling Green Waste and Vegetation Biomass		X	X		X				X			
Unauthorized trails		X	X							X		
Habitat Restoration	X			X	X	X	X	X	X	X		X
Invasive Plant, Pest and Disease Control	X			X	X		X	X	X		X	X
Shoreline Vegetation Management	X	X	X		X	X				X		
Volunteer, Public Involvement		X				X						
Grazing	X			X					X		X	X

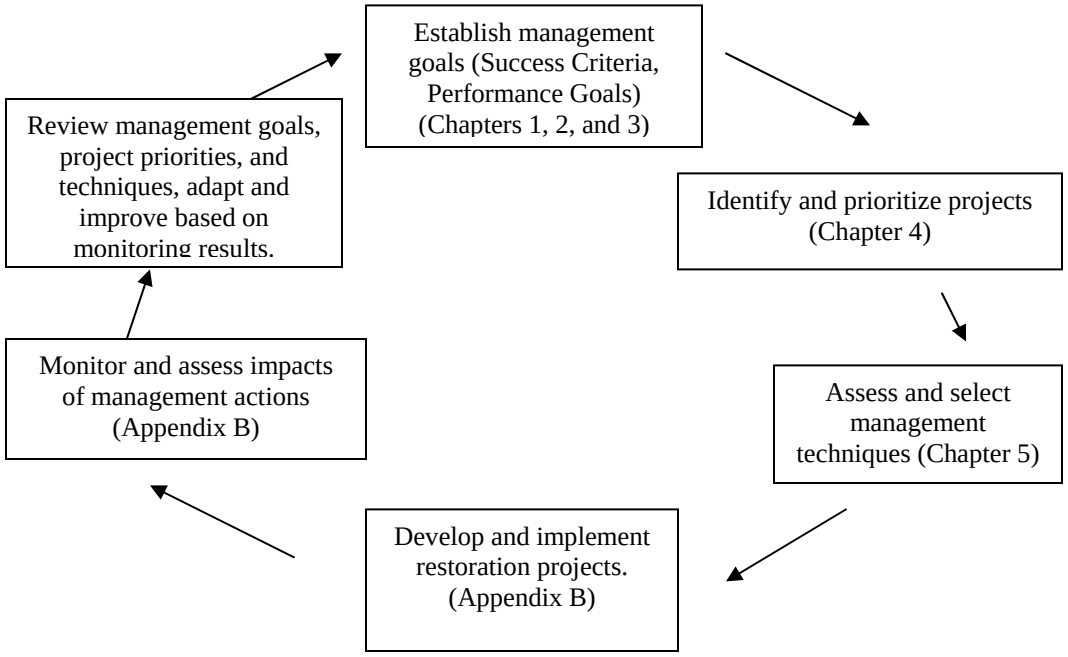
5.1 ADAPTIVE MANAGEMENT

Adaptive management incorporates research into conservation action. Specifically, it is the integration of design, management, and monitoring to systematically test assumptions in order to adapt and learn. Adaptive management is useful in all aspects of vegetation management, and especially invasive plant control and habitat restoration projects (described in more detail below).

Using adaptive management requires the following:

- Know what is working and what isn't (through monitoring);
- Identify how the current processes and procedures could be changed to better address the issue (i.e. evaluate the situation);
- Alter the way work is performed based on the analysis (i.e. adapt); and
- Share findings among the various San Mateo County Parks (i.e. knowledge transfer).

Years of experience of controlling invasive weeds and restoring sensitive habitats have made it clear that the best form of control is the use of multiple methods. Coordinating the use of multiple vegetation management methods requires knowing when strategies are effective and when they aren't. Monitoring and adjusting methods to make them more effective are critical to a project's overall success. The transfer of knowledge and institutionalizing the process among parks is also critical to saving time and making efficient use of limited resources. Transferring ideas and communicating what is or isn't working can be accomplished through regularly scheduled meetings, newsletters, or similar formats. Refer to the following Figure for a graphic depiction of how adaptive management works.



Adaptive Management Flowchart (adapted from Schwartz and Randall (1995) in Luken and Thieret (1997)).

As illustrated in the chart above, the cycle begins with establishing goals and objectives (Chapter 1). These goals and objectives are usually an outcome of the vegetation management context (i.e. visitor use and recreational patterns; the current management issues and concerns, the relevant plans and policies that pertain to work in the parks) (Chapter 2). Based on what is present at each park (Chapter 3), a park manager can then use the vegetation management techniques and approaches (Chapter 5) to make informed decisions about what course of action to choose to solve a particular problem.

Implementation begins with a written plan that clearly communicates success criteria, as presented in Appendix A. After a project is completed, Monitoring (Chapter 5 and Appendix A) is used to assess how well the project met the original success criteria. The project plan and monitoring reports can then be compared to evaluate the results of the project.

If a project does not meet the success criteria, remedial actions can be taken, if necessary to get a project back on track, including modifying the original treatment methods, changing treatment methods, or increasing or decreasing other factors (e.g. watering, weeding, replanting, using different species etc).

5.2 WATERSHED PROTECTION MAINTENANCE STANDARDS / NON-POINT SOURCE POLLUTION CONTROL

Meets Vegetation Management Objectives 1, 3, 9, and 10.

In 2004, the County of San Mateo prepared a report entitled "Watershed Protection Program-Volume 1- Maintenance Standards" (County of San Mateo 2004) intended to document standard, Best Management Practices, and describe anticipated Conservation Outcomes for all activities routinely undertaken by the Department of Public Works Road Maintenance Division and the Parks Department Maintenance Division. It includes county-wide approved Stormwater Pollution Prevention Program (SWPPP) standard procedures to minimize impacts to water quality and fish and wildlife habitat throughout unincorporated areas of the County. Volume 1 was intended to address maintenance standards, and subsequent volumes will address engineering design, construction management and inspection, and facility maintenance issues. The final draft (April 2004) version of the San Mateo County Watershed Protection Program Maintenance Standards is now available on line at: http://www.co.sanmateo.ca.us

In addition, San Mateo County has an active and well-organized Stormwater Pollution Prevention Program (STOPPP) program. The San Mateo County STOPPP is a program that aims to partner with the county's residents and businesses to prevent pollution of local water bodies such as creeks, the San Francisco Bay and the Pacific Ocean. San Mateo County STOPP has developed Best Management Practices (BMPs) for residents, businesses, and the community and Integrated Pest Management recommendations that are available online at: http://www.flowstobay.org/.

The following section synthesizes several reports and common land management practices to provide a broad overview of typical non-point source pollution control activities as they relate to vegetation management only. There is no substitute for reading and following the original report. Refer to the original report (County of San Mateo 2004) for all other maintenance issues such as road resurfacing and road closures.

5.2.1 General Minimization and Avoidance Measures

(Source, Watershed Protection Program- Volume 1- Maintenance Standards)

The following is a short list of general minimization and avoidance measures:

- Avoid endangered species and habitats, except when activity focuses on restoring habitat values;
- Avoid use of heavy equipment within the banks of a stream or lake;
- Use natural materials (e.g. logs, stumps) in place of human-made hard armoring such as riprap or concrete whenever feasible;
- Schedule work during the dry season to avoid pollution runoff;
- Perform revegetation (seedling, hydroseeding, etc) prior to first rains; and
- Obtain and comply with necessary permits, or in emergency situations, Use form RM-E01 (Appendix B) to report after-the-fact emergency repair work.

5.2.2. Necessary Permits and Reporting:

Prepare permits and reporting for the following actions:

- Discharge into waterbodies (including fill, rip-rap, soil, concrete, asphalt, woody material).
- Dredging, removal or modification of any structure, fill, sediment, large woody debris, or vegetation below ordinary high water mark of waterbodies.
- Any work in wetlands that support endangered species (e.g. lakes, streams, tributaries, ponds, ditches, etc.).
- Any work in the Coastal Zone involving excavation, fill, or vegetation removal (including culvert removal of headwall construction).

5.2.3 Best Management Practices

Refer to the document entitled "Watershed Protection Program- Volume 1- Maintenance Standards" (County of San Mateo 2004).

5.3 EROSION AND SEDIMENT CONTROL

Meets Vegetation Management Objectives 1, 3, 9, and 10.

Erosion and sediment control is largely addressed in Section 5.1, Non Point Source Pollution Control, above. In addition to the measures described above, this section describes the soil erosion process and summarizes general techniques to control soil erosion during vegetation management activities. This section is largely excerpted from Section 9.1 of the Watershed Protection Program Volume 1 Maintenance Standards (San Mateo County 2004). As stated above, there is no substitute for reading and following the original report, however, this section synthesizes the report findings to provide a broad overview of typical erosion and sediment control activities as they relate to vegetation management ONLY. Refer to the original report (County of San Mateo 2004) for all other maintenance issues such as road resurfacing and road closures.

5.3.1 Sources of Erosion

Soil erosion results when either wind or water detach and move soil particles. There are several types and sources of soil erosion. Sheet erosion occurs when soil particles are transported in a thin layer or sheet by flowing water. Rills and gullies are formed by concentrated high velocity sheet flows. Stream and channel erosion occurs when high velocity water flows unevenly through a waterway as a result

of changes in rates of velocity or steepness of slope. Wind erosion typically occurs when soils are dry, and wind velocity is sufficient to move soil particles.

A comprehensive sediment assessment was conducted for approximately 73.8 miles of roads and trails within the Pescadero Park Complex (i.e., Pescadero, Memorial, and Sam McDonald County Parks) in 2003 (Pacific Watershed Assessment, 2003). This report identified the following major contributing factors to excess sediment input to stream channels:

- Stream crossings with undersized culverts;
- Plugged culverts;
- Stream crossings with a diversion potential; and
- Stream crossings with a gully erosion at the culvert outlet.

These erosional sites at 71 of the 73 stream crossings studied were estimated to yield approximately 15,230 cubic yards (88%) of the total sediment entering the stream system.

5.3.2 Overview of Erosion and Sediment Control Strategies

The sediment assessment report for the Pescadero Park Complex (i.e., Pescadero, Memorial, and Sam McDonald County Parks) recommended the following remediation to control the majority of sediment entering the stream system (Pacific Watershed Assessment, 2003). Similar erosion and sediment control strategies can be implemented at other parks:

- "Storm proofing" the stream crossings by installing larger culverts;
- Adding debris plates at culverts to prevent plugging;
- "Armoring" outfall points, as specified in the Watershed Maintenance Standards;
- Re-grading trails and roads to include rolling dips that divert water off the trail or road; and
- Where appropriate, upgrading or decommissioning some trails and roads, and converting some roads to trails.

Beginning in 2005, $600,000 worth of priority sediment control actions were initiated (S. Herzberg, pers. com.). As additional funds become available, the remainder of the report recommendations should be implemented.

For other park sites, similar actions can be undertaken during the regular course of maintenance activities (as staffing and funding allows). At all parks, storm drains should be checked prior to major storm events for proper sizing, obstructions, and any signs of siltation or overflow. It may be necessary to:

- Replace some culverts with larger sized culverts that can accommodate flow during major storm events;
- "Armor" the outfall sites at culver crossings;
- Add debris plates at culverts that become routinely plugged with debris; and
- Re-grade or recontour eroded roadbeds and trails, adding water bars or rolling dips to keep water from concentrating on the road and causing erosion and sedimentation.

General recommendations to control erosion and sediment include the following. To control soil erosion, the soil surface must be protected from the erosive forces of wind, rain, and water runoff, and a system to collect the sediments and reduce offsite migration of sediments is necessary. Actions to be taken include one or more of the following:

- Minimize the extent and duration of exposure;

- Protect areas from disturbance;
- Stabilize disturbed areas;
- Minimize runoff velocities;
- Retain sediments onsite; and/or
- Inspect and maintain sediment control measures over time (Pacific Watershed Associates, 2003).

There are a wide variety of Best Management Practices that can be used to control sedimentation and erosion. Refer to Section 9.1 of the Watershed Protection Program Volume 1 Maintenance Standards (San Mateo County 2004) for a detailed description of erosion control methods that can be employed to control sedimentation and soil erosion, including brush packing, water bars, brush layering, cofferdams, coir fabricating, sediment barriers, diversion berms, energy dissipater structures, erosion control blankets, mats, netting, and wattles, slope protection devices, and other more detailed structural solutions to soil erosion and sedimentation.

5.4 PUBLIC HEALTH AND SAFETY

Meets Vegetation Management Objectives 1, 2, 3, 6, 9, and 10.

The health and safety of park visitors is a high priority when determining vegetation management actions and priorities. Some health and safety issues that are related to vegetation management include:

- Landslides, slumps, and other natural erosion;
- Flooding, culvert malfunctions, drainage failures;
- Poison oak;
- Invasive plant infestations and noxious/undesirable plant control;
- Lyme disease, tick bites, snake bites;
- Other hazardous animals (mountain lions, coyotes); and
- Hazard trees (described below in Section 5.5).

In general, park managers address hazardous conditions as they arise. For example, a landslide across a roadway would be assessed by the park manager, then caution signs, tape, or detour signs would be installed until the slide could be physically removed. Likewise, a blocked culvert that caused flooding would be assessed, signed, and then repaired as soon as possible.

Poison oak, Lyme disease, ticks, mountain lions, coyotes, and snakes are all naturally occurring hazards that are part of the natural environment in San Mateo County Parks. Park managers should develop and post information about these hazards at each park and online. When a particular natural hazard becomes problematic (e.g., poison oak branches begin to engulf a trail, mountain lion activities become dangerous), then the park manager may have to take additional actions to help ensure the safety of the park visitors.

5.5 FOREST HEALTH

Meets Vegetation Management Objectives 1, 2, 3, 6, 9, 10, and 12.

The San Mateo County Parks contain many mature woodland and forest communities. Naturally, some of these trees are in a state of decline, either from natural causes (aging, disease, structural damage from natural causes) or human-induced reasons (structural damage from human use, irrigation, or soil compaction effects). Mature trees, as well as dead and dying trees (also known as "snags") provide important wildlife habitat value and play an integral role in forest dynamics.

The challenge for park managers is to balance the need for structural diversity in a forest (e.g. keeping a diverse forest full of trees of every life stage including retention of snags, downed wood, and brush piles) with the need to provide safe and accessible trail systems for park visitors.

5.5.1 Assessing Hazardous Trees

One of the issues brought up by several park managers is the need to assess parks for hazard trees. To help park staff understand this issue, the following section provides an overview of the topic. Refer to Appendix A for specific "How To" suggestions, and to the Brochure provided in Appendix C for a pictorial guide to conducting hazardous tree assessments.

A good rule of thumb is to assess hazardous trees annually in relation to land use and visitor frequency. In areas where human uses are expected to be low (e.g. in the interior of a forest community far away from main trails), mature and damaged trees should be left to complete their natural life cycle. In high human use areas, such as major trials, trail heads, parking lots, playgrounds, picnic facilities and sports areas, camping facilities, and in areas with developed facilities (concrete paths, buildings, restrooms etc) trees should be regularly assessed (annually) for their potential to fulfill their lifecycles.

It is recommended that an annual hazardous tree assessment be conducted at every park. Hazard trees should be assessed and their relative level of hazard ranked using the following hazard ranking criteria:

- High probability of failure;
- Observed poor health;
- Evidence of significant die-back;
- Problematic tree structure;
- Root damage;
- Visible cankers and/or rot;
- Observed or suspected disease or pest infestations (Refer to information on California Oak Mortality disease, Pitch Canker, and other tree diseases below); and
- Probability of striking a target (human or structure).

Because of the prevalence and importance of forest resources on park lands, the County of San Mateo should consider the set up and maintenance of a centralized GIS database to track the location and condition of hazard trees, as well as other forest health issues (e.g. locations of Sudden Oak Death Syndrome outbreaks, invasive tree infestations, fuel reduction priorities) over time.

Similar GIS database systems have been developed by a number of resource management agencies, including the National Park Service, National Forest Services, Bureau of Land Management, and other Counties (e.g., Napa County, Solano County, and Sacramento County). These GIS database systems have become standard tools for vegetation management. GIS databases provide an

invaluable and cost effective system to track changes over time, and to prioritize vegetation management actions. For example, a GIS database could be used to track potential hazard trees, forest disease outbreaks and other forest health issues, such as understory buildup and infestation by invasive trees and shrubs.

In the absence of the GIS database system, we recommend that each park set up a paper mapping system to identify the location of potential hazard trees, assess hazard trees annually, and prioritize removal based on risk and funding limitations. Depending on the severity of the hazards and the limitations of staff funding, hazard trees could be tracked, treatment prioritized, and the trees removed as time and funding are available. Interim actions could also be tracked and implemented to ensure the safety of the public (e.g. cordoning off areas around hazard trees, or closing trails near diseased forest stands).

5.5.2. Forest Structure

Forest structure refers to both the vertical structure of the vegetation (e.g., variations in tree, shrub, and understory heights, presence of snags, downed wood and brush piles) and also the variations in horizontal structure and species diversity across a landscape (e.g., patch size, tree density, mixture of open areas and closed tree canopy areas, and microclimate variations such as moist and cool shaded areas, and hot dry un-shaded areas).

Numerous studies have shown a direct correlation between forest structure diversity and wildlife diversity (Maser et al, 1979, University of New Hampshire Cooperative Extension 1995)- in simple terms, the more types of microhabitats, food plants, types of shelter in a forested system, the more the area is able to support many different species of birds, insects, mammals, and plants. The challenge for park managers is to maintain forest diversity while controlling fuel load, visitor access and safety, and tree hazards.

To help ensure the health of park forests over time and to help maintain the diversity of the wildlife species that the forests support, park managers should seek to achieve a multi-age, multi-storied forest structure. In practical terms, this may be as simple as actively managing forests near trails and other high use visitor areas, including managing brush, maintaining fire breaks and implementing fuel reduction programs (i.e. brush removal), removing downed wood and other obstacles, and (as necessary) selectively thinning and or planting trees and shrubs. In low use areas such as inaccessible forest interiors, a policy of annual monitoring and limited active management (e.g. leaving snags and downed wood, not cutting unnecessary fire breaks, not actively planting trees and shrubs) may help the park staff maintain a diverse forest structure. The annual hazard tree assessment and mapping efforts can also include an assessment of forest health, structure, and diversity to help focus resources on the most important forest management actions required to maintain a diverse structure.

The forests of the San Mateo County Park system are relatively mature, including some old growth redwood forest, mature oak woodland, and mixed conifer oak forest. These forests have been managed for their park value only, for the most part left unmanaged since the forests were incorporated into the Park system. There have been several forest management studies conducted at individual parks, including:

- Forest Resources of San Mateo County (Forest Resources Study Committee 1971);
- Natural Resources Management Program for Pescadero Creek County Park (WESCO 1983); and
- Natural Resources Management Program, Implementation Concept Plan, Pescadero Creek County Park (County of San Mateo Parks and Recreation Division 1995).

These forest plans were prepared by professional forest ecologists, and provide several options for management and restoration of the forest resources within the Pescadero Creek Park Complex. Seven management options considered in the Natural Resources Management Program for Pescadero Creek County Park (WESCO, 1983) report were:

- Hands off (Do Nothing);
- Safety Management Only;
- Maximum Resource Management;
- Resource and Recreational Management;
- Maximum Recreation, Repair Resource Damage;
- Timber Production and Recreation; and
- Timber Production Only.

The San Mateo County Parks and Recreation Division embarked on the Safety Management Only option (County of San Mateo Parks and Recreation Division 1995), however, due to staff and funding shortages, this course of action was abandoned, and current management is mostly the "Hands Off" option.

All of the reports referenced above indicate that the forest health and fire hazard level in these parks is seriously compromised. In addition, old logging roads (some of which now function as access roads and trails) are the source of substantial sedimentation into streams, including salmonid streams (Pacific Watershed Associates 2003). As stated above in Section 5.3, some of the erosion control actions will be implemented beginning in 2006.

It appears prudent that a comprehensive trail and road improvement plan be combined with a forest management plan for the Pescadero Park Complex. The major factors that have prevented forest improvements in the past appear to be:

- Staffing limitations;
- Lack of funding; and
- Public perception of thinning for habitat restoration and fire hazard reduction in park settings.

To overcome these obstacles, we recommend the following approach:

- Adopt one of the options in the 1983 report (WESCO 1983). The "Resource and Recreation Management" option was the one recommended in the 1995 Implementation Concept Plan (County of San Mateo Parks and Recreation Division 1995), however, if found to be too controversial; a modified option that balances forest health with recreation should be developed. Review the plan and modify based on updated resource management practices.
- As recommended in the Implementation Concept Plan (County of San Mateo Parks and Recreation Division 1995), set up a trust fund/nonprofit to obtain and administer planning grants and project implementation, and manage any profits yielded from selective forest thinning and management. Ensure that any and all funds from the selective thinning and management are to be directed ONLY back into forest health improvements, sediment and erosion improvements, and recreational improvement at the Pescadero Park Complex.
- Conduct community outreach, and in close coordination with the public and a registered professional forest ecologist, conduct a demonstration project to show how an ecologically sensitive forest management plan can benefit the Parks.

- Review the results of the demonstration project, and revise techniques before beginning a multiple year, staged forest management plan.
- Implement a long-term, staged forest management plan, and monitor results. Use adaptive management to help ensure desired outcomes.

5.6 FUEL LOAD AND FIRE MANAGEMENT

Meets Vegetation Management Objectives 2, 3, 5, 9, and 12.

San Mateo County, like many other parts of California, has environmental characteristics which increase the potential for fires in wildland areas. These characteristics include highly flammable vegetation; long, dry summers; rugged topography; poor access for fire vehicles; increasing recreational use of remote lands; and continuing popularity of rural residential development. Refer to Chapter 15 "Natural Hazards" of the County General Plan for more information on this subject.

5.6.1 Fire Management at County Parks

In addition to ongoing forest health improvements, managing fuel load and fire hazard is one of the priority topics mentioned by park staff. In the past, much of the fuel reduction programs in County Parks were completed using prisoner work programs, Americorps, and California Conservation Corps (CCC) work programs such as the Ben Lomond Conservation Camp Crew. However as funding for these other programs has been eliminated or severely cut, the availability of much-needed labor to implement fuel reduction has been significantly reduced. Parks staff is struggling with effective ways to detect and manage hazardous fuel loads and fire danger. At present the County staff is considering a Fire Safe Coordinator position that, when filled, would assist with the coordination and management of fire crews. For planning purposes the 2006 rough cost for use of work crews is approximately $200 per day for a crew, with an additional 30$ charge for administration by the fire safe management. The fire safe crews are equipped with basic hand tools and chainsaws, but additional tools such as chippers and brush mowers are to be provided by the County.

At present, there is no comprehensive fire management plan for County Parks. There are however several park-specific documents that discuss fire management actions for various parks, including San Bruno Mountain, Huddart and Wunderlich Parks. Further, there is ongoing coordination with all of the other county fire agencies through participation in the Fire Safe Council (S. Herzberg, pers. comm.).

While this chapter cannot address how to develop long-term budget strategies and labor forces to meet fuel reduction needs, it can provide guidance on how to detect problem areas (described below), and how to implement effective fire and fuel load management (Appendix A).

Assessing the degree of fire hazard is dependent upon at least three factors. These include the degree of human use and occupancy of the wildland area, the level and ability of public services to respond to fires, and the natural setting of the wildland areas. While the first two components are fairly self explanatory, the third is described below.

5.6.2 Assessing Fire Hazard

In addition to weather factors and slope characteristics, one of the key components in measuring fire hazard severity is the type and quantity of flammable vegetation within a given unit of land area. This

factor, known as "fuel loading characteristics" is combined with weather and slope information to determine fire hazard.

- **"Heavy" Fuel Loading Vegetation** is comprised of woodland and mixed woodland and brush areas with vegetation more than six feet tall, including conifers, mixed evergreen timberlands, and chaparral. Fuel 'ladders' (i.e. multilayered vegetation that effectively connects fires from the forest floor via shrubs, small trees, and vines to the top of the forest canopy) are especially dangerous during fires.

- **"Medium" Fuel Loading Vegetation** includes scrub vegetation less than six feet in height, such as California sagebrush, coyote brush, and manzanita.

- **"Light" Fuel Loading Areas** are primarily treeless. Vegetation types include grasslands, herbaceous rangelands, and irrigated pasture lands.

There are several computer programs that model fuel load and help predict fire behavior in wildland settings. While such modeling is above and beyond the scope of this report, we recommend that the Park partner with the California Department of Forestry and Fire Protection (CDF) to develop a fire risk assessment for some of the larger forested County Parks such as the Pescadero Park Complex and, as staffing and budgets allow, develop and implement this type of modeling. Information on free, public domain fire modeling software is available at http://www.fire.org and at the following website under "software": http://farsite.org/index.php?option=content&task=section&id=2&Itemid=25.

Much of this free software runs on Microsoft Windows™ software. Necessary fuel load assessment could be dovetailed with the annual assessment of hazard trees and forest health. We recommend that the County of San Mateo develop and maintain a GIS database of forest resources, and update this data layer with locations of potential hazard trees, forest health assessment data, and fuel and fire risk data (perhaps generated form the free software mentioned above). Following the annual assessment of fire risk, park staff can use results to focus fuel load management on the most important areas within the Park system.

Typically, the primary burden for wildland-urban interface fire protection falls to property owners and state and local governments. Rural and volunteer fire departments provide the front line of defense, or initial attack, on up to 90 percent of these high-risk and costly fires. While they have a good record in rapidly suppressing traditional wildland fires, these local resources often struggle to effectively address the complex demands of fighting fire at the wildland-urban interface. A 100-foot buffer along the urban/wildlands interface is recommended by CDF.

5.6.3 Fuel Management

Fuel management is important for fire hazard reduction, but it is equally important as a habitat restoration tool to manage the health of Park forests. The General Accounting Office (General Accounting Office report to the Clinton Administration of Federal Wildfire Activities, 1999) emphasized the need for fuels management, concluding that…

> "the most extensive and serious problem related to the health of forests in the interior West is the over-accumulation of vegetation, which has caused an increasing number of large, intense, uncontrollable, and catastrophically destructive wildfires."

There are numerous options for managing fuel loads and maintaining healthy forest ecosystems, including:

- Controlled burns or flaming;
- Physical removal of undergrowth and secondary tree growth; and
- Prevention and eradication of invasive plants (General Accounting Office report to the Clinton Administration of Federal Wildfire Activities 1999).

Refer to Appendix C for an overview of these options and a summary of how to use fire to manage invasive plants, improve forest health, and reduce overall fuel load. These options are briefly discussed below.

Controlled Burns. Despite its risks, the prudent use of fire, either alone or in combination with other habitat restoration and fuel control methods is one of the most effective means of reducing hazardous fuel (General Accounting Office report to the Clinton Administration of Federal Wildfire Activities 1999).

Unfortunately, controlled burns may not be a viable option for consistent management of park lands due to increasingly strict air quality standards and regulations that severely restrict them. Further, the perceived threat of out of control wildfires damaging nearby residences and businesses has become a 'hot button' issue amongst many park neighbors. While this perception should not necessarily discourage or prevent Park staff from planning to use fire, it does highlight the importance of public notification and public outreach when fire is to be used on park lands. Finally, some of the park lands have a combination of environmental factors (i.e. fairly constant winds, flammable vegetation, fuel ladders, and proximity to high value homes) that makes using fire as a management tool less practical.

Parks staff should team with CDF and local fire departments more fully address this issue and to jointly develop a comprehensive plan to control fuel loads on park lands. When implementing controlled burns, CDF staff or local fire department staff are recommended.

Pile Burns. Park staff have in the past been assisted by CDF work crews and other work crews who can, as low-cost paid assistants, conduct fuel reduction (understory removal) and pile burns to eliminate biomass. Park staff should continue to use these valuable and low cost alternatives whenever possible. For planning purposes, the 2006 approximate cost for using work crews is approximately $200 per day, with an additional 30$ charge for administration. The fire safe crews are equipped with basic hand tools and chainsaws, but additional tools such as chippers and brush mowers are to be provided by the County.

Flaming. An alternative to controlled burns is 'flaming' whereby a propane torch is used to 'boil' plants, effectively killing the cambium layer of the plant and consequently killing it. Flaming has been used with great success throughout California for invasive plant control, forest health improvements, and to reduce fuel loads. Locally, it has been used in the Santa Cruz Mountains, in Marin County, and on Golden Gate National Recreation Area (GGNRA) lands in the Marin Headlands. The most effective application is for habitat restoration, specifically the control of invasive plant seedlings and resprouts of most grasses and non-woody forbs, and for some woody shrubs (e.g. French broom, other broom species, and gorse). To reduce potential for wildfire, 'flaming' is typically only undertaken when vegetation is very wet- either during or immediately after a rain event, or when vegetation is damp from fog and on low wind days (less than 5 mph is preferable). Winter is the preferred time for implementing this method, and it should only be undertaken by

trained practitioners, under the approval and supervision of a local fire department or CDF staff. Flaming does not typically require a burn permit because there is only limited flame (from the torch), and almost no smoke (mostly steam), however, local fire departments should be notified just in case flaming activities results in a wildfire. Again, its effectiveness is limited to small diameter woody vegetation (1 inch in diameter or less), seedlings, and non-woody grasses and forbs.

Selective Tree Thinning. Selective thinning is the removal of some trees to create openings for more desirable species to be established, and/or removal of some trees (such as resprouting saplings) to create a more desirable tree density. Selective thinning is an important tool in maintaining forest health, and is recommended for even aged forests (such as logged areas) to, over time; create a multiple-aged forest structure. In some areas, such as the Pescadero Creek Park, past clear cutting and other historic forestry practices have resulted in forests that are dominated by hardwoods such as tanoak rather than redwoods and other conifers. In other areas, dense tree stands resulting from resprouting saplings from the base of cut trees have replaced more natural tree formations. Selective tree thinning in this area is recommended as a habitat restoration action to help correct past management actions. A forest ecologist should help determine which trees and how many should be thinned from each forest to achieve desired results.

Undergrowth and Invasive Species Removal. In addition, early research has demonstrated that selective removal of undergrowth and invasive plant species from forested areas can improve overall forest health and reduce fire risks. In a report published in Proceedings from the Joint Fire Science Conference and Workshop (1991) fourteen researchers studied four large wildfires in Montana, Washington, California, and Arizona to determine if previous fuel treatment and thinning activities had any impact on fire severity. The sites selected for study underwent treatment within ten years prior to being burned in wildland fires. The findings indicated that fuel treatments are effective in reducing fire severity. These studies concluded that …"Although topography and weather may play a more important role in fuels in governing fire behavior, topography and weather cannot be realistically manipulated to reduce fire severity. Fuels are the leg of the fire environment triangle that land managers can change to achieve desired post-fire condition." (General Accounting Office report to the Clinton Administration of Federal Wildfire Activities 1999).

There are several ways to physically remove undergrowth and invasive species in forested areas for habitat restoration and fuel load reduction purposes. These methods are described in more detail elsewhere in this report, so are only summarized below:

- **Chemical control** (use of herbicides);
- **Physical remova**l using work crews, including contract, volunteer, staff, or other labor (e.g. correctional facility, AmeriCorps or California Conservation Corps work crews); and
- **Physical removal using grazing** (typically goats).

5.6.4 Fuel and Fire Breaks, Fire Resistant Landscaping

Three basic methods are commonly used to manage the spread of wildfires: firebreaks, fuel reduction areas and ornamental landscaping. A firebreak eliminates all vegetation and combustible growth to prevent fires from spreading. A fuel reduction areas reduces the fuel mass of flammable vegetation and combustible growth, thereby limiting the intensity of fire and slowing its rate of spread. Landscaping with fire resistant plants provides a third option for slowing the spread of wildfires, although this option has limited applications in park settings.

Fuel and fire breaks are already an important component of most of the parks. Parks are required to maintain a 100-foot buffer between urban areas and wildlands. Annual inspection and maintenance of existing fire breaks, strengthening 'good neighbor' relationships (e.g. seeking to reduce the threats of wildfires spreading from the park perimeters into the parks by undertaking fire management restrictions on adjacent lands), and establishment of new fire breaks are all recommended as pat of this effort.

For the most part, new fire and fuel reduction areas are established using traditional methods of mowing or disking a swath of habitat that is wide enough to stop a wildfire from moving across or into an area. Fire and fuel reduction areas can cause environmental damage, including segmenting native habitats, disrupting wildlife movement corridors, causing mortality of sensitive species, and increasing and spreading invasive plant populations. New fire breaks should be carefully planned to avoid such impacts by relocating the fire breaks to less sensitive areas, or reduce impact potential (e.g. seasonal restrictions on mowing or disking). Refer to information presented in the 'Mowing" section of this document and Appendix A for information on suggested seasonal restrictions for mowing (and disking) activities.

There are several research efforts currently underway in California to study alternative methods to establish fire breaks, including planting of fire resistant vegetation. One excellent free publication is available online from the East Bay Municipal Utilities District (EBMUD) entitled "Firescape Landscaping to Reduce Fire Hazard (EBMUD, 2003) available online at: http://www.ebmud.com/conserving_&_recycling/conservation_publications/firescape_booklet.pd. Although the results of many of these studies are not yet published, parks managers should be aware, and consult with CDF and others to keep abreast of new fire break methodologies as they are developed.

5.6.5. Related Fire Plans

Golden Gate National Recreation Area. The GGNRA recently published a draft Environmental Impact Statement (EIS) for Fire Management in San Francisco, Marin, and San Mateo National Parks lands (GGNRA 2005). Although this document is not specific to San Mateo County Park lands, it may provide useful information on the types of fire management practices that can be effectively implemented in wildland situations near urban areas, and fuel reduction programs conducted in sensitive species habitats. Information provided below is excerpted from the draft GGNRA fire management plan EIS.

Naturally occurring fire is an important ecological process necessary for maintaining the native plant communities of the park, but wildfire poses a hazard to life and property in the park's urban-wildland interface and developed sites within the park. GGNRA practice has been to aggressively suppress all wildland fire in the park whether naturally occurring or human-caused. The Planning Area for the GGRRA fire plan is contains lands in Marin, San Francisco and San Mateo counties--three of the nine counties that make up the San Francisco Bay Area. Several of the smaller national park sites are within the City of San Francisco itself; remaining areas are in southern and southwestern Marin County, northwestern San Mateo County and the Phleger Estate, in southeastern San Mateo County near the Town of Woodside. The fire management plan alternatives under consideration include:

- Prescribed fire;
- Mechanical fuel reduction (e.g., mowing, cutting to remove invasive shrubs and trees, and selective thinning in forested stands);

- Continued implementation of the Wildland Urban Interface Initiative;
- Maintenance of the park's fire roads and trails;
- Vegetation clearing around park buildings;
- Suppression of unplanned ignitions;
- Public information and education;
- Construction of a new fire cache for equipment storage; and
- Continuation of the current fire monitoring program.

California Department of Forestry and Fire Protection Fire Management Plan for the San Mateo/Santa Cruz Unit. The California Department of Forestry And Fire Protection Fire Management Plan San Mateo/Santa Cruz Unit, California Northern Region published a Fire Management Plan in July 2002. The overall goal of this plan is to reduce total wildfire costs and losses from wildland fire by protecting assets at risk through focused vegetation management projects and aggressive "Fire Safe Defense Awareness" Programs throughout the San Mateo & Santa Cruz Unit. This document is a dynamic working plan that will be reviewed and updated periodically yet is flexible enough to meet the needs of the Unit. The intent is to keep it simple, easy to understand and, above all, a "guide". The major components of the plan (excerpted from the document) include:

- 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 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 risks of 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.

5.7 MOWING

Meets Vegetation Management Objectives 2, 3 4, and 12.

Mowing is an effective and relatively low cost vegetation management tool that is utilized extensively in San Mateo Parks for a variety of reasons, including

- Invasive plant control;
- Fire breaks and fuel load reduction;
- Trail maintenance; and
- Maintenance of high use recreation sites.

As mentioned in Section 2.3 (Current Management Practices) above, there is a centralized mowing program utilizing all staff members which employs onsite mowers and mowers transported by trailer. The garden crew currently maintains turf at the following units:

- Coyote Point Park and Marina;
- Flood Park;
- Huddart Park;
- Edgewood Park;

- Junipero Serra Park;
- San Bruno Mountain;
- San Pedro Valley; and
- Sanchez Adobe.

Some issues and concerns related to mowing include:

- Inadvertent damage to sensitive species and ground nesting birds (multiple parks);
- Timing of mowing to maximize weed control effectiveness, especially control of rattlesnake grass and bristly ox tongue (Coyote Point and other parks);
- Timing of mowing to provide foraging areas for western bluebird (Edgewood Park);
- Need to mow in late spring and early summer for rattlesnake detection along trails (Edgewood Park); and
- Reducing potential for transport of invasive plants, plant diseases to other areas and other parks.

Refer to Table 5.6 for an overview of suggested mowing timing restrictions listed by individual park. These issues, and suggested "How to" solutions, are presented in Appendix A.

Table 5.6 General Mowing Schedule Presented by Park for Special Status Species Known to Occur on Park Lands*

Key: Indicates time period when mowing can take place without interfering with sensitive species; Indicates time period when mowing activities shall be restricted depending on the sensitive species present

Park	Month												Sensitive Species Present **
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	(Refer to Page 2 for recommendations on mowing in or near habitats for individual species)
Crystal Springs													Plants (*western leatherwood*), WPT, Edgewood blind harvestman spider, MBB.
													CRLF, CTS, SFGS,
Coyote Point													Monarch and SFGS
Edgewood													Plants (*San Mateo thornmint, serpentine linanthus, Marin dwarf flax, white-rayed pentachaeta, fragrant fritillary, woolly headed lessingia, King's mountain manzanita, arcuate bush mallow, and western leatherwood*), Bay checkerspot, Edgewood blind and micro-blind harvestman
													Raptors
Fitzgerald													Plants (*coast yellow linanthus*)
													California horned lark, Common Yellowthroat, Tri-colored blackbird
													Raptors
													CRLF, SFGS
Flood	*No sensitive species known for this park*												
Huddart	*No sensitive species known for this park*												
Junipero Serra	*No sensitive species known for this park*												
Mirada Surf	*No sensitive species data available for this park*												

Park	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	**Sensitive Species Present ****
Pescadero/ Memorial/ Sam McDonald													Plants (*Santa Cruz cypress*)
													California horned lark and other nesting songbirds
													Raptors
													CRLF, FYLF
San Pedro Valley													Plants (*Montara manzanita, heart-leaved manzanita, western leatherwood*)
													Raptors
San Bruno Mountain													Plants (*Coast rock cress, San Bruno mountain manzanita, Montara manzanita, SF spineflower, SF collinsia, SF lessingia, SF wallflower, SF gumplant, Diablo helianthella, Choris' popcorn flower, SF campion, SF owl's clover*), CRNT, mission blue butterfly, San Bruno elfin butterfly
													CRLF, CTS
													Raptors
													Nesting songbirds
Sanchez Adobe	*No sensitive species data available for this park*												
Woodside Store	*No sensitive species data available for this park*												
Wunderlich													Plants (*Santa Cruz manzanita*)
													Raptors

*See Chapter 3 for special status species known to occur in each park. This table does not address species with potential to occur; however, if these species are later found to occur within a park, additional mowing restrictions may need to be applied and/or developed as necessary to avoid and minimize harm during mowing activities.

**Species-specific recommendations and restrictions. *Specific locations for the species and habitat types listed below can be found in the maps of each park contained in the San Mateo County Parks Vegetation Resources Report (Rana 2002).*

Species	***Time Period for Restricted Activities***	***Restricted Areas***	***Required Actions***
Plants	All year	Areas where plants are known to occur (see maps per park) and a 20 foot buffer around those plants or populations	Do not mow in restricted areas. Western leatherwood along trails (particularly at Crystal Springs) should be avoided by establishing a 'no mow' zone around the tree(s) and installing signs.
CRLF = California red legged frog.	During breeding season (November 15-April 15)	Areas within a 100 ft. around ponds, wetlands, and riparian (creek) habitats.	Do not mow in restricted areas.
	Summer Months		In restricted areas (likely only along trails), vegetation should be cleared to a height of 4 inches by hand then checked for CRLF. If none are found then mowing can proceed.
FYLF = Foothill yellow-legged frog.	During breeding season (November 15-April 15)	Shallow, slow, gravelly streams and rivers with sunny banks, in forests, chaparral, woodlands along trails. A small buffer around waters where this frog is known to occur should be maintained.	Do not mow in restricted areas.
	Summer Months		In restricted areas (likely only along trails), vegetation should be cleared to a height of 4 inches by hand then checked for FYLF. If none are found then mowing can proceed.
CTS = California tiger salamander.	During breeding season (November 15-April 15)	Ponds, and grasslands and open woodlands within 100 feet of ponds.	Do not mow in restricted areas.
	Summer Months		In restricted areas (likely only along trails), vegetation should be cleared to a height of 4 inches by hand then checked for CTS. If none are found then mowing can proceed.
CRNT=Coast range newt.	All year	Wet forests, oak forests, chaparral, and rolling grasslands	In restricted areas (likely only along trails), vegetation should be cleared to a height of 4 inches by hand then checked for CRNT. If none are found then mowing can proceed.

Species	***Time Period for Restricted Activities***	***Restricted Areas***	***Required Actions***
SFGS = San Francisco garter snake.	November - March (when residing in upland winter burrows)	Areas within a 100 ft. around ponds, wetlands, and riparian (creek) habitats.	Do not mow in restricted areas.
	Summer Months		In restricted areas (likely only along trails), vegetation should be cleared to a height of 4 inches by hand then checked for SFGS. If none are found then mowing can proceed.
WPT = Western pond turtle.	All year	Within 20 feet of ponds, lakes, slow moving waterways.	Do not mow in restricted areas.
Butterflies and spiders	All year	Areas that are mapped as habitat for special status invertebrates, including the mission blue butterfly, San Bruno elfin, Edgewood blind harvestman (spider), monarch butterfly, and bay checkerspot butterfly (see maps per park)	Do not mow in restricted areas.
Raptors	Nesting season, January 1 to July 31	Areas within a 100 ft. around known nesting sites (including trees). Includes	Do not mow in restricted areas. For ground-nesting raptors, vegetation in restricted areas should be removed to a height less than 8 inches in height before nesting season and maintained for the remainder of the nesting season to prevent nests from being built in these areas.
Nesting Songbirds	Nesting season, March 1 to July 31	Grasslands; these birds either nest on the ground or in tall grasses. Includes California horned lark and Common Yellowthroat.	Do not mow in restricted areas. Vegetation in restricted areas should be removed to a height less than 8 inches in height before nesting season and maintained for the remainder of the nesting season to prevent nests from being built in these areas.
Tri-colored blackbirds.	Nesting season, March 1 to July 31	Ponds with wetland vegetation such as tules and cattails	Do not mow in restricted areas. Vegetation in restricted areas should be removed to a height less than 8 inches in height before nesting season and maintained for the remainder of the nesting season to prevent nests from being built in these areas.

5.8 SENSITIVE RESOURCE MANAGEMENT

Meets Vegetation Management Objectives 1, 5, 7, 8, 9, 10, and 12.

Natural resources exist in a dynamic, ever-changing state that is affected as much by environmental conditions (rainfall, temperature, vegetation succession) and random events (wildfires, landslides, diseases etc) as by management activities. Therefore, effective management of sensitive resources must recognize and account for the ever-changing nature of the sites, and shift focus to maintaining the long term health and viability of the natural communities that sensitive resources depend on.

In practical terms, this means management decisions require (1) baseline knowledge of the individual sensitive species' ecological needs, and (2) periodic assessment of the sensitive resource populations and their related natural habitats at each park. Refer to the Adaptive Management and Monitoring Sections of this report for more information on monitoring and detecting trends in natural resources at County Parks.

5.8.1 Detecting Trends in Sensitive Species Populations

Knowing the number and distribution of target sensitive species is an important component to determining effective management strategies. As an example, the population size of mission blue butterfly, a federally endangered species known from San Bruno Mountain, is known to fluctuate greatly from year to year. This species is also believed to have a relatively small home range, only traveling short distances from its habitat and host plant. In this example, it would be important to a land manager to know how many butterflies are present annually, and where they are being found. Over time if this data is collected, a manager could detect trends in population decline, and also where such declines are taking place, important clues to determining where and how best to spend management efforts on protecting the species. The San Bruno Mountain Habitat Conservation Plan is currently conducting annual species monitoring, the results of which are helping to guide management decisions such as replanting host plants between butterfly population centers, determining where invasive plant control can be undertaken to best help the species, and providing overall information about the status of the butterfly at the Park. A similar approach can be applied to other sensitive species and other parks.

An invaluable resource for park staff are local experts -- representatives from Audubon Society, California Native Plant Society, and local "Friends of" groups -- have a wealth of knowledge about the ecological requirements and population status of the sensitive species in San Mateo County Parks. These organizations and individuals will usually provide accurate and low cost or free information which is usually more up-to date than traditional sources such as the California Department of Fish and Game's Natural Diversity Database. A list of valuable references with regards to sensitive resources is provided in Appendix D.

We recommend developing and maintaining a GIS database of target sensitive species by park. This would greatly increase effective management of all species. Even if financial limitations do not allow for annual updates, data on species occurrence and population size can be periodically collected as funding allows, or collected by park volunteers, or during various studies, and added to the centralized database.

5.8.2 Detect Changes in Habitat Required by Sensitive Species

Knowing the distribution and abundance of the natural habitats associates with sensitive species is important in determining effective management strategies. For example, some of the rare butterflies known from San Bruno Mountain are closely associated with a small suite of plants upon which the butterflies feed, lay eggs, and develop into butterflies. Management of these butterflies requires not only efforts to prevent harm to individual butterflies and their individual host plants (i.e. fencing signing, limiting work in and near the habitats), but also making sure that enough suitable habitat (i.e. host plants) is present over time. In this example, it would be important to a land manager to know where the host plants ('suitable habitat' for the species) are located, and in what condition the habitat is during any management year. If, for instance, host plants near the butterflies were found to be declining, management could focus on reducing grasses and invasive plants (such as gorse, French broom, velvet grass) that are displacing host plants and therefore limiting the butterfly population.

5.8.3 Maintain a Diversity of Natural Habitats for Sensitive Species at Each Park

One of the simplest and most effective ways to help ensure that sensitive species are present in the future is to preserve the variety and health of the natural habitats that are currently present at each park. While the concept is simple, detecting changes can be difficult. For example, climatic changes such as cycles of drought and heavy rain can shift the abundance and distribution of shrublands, grasslands and even forests over time. Likewise, some evidence suggests that global warming is altering the distribution of both common and sensitive species and habitats, shifting species along elevation (and related temperature) gradients. While we do not suggest trying to manage for a static (unchanging) condition on County Park lands, it is valuable for managers to be able to track vegetation changes over time.

We strongly recommend developing a GIS database of vegetation that includes current aerial photographs, as well as scanned historic aerial photographs to facilitate comparison of site conditions over long periods of time. Historic aerial photography can also be invaluable in determining what type of restoration is most appropriate for various sites.

Comparing aerial photographs of the same site over decades can provide indicators of vegetation trends, including loss or expansion of grasslands, shrublands, and forested lands. In some instances, active management may be required to artificially correct shifts in vegetation types over time. For example, it is very likely that grassland habitats that support mission blue butterfly habitats on San Bruno Mountain may be shifting towards becoming coastal shrubland. Likewise, serpentine grasslands at Edgewood Park that support a suite of sensitive plants and insects may be shifting towards being dominated by shrubs such as Coyote bush. In these examples, actively removing shrubs in specific locations may help maintain habitat 'mosaics' that could allow grasslands that support sensitive species to persist at these parks. Similar management decisions can be reached on a park by park basis through a relatively fast and inexpensive comparison of past and present aerial photographs.

5.8.4 Maintain Wildlife Corridors

Wildlife corridors—large connected areas of habitat— are recognized as important to maintaining wildlife species diversity and abundance (Noss, 1987; Gilbert *et al.*, 1998; Perault and Lomolino, 2000). Such corridors allow wildlife (and plant) species to move between habitat patches, allowing re-colonization of patches in which a local extinction event has occurred, and providing increased foraging area and escape areas for a wide variety of species. Further work has suggested that a network of small patches in close proximity to one another (habitat "stepping stones") can also increase wildlife population sizes and persistence (Webb and Thomas, 1994; Schultz, 1998).

As San Mateo County becomes increasingly developed and lands surrounding the parks are urbanized, the natural areas in County Park lands become increasingly important as wildlife movement corridors. The general rule of thumb for maintaining wildlife corridors is 'bigger is better' – i.e. the larger and more contiguous the area, the more likely that it will act as a wildlife corridor. Land managers should consider the effects of placing trails, buildings, access points, fire breaks, and other features on these larger contiguous tracts of habitat, and if possible, place such features on the edges or in clusters to help keep the corridors as 'intact' as possible.

5.8.5 Minimize 'Edge Effect'

Another simple way to help preserve sensitive resources at all parks is to minimize edge effects. This simple concept means that resources in the center of a park are less subject to effects than resources located on the edges. The shape of the park becomes important, as square and round parks have less edge than long thin or rectangular parks.

In practical terms, park managers should check park perimeters periodically for 'edge effects,' including but not limited to:

- Invasion of invasive plants from neighborhood backyards. This is thought to be one of the main pathways that invasive plants enter into wildlands. Backyard garden plants that become problematic in park wildlands include calla lily, periwinkle, several species of ivies, several species of brooms, Pampas grass (or jubata grass), fountain grass, and other cultivated ornamental garden plants.
- Neighborhood trespass onto park land, including the following types of private uses on park lands - dog kennels, gardens, volleyball, tennis courts and other private recreational uses, tree forts, barbeque sites etc.
- Inadvertent introduction of irrigation water and backyard chemicals (oil dump sites, herbicide and pesticide runoff from urban landscaping).
- Fuel and fire breaks next to neighborhood fence lines (mostly thought of as a positive edge effect).
- Domestic pets that escape into park lands and hunt and kill native wildlife and songbirds.

In most cases, developing good relationships with park neighbors will help ensure minimal edge effects on sensitive natural resources. In some instances, active management may be required to correct problems, such as fixing fences to exclude pet trespass, fixing irrigation problems, cooperatively maintaining adequate fuel reduction areas etc.

5.8.6. Actively Manage for Sensitive Species

Some species within the parks system are very rare, some of which are listed under the federal and/or state Endangered Species Acts. In instances where the general sensitive species management described above is not sufficient to protect and maintain these species, additional, species-specific actions may be required. For example, there is a separate Habitat Management Plan (HCP) in place at San Bruno Mountain for the federally listed mission blue butterfly, as well as several other endangered species. This HCP manages, monitors, and implements site-specific management actions to help ensure the continued existence, and in some instances recovery of these rare butterfly species. Active management includes removal of gorse and other invasive plants; active revegetation of host plants/expansion of habitat onsite, public outreach and education, and several other restoration activities (e.g., Colma Creek habitat restoration project).

Likewise, the Santa Cruz cypress *(Cupressus abramsiana)* is a federally listed endangered species that occurs at Pescadero Creek Park. According to a Recovery Plan for the Santa Cruz cypress, one

population, located on Butano Ridge at Pescadero Creek Park was the subject of a Coordinated Resource Management Plan (CRMP) that was being developed in 1992, but was delayed due to lack of funding (U.S. Fish and Wildlife Service, 1998). This species is still present, and presumably would benefit from focused management actions.

Management decisions related to sensitive species will be guided by the following:

- **Is the species listed under the federal or state endangered species act?** If so, some consultation (formal or informal) may be required with state and federal resource agencies before implementing management activities for the species.
- **Is the species in decline with the County Park or regionally?** If so, active management may be required. As mentioned throughout this document, the County Parks would greatly benefit from a GIS system intended to track changes in sensitive species populations over time. Such tracking, if updated regularly, would provide important data to detect population trends, and adjust management accordingly.
- **What is limiting the species?** In some instances, the condition of the park may be limiting the amount of suitable habitat available for the species. For example, gorse, an invasive plant species is displacing host and nectar plants, and also reducing the amount of low grassland habitats favored by the mission blue butterfly and other sensitive butterfly species. Steelhead, a federally listed species, may be limited by erosion and sedimentation into spawning streams.
- **What are other (nearby) Land Managers doing to maintain the health of the species?** Where possible, San Mateo County Parks should seek to add to existing program or use similar management approaches as other nearby land managers. An example of this would be the GGNRA who is actively managing the Mori Point Parks site for both San Francisco garter snake and California red-legged frog. The GGNRA, in association with the U.S. Fish and Wildlife Service has developed land management actions intended to maintain the recreation uses of this site while managing snake and frog populations and enhancing habitat values of the site. In this example, it would be useful for park staff at nearby Fitzgerald and other County Parks to coordinate with GGNRA and USFWS to implement similar management strategies at parks that support San Francisco garter snake and California red-legged frog.

Once these factors and issues are identified, appropriate active management actions can be identified. Some of the active management actions that may be considered by park staff include:

- **Controlling invasive plants** if they are displacing native habitats required by that sensitive species;
- **Creating or restoring habitats** to create larger, interconnected habitat areas; and
- **Modifying Recreational and Park Maintenance Practices** to help reduce potential for mortality or harm. For example, if a particular wetland is known to support California red legged frog, it may be important to restrict recreational access by re-routing trails, or to post interpretive signs. Another example would be to reduce speed limits on roads that pass through San Francisco garter snake habitat.

Table 5.8.6 provides a summary of management plans and management activities underway for sensitive species known from San Mateo County Parks.

Table 5.8.6. Known Sensitive Species and Related Management Plans and Actions

Known Species	Coyote Pt	Crystal Springs	Edgewood	Fitzgerald	Flood Park	Huddart	Junipero Serra	Memorial	Pescadero	Sam McDonald	San Pedro	San Bruno Mtn	Wunderlich	Management Plans, Management Activities
Plants														
arcuatebush mallow (*Malacothamnus arcuatus*)*			●											None Active
Bolander's horkelia *(Horkelia bolanderi)*							●							
California black walnut *(Juglans californica var. hindsii)*			●		●									
Choris's popcorn flower (*Plagiobothrys chorisianus var. chorisianus*)		●										●		None Active
coast rock cress (*Arabis blepharophylla*)												●		None Active
coast yellow linanthus (*Linanthus croceus*)				●										None Active
*Crystal Springs flax (Hesperolinon spergulinum)**		●												None Active
Diablo helianthella (*Helianthella castanea*)												●		Natural Resources Management Plan Pescadero Creek
Engelmann/Mesa Oak (*Quercus engelmannii)*														
Fragrant fritillary (*Fritillaria liliacea*)*			●											None Active
heart-leaved manzanita (*Arctostaphylos andersonii*)		●									●			None Active
King's mountain manzanita (*Arctostaphlos regismontana*)*			●											None Active
Marin dwarf flax (*Hesperolinom congestum*)*			●									●		Edgewood Park Master Plan1984
Montara manzanita (*Arctostaphylos montaraensis*)											●			None Active
Monterey mansanita (*Arctostaphylos montereyensis*)*	●													
Pacific ninebark (*Physocarpus capitatus*)		●												None Active
Robust coyote mint *(Monardella villosa ssp. globosa)*			●											
San Bruno Mountain manzanita (*Arctostaphylos imbricata*)		●										●		None Active
San Francisco Bay spineflower (*Chorizanthe cuspidata var. cuspidata*)												●		San Bruno Mtn HCP
San Francisco campion (*Silene verecunda ssp. verecunda*)												●		Edgewood Park Master Plan1984
San Francisco collinsia (*Collinsia multicolor*)			●									●		None Active
San Francisco lessingia (*Lessingia germanorum*)												●		San Bruno Mtn HCP

Known Species	Coyote Point	Crystal Springs	Edgewood	Fitzgerald	Flood Park	Huddart	Junipero Serra	Memorial	Pescadero	Sam McDonald	San Pedro	San Bruno Mtn	Wunderlich	Management Plans, Management Activities
San Francisco onion *(Allium peninsulare var. franciscanum)*			•											
San Francisco owl's clover (*Triphysaria floribunda*)- not seen since 1960's												•		None Active
San Francisco wallflower (*Erysimum franciscanum*)											•	•		None Active
San Francisco gum plant (*Grindelia hirsutula var. maritima*)												•		None Active
San Mateo thornmint (*Acanthomintha duttonii*)*			•											Edgewood Park Master Plan1984
San Mateo tree lupine *(Lupinus eximius)*							•				•			
Santa Cruz cypress (*Cupressus abramsiana*)								•	•	•				USFWS Recovery Plan, draft CRMP initiated 1992, Natural Resources Management Plan Pescadero Creek
Santa Cruz manzanita (*Arctostaphylos andersonii*)												•		None Active
serpentine linanthus (*Linanthus ambiguous*)			•											None Active
Western leatherwood (*Dirca occidentalis*)*		•	•								•			None Active
white-rayed pentachaeta (*Pentachaeta bellidiflora*)*		•	•											None Active
wooly headed lessingia (*Lessingia hololeuca*)*			•			•								None Active
Wildlife														
American Bittern (*Botaurus lentiginosus*)				•										None Active
American Peregrine Falcon (*Falco peregrinus anatum*)				•										None Active
Bank Swallow (*Riparia riparia*)				•										None Active
Bay checkerspot butterfly (*Euphydryas editha bayensis*)*			•											San Bruno Mtn HCP, Bay Checkerspot Butterfly Federal Listing Studies 1994. Monitoring studies only-Not detected in 20 years. Adjust mowing, grazing burning to avoid habitat
Black Swift (*Cypseloides niger*)				•										None Active
Burrowing Owl (*Athene cunicularia*)												•		None Active

Known Species	Coyote Point	Crystal Springs	Edgewood	Fitzgerald	Flood Park	Huddart	Junipero Serra	Memorial	Pescadero	Sam McDonald	San Pedro	San Bruno Mtn	Wunderlich	Management Plans, Management Activities
California Sea Lion (*Zalophus californianus*)				●										Fitzgerald Marine Preserve Master Plan
California Gull (*Larus californicus*)				●										Fitzgerald Marine Preserve Master Plan
California Horned Lark (*Eremophila alpestris actia*)				●				●	●	●		●		None Active
California red-legged frog (*Rana aura draytoni*)*		●		●			●	●	●	●		●		San Bruno Mtn HCP-No observations in 22 years, assumed absent, Fitzgerald Marine Preserve Master Plan
California tiger salamander (*Ambystoma tigrinum californiense*)*		●					●					●		None Active
Callippe Silverspot butterfly (*Speyeria callippe callippe*)														San Bruno Mtn HCP. Invasive control, habitat restoration, grazing, prescribed burn
Coast Range Newt (*Taricha torosa torosa*)												●		None Active
Coho Salmon-Central CA Coast ESU (*Oncorhynchus kisutch*)								●	●	●				None Active
Common Yellowthroat (*Geothlypis trichas sinuosa*)				●										None Active
Cooper's hawk (*Accipiter cooperii*)*		●	●	●			●	●	●	●				Natural Resources Management Plan Pescadero Creek
Double-crested Cormorant (*Phalacrocorax auritus*)				●										Fitzgerald Marine Preserve Master Plan
Edgewood micro-blind harvestman (*Microcina edgewoodensis*)*			●											None Active
Edgewood blind harvestman spider (*Calcina minor*)*		●	●											None Active
Elegant Tern (*Sterna elegans*)				●										None Active
Ferruginous Hawk (*Buteo regalis*)														None Active
Foothill Yellow-legged Frog (*Rana boylei*)								●	●	●				None Active
Golden Eagle (*Aquila chrysaetoes*)				●										None Active
Harbor Seal (*Phoca vitulina*)	●			●										Fitzgerald Marine Preserve Master Plan
Lawrence's Goldfinch (*Carduelis lawrencei*)							●							None Active
loggerhead shrike (*Lanius ludovicianus*)*		●		●			●	●	●	●		●		None Active

Known Species	Coyote Point	Crystal Springs	Edgewood	Fitzgerald	Flood Park	Huddart	Junipero Serra	Memorial	Pescadero	Sam McDonald	San Pedro	San Bruno Mtn	Wunderlich	Management Plans, Management Activities
Marbled Murrelet *(Brachyramphus marmoratum)* Breeding.								●	●	●				Natural Resources Management Plan Pescadero Creek
mission blue butterfly (*Icaricia icarioides missionensis*)*		●										●		San Bruno Mtn HCP. Invasive control, habitat restoration, grazing, prescribed burn
Monarch butterfly (*Danaus plexippus*)	●													Fitzgerald Marine Preserve Master Plan
Northern Elephant Seal (*Mirounga angustirostris*)				●										Fitzgerald Marine Preserve Master Plan
northern harrier (*Circus cyaneus*)*			●	●				●	●	●		●		None Active
olive-sided flycatcher (*Contopus copperi*)*		●		●				●	●	●		●		None Active
Osprey (*Pandion haliaetus*)				●										None Active
purple martin (*Progne subis*)*		●		●				●	●	●				None Active
Rufous Hummingbird (*Selasphorus rufus*)				●			●					●		None Active
San Bruno Elfin Butterfly (*Incisalia mossii bayensis*)												●		San Bruno Mtn HCP
San Francisco garter snake (*Thamnohis sirtalis tetrataenia*)*	●	●		●			●							San Bruno Mtn HCP. No observations in 22 years, assumed absent
sharp-shinned hawk (*Accipiter striatus*)*		●	●	●			●	●	●	●				None Active
Short-eared Owl (*Asio flammeus*)				●										None Active
Southern Sea Otter (*Enhydra lutris*)				●										Fitzgerald Marine Preserve Master Plan
Steelhead-Central CA Coast ESU (*Oncorhynchus mykiss*)								●	●	●				Natural Resources Management Plan Pescadero Creek
Steller's Sea Lion (*Eumetopias jubatus*)				●										Fitzgerald Marine Preserve Master Plan
Tri-colored Blackbird (*Agelaius tricolor*)				●										Fitzgerald Marine Preserve Master Plan
Vaux's Swift (*Chaetura vauxi*)				●										None Active
western pond turtle (*Clemmys marmorata*)*		●												None Active
white-tailed kite (*Elanus leucurus*)*		●	●	●										None Active
White-throated Swift (*Aeronautes saxatalis*)				●										None Active
Yellow Warbler (*Dendroica petechia*)				●				●	●	●				None Active

Refer to Appendix A for more information on how to monitor sensitive species, and how to implement habitat restoration activities.

5.9 RECYCLING GREEN WASTE AND VEGETATION BIOMASS

Meets Vegetation Management Objectives 2, 3, 5 and 9.

One of the guidelines for Vegetation Management outlined in the County of San Mateo Watershed Protection Program Maintenance Standards document (April 2004) is to "recycle/reuse vegetative matter where practicable."

This sentiment is echoed by the County's RecycleWorks program, which assists San Mateo County Parks. According to "highest use" principles, plants that are able to be chipped, composted, or used in some manner onsite at a County Park should not be disposed of in a landfill. This section describes current County practices relating to green waste management, and options for processing vegetation biomass generated during vegetation management activities.

5.9.1 Current County Practices

Vegetation biomass generated by County Parks includes trees and shrubs cut for fuel reduction and fire management, invasive trees and shrubs removed for habitat restoration (for example, Eucalyptus trees at Colma Creek as part of the Colma Creek restoration program), lawn clippings and other green waste from mowing programs, invasive plant removal biomass, and other large-scale vegetation removal projects. At present, the majority of vegetation biomass is left onsite. The biomass is either piled "as is" in inaccessible locations (e.g., brushpiles, logs, downed wood), or cut, chipped, or composted, then spread at the Parks. This practice is consistent with other land managers in the state, including the National Parks Service, the State Parks system, and other counties. Due to the cost of transportation and the large amount of biomass generated by a park, many times the only feasible alternative is onsite treatment.

Vegetation biomass that is not left onsite is typically disposed of in debris boxes that are transported to County dump facilities. RecycleWorks is a County program that assists the parks with disposal of green waste and other debris, but does not do the actual hauling. The amount of waste that can be transported by a debris box company or waste and recycling hauler depends on:

- What's being picked up and where;
- How much needs to be transported; and
- Whether it's regular or specially-scheduled pick up service.

At present, County Parks does approximately 80% of its own processing of green waste and off hauling. Processing is done using 3 chippers; however, these three chippers are reaching the end of their productivity, and should be replaced soon. Replacement equipment under consideration are 2 to 3 larger-capacity "Brush Bandits" at a cost of approximately $37,000 per unit. The new equipment would allow County Parks to reduce its offsite disposal needs by as much as 50% (Dave Moore, pers. comm.).

RecycleWorks suggests the following for park management consideration:

- Ensure each park has enough waste containers or adequate space for composting facilities.

- Each park should designate and approve a green waste disposal area (intended to reduce fuel loading that results from leaving materials in wildlands).
- Ensure any green waste that is to be disposed of offsite is "clean" and not mixed with trash.
- Invasive weeds and infested trees mush be separated and disposed of differently than native plants.

5.9.2 Options for Processing Green Waste

Since RecycleWorks assists the Parks with disposal, there is some consensus that they should have some authority over the handling of green waste, however a comprehensive green waste program has not been developed for County Parks. RecycleWorks is most interested in finding the highest use for vegetation biomass (Boone pers. comm.).

The following alternatives for processing green waste are provided by RecycleWorks:

- **Dispose of onsite** (suitable for brush and downed wood. Cut into sections and store in designated disposal locations. Allow to break down naturally. Suitable for disease-free trees and shrubs).
- **Compost or chip onsite** (suitable for native plants, leaf litter, mowing and mulching grass cuttings, and chipping ground cover). These materials can be used for compost or mulch.
- **Compost at an off-site green waste facility** (large amounts of biomass, some invasive weeds). There are currently no sites in San Mateo County. Available sites that accept green waste include Z Best in Gilroy, Jepson Prairie in Davis, and Newby Island in San Jose.
- **Alternative Daily Cover (ADC).** Clean loads of green waste can be used as cover for landfill, and are not considered disposal (Costs less and is more environmentally friendly).
- **Landfill disposal of green yard waste** (typically hauled to Ox Mountain landfill and co-mingled with garbage)(Higher cost).
- **Local transfer station and/or curbside pick up of clean green waste.** (Green waste will be transferred to offsite composing facility, biomass facility, or for ADC).
- **Special disposal methods** for biomass in areas with potential for plant diseases such as Sudden Oak Death syndrome (i.e. Crystal Springs Regional Trail, Huddart/Wunderlich).

The following suggestions are provided to assist park managers in making decisions regarding green waste management.

1) **Estimate the Amount of Vegetation Biomass that could be generated By a Project.** For example, the Colma Creek restoration project will result in the need to dispose of 50 small trees and 50 large trees, therefore disposal methods should be determined that can handle this volume of material. Refer to Appendix A for methods to estimate biomass in tons per acre.

2) **Assess the Type of Vegetation Biomass Being Generated and Determine the Most Appropriate Disposal Method.** This will require park staff to make a judgment based on the type of vegetation, how fast it can be expected to break down or mulch, and the potential for the biomass to contain viable seeds and roots that could cause inadvertent spread to other areas. As stated above, trees and invasive plants should be disposed of differently than lawn clippings.

Refer to Appendix A for details on methods to process and dispose of various types of vegetation biomass.

3) **Find an Appropriate Disposal Site.** Possible sites include the original removal/treatment site; a nearby designated green waste disposal site (to be designated in each park). (Note: some land management organizations stash small tree branches and cut logs under dense shrubs, however, this will increase fuel loading in San Mateo Parks, and is therefore not encouraged); a centralized compost pile, storage bin, maintenance yard, or convenient onsite storage location developed for an individual project; or offsite disposal. Refer to RecycleWorks for proper vegetation biomass preparation for transport and transportation procedures.

4) **Monitor all Onsite Disposal Sites.** The job is not over until the vegetation material is completely composted! As needed to properly compost vegetation (may require monthly or bimonthly management for up to 1 year) and control the spread of invasives, monitor your disposal sites periodically to detect problems (annual assessment and spot treatment for several years).

A list of valuable references with regards to disposing and treating green waste is provided in Appendix D.

5.10 UNAUTHORIZED TRAILS

Meets Vegetation Management Objectives 2, 3 and 10.

Unauthorized trails are defined as trails that are created by human trespass into areas that lack designated park-approved trails. Unauthorized trails can be a significant source of soil erosion and habitat degradation, and are often the source of invasive plant infestations.

Unauthorized trails can also be important indicators of management issues or other problems that need to be addressed. For example, multiple unauthorized trails that lead from an existing trail to an off-trail destination may indicate that the overall trail circulation pattern is not effectively addressing visitor use. This can be corrected in a number of ways, including:

- Adding curbing or better demarcation of the main trail, along with trail closed signs on the social trail. Studies have indicated that most people will stay on a well marked trail!
- Posting trail locator maps at the social trail diversion from the main trail showing the visitor how to get where they want to go on the designated trail system, and providing estimated distances to their destination.
- Creating new spur trail(s) to the destination to eliminate multiple unauthorized trails.
- Installing physical or visual barriers to discourage trespass from the main trail (e.g., installing brush piles, barrier fencing, dirt piles, or planting dense vegetation screening (shrubs, trees).
- Revegetating the old unauthorized trails to erase the trail trace so that subsequent visitors do not follow unauthorized trails.

Another source of unauthorized trails is unusual or illicit human behavior. In these instances, eliminating dense cover may be the key to changing social trail use: for example, 'limbing up' trees

and removing understory layers to create a park-like open area often is effective at eliminating illegal encampments, and other human groupings, thereby eliminating the social trail use as well.

Unauthorized trails can also indicate a structural problem with the main trail. For example, if the main trail crosses a wetland or seep and the trail does not drain, visitors will often 'go around', avoiding the wet areas. In this example, the key to eliminating unauthorized trails is to 'fix' the main trail by installing a culvert or boardwalk/bridge, then revegetating the unauthorized trails.

It is important to note that in most cases, unauthorized trails are created by human activity (e.g. hiking, offroad vehicle use, offroad biking), then the trail scar is typically widened and deepened through a combination of continued use (human and/or wildlife) and related soil erosion. Unauthorized trails can be exacerbated by surface drainage patterns that follow the down-cut of the social trail pathway. Therefore, it is important to first create sustainable circulation patterns that provide visitors safe and well-marked access to popular destination points, then close and restore the social trail.
The success of reducing or eliminating unauthorized trails is related to:

- Providing well-marked safe trails that lead to desired visitor destination points;
- Erasing the "hydrologic memory" of the old social trail;
- Removing the "scar" of unauthorized trails and providing adequate time for plant establishment; and
- Providing signage indicating routes, distances, destinations, hazards, trail closures, etc. to encourage visitors to use designated trails.

Refer to Appendix A for additional information on how to restore unauthorized trails.

5.11 HABITAT RESTORATION

Meets Vegetation Management Objectives 1, 4, 5, 6, 7, 8, 9, 10, and 12.

This section is intended to provide a brief overview of management considerations related to habitat restoration. Much more detailed information on how to plan and implement habitat restoration projects is provided in Appendix A and C. Useful resources that can help park staff plan habitat restoration activities are provided in Appendix D.

Habitat restoration should be largely based on the following fundamental concepts:

- Restoring natural processes to the greatest degree feasible and appropriate;
- Protecting rare and sensitive plant and wildlife habitat, and enhancing and expanding these habitat values wherever possible;
- Increasing overall biological diversity of native species;
- Expanding existing native habitats areas through a combination of both passive (e.g. removing forest canopy overstory, invasive plants) and active restoration (large-scale invasive control, grading, and planting) activities;
- Enlarging and linking smaller isolated wetlands and riparian woodlands into larger habitat restoration corridors, to promote genetic diversity in wildlife populations;
- Creating and/or maintaining a diverse "mosaic" pattern of native habitat types (e.g., grassland, scrub, woodland) and structures for a variety of wildlife species. [Special attention will be given to restoring riparian woodland habitat adjacent

to wetland and scrub habitat with the goal of creating large contiguous blocks of high quality songbird habitat];

- Controlling targeted invasive plant species;
- Reducing non-natural erosion sources;
- Creating sustainable park stewardship and sufficiently resourced maintenance programs (especially for sites with problematic invasive plant species issues);
- Offering diverse and coordinate opportunities for engaging the community in park stewardship;
- Linking habitat restoration efforts with trail management efforts wherever possible to ensure holistic landscape management and synergistic results; and
- Providing interpretive and educational opportunities wherever appropriate.

Refer to Appendix A for a detailed account of how to plan and implement habitat restoration.

5.11.1 Effects of Global Warming on Vegetation Communities and Sensitive Species

Global warming is a worldwide phenomenon that is well documented, however its effects on vegetation resources are not well understood. It is clear that there is an overall trend towards more extreme weather patterns, including more frequent and severe El Nino events, flooding events and drought cycles. These types of weather patterns effect vegetation in a number of ways that are important in the context of vegetation management.

First, coastal areas (including such as Fitzgerald Marine Reserve, Mirada Surf, and Coyote Point may be subjected to increased wave action and flooding events. Such events may accelerate the rate of coastline erosion, leaving near-ocean sea bluffs and coastal marsh increasingly vulnerable to loss or damage. Facilities such as roads and buildings that are near the coast interface may be subject to damage from increased wave action, coastal erosion, and more severe flooding events.

Changes in weather patterns (for the most part, interpreted as longer and hotter summers, possibly longer and more severe storm events) can cause shifts in vegetation communities over time. One possible shift that may be attributed to changing weather is a shift from grassland to shrub-dominated communities (during wetter weather cycles) and from shrubland to grassland (during dry or drought cycles).

These trends may have vegetation management implications. For example, as buildings and roads suffer increased damage, they may need to be more frequently repaired, relocated to more stable areas, or abandoned. Park managers should consider placing new facilities in areas away from the coastal interface area, or (if facilities are necessary) using more durable materials or requiring planning for more frequent maintenance. Vegetation shifts may also necessitate changes in vegetation management, especially for those species that are closely tied to a certain type of vegetation. For example, if shrubs become more dominant in mission blue butterfly habitat, park managers may have to increase shrub eradication, mowing or grazing programs, or possibly controlled burns to keep sufficient grassland habitats available to support the butterfly. Several species sensitive species are associates associated with wetlands, and; changes in weather patterns may affect the duration and quantity of water in these habitats. Therefore, park managers may have to increase or decrease the amount of wetland habitat or water available to compensate for changes in wetland habitats resulting from weather patterns global change. Invasive plant species populations may also shift distribution, and those adapted to the new climate conditions would be more likely to spread.

There is no good method to track and detect changes resulting from global warming. We suggest that over time, historic records such as aerial photographs may be a good way to detect subtle changes in vegetation patterns over time. For coastline damage, more frequent monitoring of coastal areas is recommended to help detect and correct problems early.

5.12 INVASIVE PLANT CONTROL

Meets Vegetation Management Objectives 1, 4, 5, 7, 8, 9, 11, and 12.

The overall goal of an invasive plant control program is sustained control, leading to elimination of target invasive plants, a goal that will require a large time commitment.

There is no single effective method to control invasive plants (also referred to in this report as weeds). Most land managers that have successfully completed invasive plant control programs indicate that what works best is to adaptively implement several control techniques. One consistent element of failed invasive plant control programs is reported to be underestimating the time and the resources (staff, costs) that will be necessary to control weeds. Our advice is to pick your weed "battles", and not to start something that you cannot finish (Source, numerous conversations with weed management professionals, information presented at the CalIPPC and SERCAL conferences, November 2004, and 2005).

The information provided below is intended to be a tool to help guide decisions about weed control efforts. Refer to Appendix A for specific invasive control treatments for individual weed species. Any invasive plant project should consider and follow Integrated Pest Management procedures to help ensure the most effective and least environmentally damaging alternative is selected. Because weed control techniques are ever evolving, we strongly suggest checking with the local Agricultural Commissioner's office, Weed Management Area and other weed resources (e.g., California Invasive Plant Council [CalIPC], The Nature Conservancy's weed websites) listed in Appendix D before finalizing an approach to weed control.

All applications of pesticides or herbicides, when needed, should follow Agricultural Commissioner's recommendations, Environmental Protection Agency guidelines, state and federal law, and product labeling guidance. Herbicides should be prescribed and applied under the directions of a qualified herbicide applicator with a valid Qualified Applicator's License (QAL) license and experience in applying herbicides in wildland settings. Park representatives should oversee contractor work on site.

Best Management Practices should be employed during invasive plant control to minimize soil disturbance, and to help ensure that biomass is removed from the site, or sufficiently composted and stored out of sight. Removal of large infestations of weeds can result in the increased potential for erosion on slopes and stream banks. Therefore, an erosion control strategy must be in place before large-scale removal efforts are undertaken. In areas where invasive plants occur on steep and unstable coastal cliffs and bluffs, special control methods should be employed (e.g. contractor rappel and spray, broadcast spray and decompose onsite).

The following section provides a very simple review of invasive removal options. Refer to Appendix A for treatment options provided for each of the most important target weed species currently known from the park system.

- Hand removal
  - Hand pull (Weed wrench).
  - Cut above ground vegetation (loppers, brushcutters, scythe).
  - Dig out entire plants, including roots (Hula hoe, rake, shovel).
- Machine removal
  - Light plow (bobcat, ATV).
  - Masticate above-ground vegetation (weedeater, brushhog).
  - Large-scale mastication, dense brush ('brontosaurus', caterpillar, tractor).
  - Pluck (Truck with winch and cable).
- Tree removal
  - Chainsaw into sections.
  - Use of cables to remove in sections.
  - Helicopter logging.
  - Brontosaurus, chip in place.
- Herbicide Application
  - Foliar application.
  - Basal bark application.
  - Spot application - cut and paint.
  - Spot application – wick.
  - Remove biomass, allow plant to regrow, then foliar spray new growth.
  - Rappel, then foliar spray.

Controlling invasive plants will be an ongoing maintenance action in developed landscapes as well as natural areas within the San Mateo County Parks. Invasive species of primary concern, and methods for their control/removal, are found in "How to Control Invasive Plants" in Appendix A. Listed below in Table 5.12 are species frequently found in San Mateo County Parks, according to Rana (2002).

Table 5.12. Known Invasive Species to Occur Within Each Park

Known Species*	Coyote Pt	Crystal Springs	Edgewood	Fitzgerald	Flood Park	Huddart	Junipers Serra	Memorial/ Pescadero/ Sam McDonald	San Pedro	San Bruno Mtn	Wunderlich
Acacias (*Acacia sp.*)	●	●			●		●			●	●
Australian fireweed (*Erechtites minima*)										●	
Australian tea tree (*Leptospermum laevigatum*)	●	●									
Blackwood acacia *(Acacia melanoxylon*)		●									
Blue gum Eucalyptus (*Eucalyptus globulus*)	●	●	●				●		●	●	●
Bull thistle (*Cirsium vulgare*)	●	●	●			●	●	●		●	
Bailey's acacia (*Acacia baileyana*)		●									
Cape ivy/German ivy (*Delairea odorata / Senicio mikanioides*)	●	●		●			●	●	●	●	
Cotoneaster (*Cotoneaster sp.*)	●	●			●		●			●	
English ivy (*Hedera helix*)		●			●		●		●	●	
Ehrharta (*Ehrharta erecta*)										●	

Known Species*	Coyote Point	Crystal Springs	Edgewood	Fitzgerald	Flood Park	Huddart	Junipero Serra	Memorial/ Pescadero/ Sam McDonald	San Pedro	San Bruno Mtn	Wunderlich
Fennel (*Foeniculum vulgare*)	●	●					●	●		●	
French broom (*Genista monspessulana*)	●	●	●			●	●	●	●	●	●
Fuller's teasel (*Dipsacus sativus*)		●									
Garden nasturtium				●							
Glossy privey (*Ligustrum japonica*)					●						
Gorse (*Ulex europaeus*)										●	
Harding grass (*Phalaris aquatica*)		●		●			●	●	●		
Heavenly bamboo (*Nandina domestica*)					●						
Himalayan blackberry (*Rubus discolor*)					●			●		●	
Iceplant/hottentot fig (*Carpobrotus edulis*)	●	●								●	
Italian thistle (*Carduus pycnocphalus*)		●	●			●	●	●	●	●	
Monterey cypress (*Cupressus macrocarpa*)		●		●			●		●	●	
Monterey pine (*Pinus radiata*)		●				●	●		●		
Mustard (*Brassica nigra*)	●				●					●	
Myoporum (*Myoporum laetum*)	●										
Ox-eye daisy (*Leucanthemum vulgare*)										●	
Oxalis/Bermuda buttercup (*Oxalis pres-caprae*)										●	
Pampas grass (*Cortaderia jubata*) or jubata grass (*C. Jubata*)	●	●	●	●		●	●	●	●	●	
Periwinkle (*Vinca major*)	●	●		●				●	●		
Pine species (*Pinus sp.*)										●	
Poison hemlock (*Conium maculatum*)		●		●				●	●	●	
Purple loosestrife (*Lythrum salicaria*)										●	
Radish (*Raphanus sativus*)	●									●	
Rattlesnake grass (*Briza maxima*)										●	
Scotch broom (*Cytisus scoparius*)	●	●					●			●	
Single-seed hawthorn (*Crataegus monogyna*)										●	
Smooth cordgrass (*Spartina alterniflora*)	●										
Smooth cord grass hybrid (*Spartina alterniflora x S. Foliosa*)	●										
Spanish broom (*Spartium junceum*)											●
Yellow star-thistle (*Centaurea solstitialis*)	●	●	●	●		●	●	●	●	●	●
Velvet grass (*Holcus lanatus)*				●							
Wandering Jew (*Tradescantia fluminensis)*									●		

* Source, Rana (2002). There may currently be more invasive plants at these park.

More information on restoration is found in "How to Plan a Restoration Project" in Appendix A.

Managers should adopt the following practices in their efforts to control invasive plant species in the San Mateo County Parks:

Invasive species control includes the following steps.

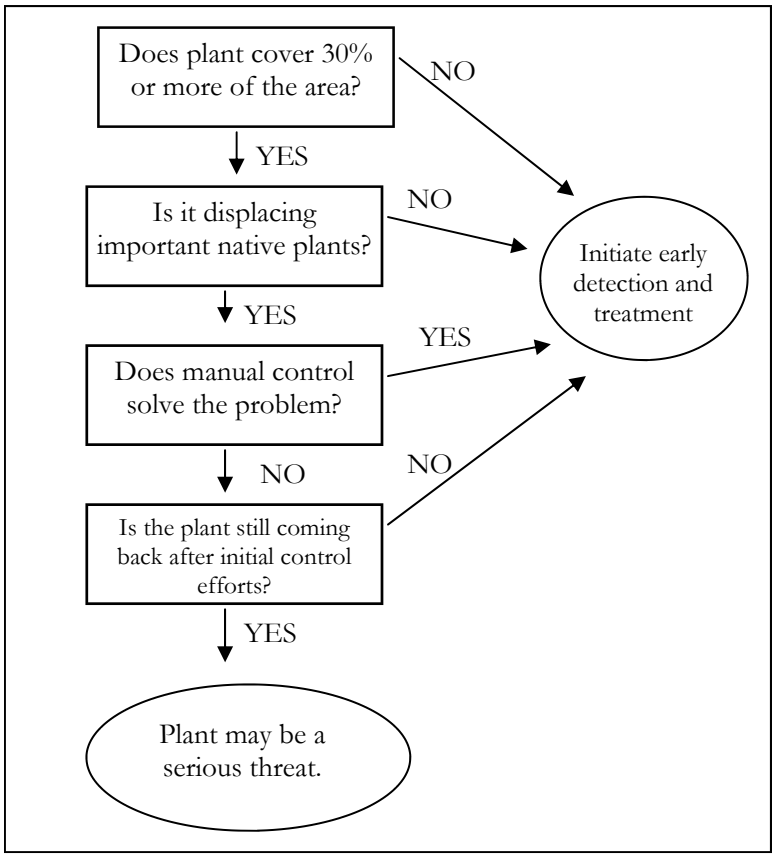
1. Collect Baseline Information on Invasive Plant Locations

The logical starting point for any invasive plant management project is a map of the weed locations. Maps can be hand drawn or GIS based, and should contain as much information as possible on the species present, density, age, and presence or absence of sensitive species. However, the absence of detailed GIS mapping of every invasive plant should not stop weed management activities as the maps can be developed to first document ongoing activities and then can be expanded to include species of particular concern. A list of invasive species present in each park is already available, and in conjunction with the prioritization methods listed below the most high priority weeds can be mapped first.

2. Prioritize Control Efforts

Once baseline maps are available for a park, a prioritization process will help determine where control efforts should be focused. It should be possible to decide which species should be **eradicated, contained or monitored** for future spread. The decision can be based on the feasibility of control of the species itself as well as the location of the weed in relation to other park resources. A rough prioritization method for each species is available in the form of the Cal-IPC Invasive Plant Inventory. This list uses available scientific data and expert knowledge to rank the plants considered most highly invasive in California. The ranking categories are: High, Moderate, Limited and Evaluated by Not Listed. Park managers can simply list the invasive plants in the park with their respective Cal-IPC ranking to determine which pose the most immediate threat to park resources. Flow Chart 1 below can be used to help managers determine whether or not a plant should be considered a serious threat.

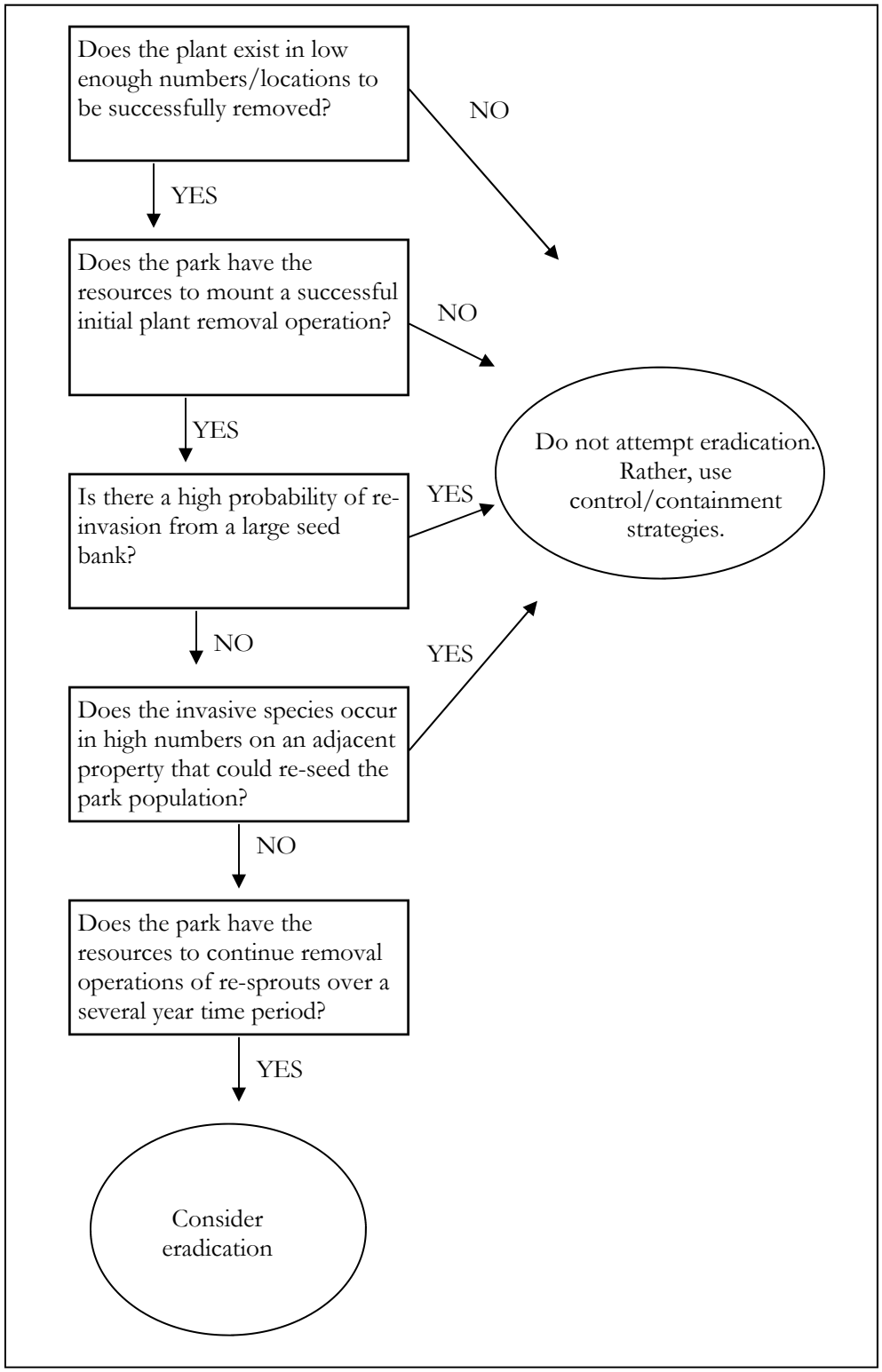
Decision-Making Flow Chart 1: Identifying Plants that are Serious Threats



3. Assess the Potential for Successful Control or Eradication

Assessing whether or not a project will successfully control (or preferably eradicate) an invasive plant is a good "acid test" as to whether you should proceed. If the project is too big, too ambitious, or the treatment area is likely to be re-infested from nearby sources, it may not be a good candidate project. Flow Chart 2 (below) may help with the decision-making process.

Decision-Making Flow Chart 2: Identifying Plants that are Candidates for Eradication



For invasive plants that pose a serious threat but can not realistically be eradicated (because they are just too widespread, or the probability of re-invasion is high), park managers can focus on sustained control, or containment of the invasive plant population.

4. Initiate an Early Detection and Rapid Response Plan for New Weeds

Detecting new weed infestations and responding to them quickly is as important as controlling the weeds that you already have in the park. Containing a new weed, like containing an epidemic, depends on identifying it as soon as possible and initiating a rapid, coordinated response. The main need is for park users, volunteers, and staff to be attentive. Some agencies such as the National Park Service, State Parks, and "Friends of" groups working in various parts of the state have instituted "invasive plant patrols" made up of volunteers who systematically search trails and other likely places for weed populations. The report findings to Park Management, who, in consultation with the Agricultural Commissioner's office and Weed Management Area representative, decide what to do about the new weed. Not all new weeds turn into invasive plants that threaten native habitats! Some simply die out. Other weeds, if they are problematic elsewhere in the state, should be considered as a potential problem in San Mateo County. Small infestations should be immediately controlled, larger ones, given priority for control before they spread. All this work is worth it. As two veteran weed workers put it, "preventing or stopping just one new invasive weed would be of greater conservation benefit in the long run than far more costly and difficult efforts to control an already widespread pest."

5. Eradicate Infestations Where Feasible

Eradication means destroying every single plant in the population, not just most of them. Typically, even if caught in the early phases, eradication will require more than one treatment, often extended treatment periods of, 5, or even 10 years. The key is diligence. If the site is weeded thoroughly enough and often enough, the remaining seed bank (i.e. seeds left dormant in the soil) can be exhausted, and the eradication will be successful.

Because eradication is labor intensive and requires a focused effort over time, it is important to pick your battles. Identify only the most problematic weeds, and among those, only attempt to eradicate the species and sites that can be completely removed within the available staffing, budget, and volunteer support base. Projects that are not followed through to completion will be a wasting of time and money, because any remaining seed will eventually lead to a new infestation. Also, make sure the whole population can be removed and new populations can't seed in from outside sources.

The key to eradication is:

- Detecting Early.
- Responding Quickly.
- Monitoring Carefully.
- Repeating as Necessary until all Plants and Seedlings are Gone!

Eradication efforts should only be undertaken under the following conditions:

- The plant is truly a threat. It spreads rapidly out of control with no limitation, biological control or seasonal control, and it displaces important native plants.
- The whole population can be successfully removed and new populations can't seed in from outside sources.

6. Where Eradication is Not Feasible, Contain and Control.
If it is not possible to eradicate an invasive plant infestation, don't give up! Change the project goals to sustained control or containment of the invasive plant population. Sustained control and containment will keep the invasive plant in check and prevent it from flowering and setting seed, and spreading to nearby areas. For some species such as French broom or cape ivy that grow near endangered species habitats, containment is a very effective management strategy to keep the invasive plant from adversely affecting sensitive resources.

When a particular weed has become widespread—like gorse and yellow star-thistle—eradication is no longer a sensible strategy. Instead, the most effective action is to contain and control the spread of the plant. To contain the spread, focus on "outlier" populations—small patches in areas otherwise weed-free. At the same time, prevent additional seed from being dispersed by cutting back fruit-bearing plant parts. In the case of English ivy, cut the parts growing up into trees and bearing fruit. Following this strategy will limit the spread of the local population to the area it currently occupies. For other species-specific control methods, see "How to Control Invasive Plants" in Appendix A.

Containment alone works best with plants that expand outward from the edge of their colony (such as ivy or broom species). When dealing with such plants, focus on containing the large infestations and eliminating all the outlier populations, rather than spending energy trying to eradicate the main population. It's easy to feel compelled to throw all your effort into working on the dense weed patches, but doing so is like sending fire fighters into the middle of a huge wildfire while ignoring its perimeter. The fire keeps spreading, as if you hadn't done a thing. If necessary, delineate a containment line or zone. This can be done by dividing the park into areas defined by a trail system, stream, fenceline or other linear feature.

Fruit and seed producing plants and plants which disperse seed over long distances are not effectively controlled using containment alone. The fruiting source must also be reduced. This should be done by:

1) Take out all mature plants and never allow remaining plants to flower or set seed again. An example of this approach would be ongoing Pampas grass (or jubata grass) control along the north coast where volunteers remove and bag all of the feathery seed "plumes" each year to prevent the wind from spreading seeds along the coast. Carefully timed mowing or weed eating can be an effective way to 'cut off' the flowering or seeding heads before they mature.
2) Pull seedlings and continue to mow re-sprouting (treat with herbicides as necessary).
3) Replace invasives with native plants, or cover treated areas with tarps, mulch, or other barriers to shade the remaining seed bank and help prevent germination and prevent resprouting.

To effectively eliminate invasives, not only the mature plant material needs to be removed. Re-sprouting rhizomes, roots, and seedlings need to be pulled on a regular basis. Once you've decided to remove a population, a key to success is to retreat the site every year in spring until no more resprouting or seed germination is occurring. Regular site monitoring will identify areas of regrowth before they re-establish.

7. Use Integrated Pest Management and Adaptive Management for Controlling Priority Infestations

Integrated Pest Management (IPM) is an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices. IPM programs use current, comprehensive information on the life cycles of pests and their interaction with the environment. This information, in combination with available pest control methods, is used to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment.

The IPM approach can be applied to both agricultural and non-agricultural settings, such as the home, garden, and workplace. IPM takes advantage of all appropriate pest management options including, but not limited to, the judicious use of pesticides. In contrast, organic food production applies many of the same concepts as IPM but limits the use of pesticides to those that are produced from natural sources, as opposed to synthetic chemicals.

IPM is not a single pest control method but, rather, a series of pest management evaluations, decisions and controls. In practicing IPM, park managers who are aware of the potential for pest infestation follow a four-tiered approach. The four steps include:

- **Set Action Thresholds.** Before taking any pest control action, IPM first sets an action threshold, a point at which pest populations or environmental conditions indicate that pest control action must be taken. Sighting a single pest does not always mean control is needed. The level at which pests will either become an economic threat is critical to guide future pest control decisions.

- **Monitor and Identify Pests.** Not all insects, weeds, and other living organisms require control. Many organisms are innocuous, and some are even beneficial. A typical IPM programs monitors pests and identify them accurately, so that appropriate control decisions can be made in conjunction with action thresholds. This monitoring and identification removes the possibility that pesticides will be used when they are not really needed or that the wrong kind of pesticide will be used.

- **Prevention.** As a first line of pest control, IPM programs work to manage the crop, lawn, or wildland to prevent pests from becoming a threat. In a park setting, this may mean using cultural methods, such as selecting pest-resistant landscaping stock, and planting pest-free rootstock. These control methods can be very effective and cost-efficient and present little to no risk to people or the environment.

- **Control.** Once monitoring, identification, and action thresholds indicate that pest control is required, and preventive methods are no longer effective or available, IPM programs then evaluate the proper control method both for effectiveness and risk. Effective, less risky pest controls are chosen first, including highly targeted chemicals, such as pheromones to disrupt pest mating, or mechanical control, such as trapping or weeding. If further monitoring, identifications and action thresholds indicate that less risky controls are not working, then additional pest control methods would be employed, such as

targeted spraying of pesticides. Broadcast spraying of non-specific pesticides is a last resort.

8. Adaptive Management
Adaptive management is an important component of invasive plant control projects. Refer to Section 5.1 above for information on Adaptive management procedures.

9. Document Invasive Species Treatments and Effectiveness
Keep track of on-going work with written documentation and a map. Maps and good record-keeping are extremely important. Except in small parks, it is nearly impossible to keep track of all the sites where weeds have been removed unless written records are kept. Since every site needs to be revisited, good record keeping will be synonymous with success. The aim of control is not to eradicate weeds, but to reduce weed density and abundance below an acceptable threshold.

10. Prevent the Spread of Invasives
Preventing the spread of invasives into new areas is one of the best ways of eliminating invasive problems. In general, invasive plants are brought into a new area by human activities, bird and wildlife foraging or natural processes such as fire and erosion. Human activities such as hiking can track undesirable seed from one space to another when we walk or bike through an area and pick up seed on shoes or bike tire treads. Some agencies provide a boot brush and a low-concentration bleach solution near trail heads, and ask visitors to clean their boots and tires before entering the trail system to help reduce weed seed spread.

Weed spread also occurs during vegetation management, and construction, as weed seeds are carried from site to site on vehicles and equipment (including shovels, chain saws, weed-eaters, and other tools). Weeds can also enter a site in fill dirt, erosion control, or in hay bales used for slope stabilization. All Park Bid specifications should include a requirement for contractors to wash all vehicles and equipment before entering parks, and to wash equipment before transporting vehicles between sites within a park.

Bird and wildlife foraging also contributes to the spread of invasive plants. Many plants need their seed to pass through the gut of an animal or bird before it can germinate. Typically these sorts of plants have attractive and delicious fruit. Birds and wildlife eat the fruits and later drop the activated seed. An example of this is cotoneaster, a plant with attractive red berries that are ingested and spread by birds. In order to effectively reduce invasive plant spread, it is necessary to replace this food source with native plant fruit.

Providing basic educational materials to staff, volunteers, and the general public will go a long way towards contributing to weed control efforts. Information for park staff (especially for those involved in weed removal efforts) will be more comprehensive, but in general, educational materials should contain the following key elements:

- General boot and equipment cleaning instructions for before and after entering the parks.
- Photos of the most noxious weeds and a request for new sightings of invasive weeds to be reported to park staff.
- Appropriate behavioral "dos" and "don'ts" around weeds to prevent further seed dispersal.
- How to handle green waste once the weeds are removed.

Refer to Appendix A and Appendix C for supporting information materials.

11. Monitoring

Monitoring of invasive species control programs is essential to determining their effectiveness. Monitoring as it relates to vegetation management in general is discussed extensively in Appendix A and many of these concepts apply to invasive species management.

12. Use Volunteer Groups Wherever Feasible

Given limited park staffing, volunteers are an invaluable resource for tracking invasive plant infestations, removing invasive plants, and monitoring the results of invasive plant projects. Local citizens who use the parks frequently and are trained to identify target weeds can be an invaluable source of information and, with staff direction, may be able to support or independently conduct invasive plant control projects.

5.13 PLANT PEST AND DISEASE DETECTION AND CONTROL

As with invasive plants, pests and plant disease management should focus on detection, containment, and treatment as necessary to control damage. New diseases and pests are likely to invade the park system over time; therefore we recommend park managers keep up to speed on new threats by partnering with the Agricultural Commissioner's office and other pest and disease organizations. A helpful list of resources is provided in Appendix D. The following describes the pests and plant diseases that have been detected on San Mateo County Park lands to date (Rana 2002).

5.13.1 California Oak Mortality Disease

California Oak Mortality disease, formerly called Sudden Oak Death, is caused by the plant pathogen *Phytophthora ramorum*. This pathogen has caused widespread diebacks (tens of thousands of trees) of tanoak and several oak species (coast live oak, California black oak, Shreve's oak, and canyon live oak) in California's central and northern coastal counties. The disease spreads from tree to tree and persists in wet and damp places. It can accumulates on other tree species such as California bay laurel which often traps moisture on its broad leaves, then spreads via wind or leaves or is transported by animals or humans to other trees such as oaks where it causes infection. The pathogen also infects the leaves and twigs of common ornamental nursery plants, such as rhododendrons and camellias, which can serve as vectors for pathogen dispersal. *P. ramorum* thrives in cool, wet climates.

In California, infestations in natural settings have been found in 14 central and northern coastal counties, including San Mateo. Within the San Mateo County Parks system, one tree within Crystal Springs Regional Trail was found to be infected. Additional new infestations are just recently being investigated at Wunderlich and Huddard (S. Herzberg pers. comm.). In addition to California, the pathogen has been found in Curry County, Oregon, where efforts to eradicate the disease are underway. It has also been identified on nursery plants and forest trees in Europe. Groups currently working to fight the spread of this pathogen include the California Oak Mortality Task Force (COMTF). COMTF has established a number of committees to diversify its control efforts. These include biomass utilization, education, management, monitoring, nursery, regulation, and research committees.

Some practical tips for park managers include the following suggestions from local arborists and forest ecologists:

- The disease spreads from tree to tree and persists in wet and damp places. It can accumulates on other tree species such as California Bay laurel which often traps moisture on its broad leaves, then spreads via wind or leaves or is transported by animals or humans to other trees such as oaks where it causes infection.
- Be aware of management and land use practices that might be spreading the disease. Wash equipment, vehicles, and shoes (a mild bleach solution is recommended) before leaving infected areas. Limit public access (e.g. temporarily close trails or cordon off areas) as needed to reduce potential spread by humans.
- Contact the Agricultural Commissioner's office and the California Oak Mortality Task Force to get up-to date information. (A helpful list of resources that can be contacted is provided in Appendix D).
- Contact a professional arborist or forest ecologist if treatment is required. As with other tree diseases there is no reliable cure for the infected tree, therefore treatment of outbreaks focuses on containment, then preventative treatment of nearby trees. Often, because it is cost prohibitive and possibly ineffective to treat a large area of possible infection around one diseased tree, the best treatment is containment of the diseased tree (i.e. cut and leave in place), and monitoring of surrounding trees until the disease has run its course in the area. Treatment is typically spraying the nearby trees with a fungicide, and perhaps treating acidification of soils under affected stands (although the effectiveness of this treatment is unknown).
- Do not transport leaf litter, soil woody debris, firewood, or cut limbs from infestation areas.

Best Management Practices for Controlling California Oak Mortality are found in Appendix A. A pictorial guide to detecting the disease is included in Appendix C.

5.13.2 Pitch Canker

Pitch canker, a disease of conifers (pines and Douglas fir) caused by the fungus *Fusarium circinatum (= F. subglutinans f.sp. pini)* was discovered in California in 1986 (McCain et al. 1987). An initial survey conducted in 1987 located the disease in five counties, primarily infecting ornamental Monterey pine *(Pinus radiata),* centered in the area from Santa Cruz County to south Alameda County (Interagency Working Group 1987). Monterey pine and Bishop pine, as well as other conifers are highly susceptible to pitch canker disease. Trees of all ages can be infected and eventually killed.

In Junipero Serra Park, many of the pines have pitch canker. The potential for the spread of the pitch canker fungus is significant considering the susceptibility of most pine species. For this disease to occur a suitable wounding agent is required. In the western United States, this is typically an insect. There are a wide variety of insects that can spread it to other nearby trees. Not all susceptible trees will be damaged by pitch canker, even if the pathogen is present, therefore infected trees should be monitored before a decision is made to cut them down.

Some practical tips for park managers include the following suggestions from local arborists and forest ecologists:

- The disease typically kills the infected tree, but some trees recover after being infested. Insects typically transport the disease from tree to tree; however because of the large number of vectors that can transport the disease, treatment (i.e. pesticide application) on the affected tree is not effective in controlling the spread of the disease.
- Pruning infected limbs does not seem to reduce mortality of infected trees and is mostly cosmetic.
- As with other tree diseases there is no reliable cure for the infected tree, therefore treatment of outbreaks focuses on containment, then preventative treatment of nearby trees.
- Be aware of management and land use practices that might be spreading the disease or vectors (insects). Wash equipment, vehicles, and shoes (a mild bleach solution is recommended) before leaving infected areas. Limit public access (e.g. temporarily close trails or cordon off areas) as needed to reduce potential spread by humans.
- Contact the Agricultural Commissioner's office and the Pitch Canker Task Force to get up-to date information. (A helpful list of resources that can be contacted is provided in Appendix D.
- Contact a professional arborist or forest ecologist if treatment is required. Treatment is typically felling the dead tree in place, then monitoring and spraying the nearby conifer trees with a fungicide to help prevent spread. Chemical controls might be exploited under nursery conditions to prevent seedling disease caused by *Fusarium circinatum*, but, for larger trees, maintaining a sufficiently high concentration of the fungicide on all susceptible surfaces would be problematic, even if cost were not a consideration.
- Do not transport leaf litter, soil woody debris, firewood, or cut limbs from infestation areas.

A Pitch Canker Task Force has been created to limit the spread of pine pitch canker in California through management, research, consideration of regulatory actions, and education (Web site: http://www.cnr.berkeley.edu/forestry/comp_proj/pitchdocs.html). In addition, research is underway to find disease-resistant varieties of Monterey pine and other conifers. Methods for detecting and treating pitch canker are found in Appendix A. A pictorial guide to detecting the disease is included in Appendix C.

5.13.3 Western Tussock Moth *(Orgyia vetusta)*

The western tussock moth *(Orgyia vetusta)*, a native of California, feeds on leaves, decreasing or eliminating a tree's photosynthetic capability and therefore limiting its growth. In an extreme outbreak, complete defoliation and tree mortality can result in a single season. According to the San Mateo County Vegetation Resources document (Rana 2002), western tussock moth was identified as infesting a manzanita in one area of San Bruno Mountain. Methods for identifying and treating western tussock moth outbreaks are found in Appendix A and C. Additional information from U.C. Davis Integrated Pest Management is available online at:
http://www.ipm.ucdavis.edu/PMG/r5300611.html

5.13.4. Root Rot Fungus *(Armillaria mellea)*

The following information was excerpted from the Integrated Hardwood Range Management's web site: http://www.ipm.ucdavis.edu/PMG/r583100211.html. Refer to Appendix C for information on detection and treatment.

Common root rot fungus *(Armillaria mellea*) is a common soil-borne fungus that lives on a wide range of woody and herbaceous plants. Also known as oak root fungus, mushroom root rot, honey fungus and shoestring fungus, it is found in the soil of temperate regions throughout the world and is native to many areas including California.

When trees become stressed, the fungus can rot the tree's roots, resulting in death of branches or the entire tree. Infected plants may have no symptoms, or may have yellowing foliage, small and few leaves. Infection may be localized to only one or so roots at first. In advanced stages it may develop into the wood. Infected wood is firm at first, eventually decaying to a soft, watery consistency with the characteristic mushroom smell. Some infected plants deteriorate slowly over a period of years while others may wilt and die abruptly.

The disease can be detected by the presence of fungal threads that grow closely together forming the characteristic flat, fan-shaped, whitish, leathery plaques. Also, the mycelium (thread-like plant structure) of the fungus can be found growing between the wood and bark, near ground level and below.

Routine inspection will help find the *A. mellea* fungus before it becomes lethal. If it is found on a tree, or in the vicinity, the following treatments will reduce the rate of the disease loss by helping the host tree to become stronger. Refer to Appendix A and Appendix C for information on disease detection and treatment.

5.14 SHORELINE VEGETATION MANAGEMENT

Meets Vegetation Management Objectives 1, 2, 3, 5, 6, and 10.

Shoreline vegetation management includes activities that are necessary to control public access and use levels, control coastal erosion (both natural and human-induced) and maintain the natural resource values of the coastal interface areas, mostly beach strand, coastal bluff, saltwater marsh, estuary and intertidal areas (i.e. areas where freshwater streams enter the ocean). Shoreline management activities described below would apply to Fitzgerald Marine Reserve, Coyote Point, and Mirada Surf Parks (east and west parcels).

In general, shoreline areas are particularly sensitive to human effects. This is due in part to the presence of sandy substrates, and the effects of wind wave action and flooding effects on these substrates. In areas that receive high visitor use such as Fitzgerald, controlling human use levels and also access points is important to maintaining the integrity of the area. The Fitzgerald Marine Reserve Master Plan (Brady/LSA 2002) identified several human effects that will require active management:

- Heavy use by visitors possibly adversely impacting the tidal area and coastal bluffs;
- Erosion and instability along the northern coastal bluffs caused by past human activity, and erosion at the San Vincente Creek bridge site; and
- Water quality issues at San Vincente Creek and Pillar Point Marsh from surrounding lands.

These types of effects are also likely at Coyote Point and Mirada Surf (west of Highway 1), although currently these two parks receive much less use than Fitzgerald. Similar activities apply to all shoreline vegetation areas within the San Mateo County Park system.

Management actions that may alleviate these effects include:

- **Carefully defining, and restricting access** by using well-defined parking lots and trail systems. If necessary, also install exclusionary fencing, interpretive signage, and conduct site monitoring (e.g., docents, rangers, law enforcement patrols).
- **Re-location of facilities into areas that are less likely to be affected by coastal erosion, wave action, or flooding** (example, moving the San Vincente footbridge to an upslope, much less erodible location). Restricting or prohibiting new facilities in unstable areas.
- **Monitoring and immediate remediation of erosion.** In many coastal areas, instability along the beach strand and coastal bluff is the result of upslope erosion (unauthorized trails, bike use, offroad vehicle use) that expedites the rate of coastal loss. Erosion control may include earthwork/regarding and compaction, use of erosion control devises, and revegetation. Any trails placed in coastal areas should use rolling dip construction and actively seek to keep visitors on the designated trails to help reduce potential for erosion.
- **Working with adjacent landowners** to control non-point source pollutants. As an example, at Fitzgerald, it will be important to work with the Half Moon Bay Airport and local landowners to reduce potential for runoff into the reserve.
- **Restoration of creeks, riparian, freshwater marsh, and saltwater marsh vegetation.** This vegetation acts as a natural buffer to reduce sediments and pollutants from entering the ocean. Any activities that maintain or increase the functioning of these natural systems will be important to maintain he overall health of the shoreline area. For example, at Coyote Point Park, detection and control of spartina is an important part of maintaining the ecological health of the shoreline vegetation. At Fitzgerald, removing invasive plants at San Vincente Creek, restoring willow riparian habitat, and maintaining the marsh vegetation at both San Vincente Creek and Pillar Point Marsh are important to maintaining the overall health and functioning of the site.

5.15 VOLUNTEER OPPORTUNITIES, PUBLIC INVOLVEMENT

Meets Vegetation Management Objectives 2 and 6.

San Mateo County Parks already has the support of numerous very dedicated volunteers who provide both technical and field services to Park staff. Public involvement and public support is essential to the financial stability and functioning of any park system. Volunteers can be especially useful in the preservation and maintenance of parks and park land areas, especially native and other fragile habitats. In essence, the residents (taxpayers) of San Mateo County are the users who support the park system. Public participation provides opportunities for outreach and education activities; reduces public concerns; builds community awareness and support; and directly addresses the environmental needs of a County Park..

In addition to involving the public and attaining public support for park activities, plans, and policies, the park system provide other avenues for public involvement. Volunteering is an often-overlooked recreational use of San Mateo and other County Park systems. In simple terms, more and more

people are seeking out opportunities to volunteer their time in the outdoors, and specifically at parks and open spaces near their homes. This is especially true in the Bay Area, a region that traditionally supports outdoor activities and environmentalism.

Existing volunteer groups are very active, and are committed to assisting the Parks System. County Parks is commited to inviting public participation of people of all ages and abilities to assist the County Park System. Some of the types of vegetation management activities that are already being implemented, or have been successfully conducted with volunteers in San Mateo County Parks and elsewhere include:

- Baseline monitoring (invasive plants, sensitive plants and animals);
- Trail patrols, litter pick up, "Adopt-a Mile" type programs;
- Invasive plant "early detection' programs;
- Invasive plant control programs using non-chemical and limited mechanical equipment (e.g., 'Broom-Bashing" events);
- Stream monitoring, water quality monitoring, fisheries stream assessments;
- Habitat restoration (e.g., "Creek Week" and Earth day events, individual restoration projects)and especially native plant installation;
- Park planning and technical studies;
- Plant collection, propagation, and installation; and
- Visitor education/interpretation; and
- Specialty services (e.g., watershed studies, trail studies, cultural resource studies).

Parks staff routinely coordinates with all of the various volunteer groups and actively direct and support their activites. San Mateo County currently has an active volunteer coordinator who organizes work events and works with several volunteer organizations. San Mateo County Parks already enjoys the support and participation including several "Friends of" type volunteer organizations, many of which have been around for years and are quite active. Refer to Chapter 3 for a review of ongoing stewardship groups and activities. In addition there are many more interested individuals, park neighbors, and others who would likely be willing to dedicate their time and professional skills to the betterment of San Mateo County Parks, if they were aware of the opportunity to assist.

We strongly recommend that County Parks acknowledge and strengthen ties with existing volunteer groups, and continue to develop existing and new stewardship program capabilities. We also recommend that County Parks include vegetation management opportunities in its stewardship program. County Parks should continue to build on the strong foundation of volunteer organizations that already exist. Especially when staff and funding are limiting necessary Park activities, a well-developed and coordinated stewardship program, including vegetation management can and does effectively 'take up the slack' when existing staff and funding resources are inadequate to accomplish necessary vegetation management.

To amplify and strengthen existing efforts, we recommend the following:

- Develop a Comprehensive Vegetation Management Component of the Stewardship Program.
- Develop Annual Vegetation-Management Related Volunteer Work Plans By Park.
- Prepare a Volunteer Docent Training Manual for Vegetation Management Tasks.

- Provide Opportunities for Volunteer Training for Vegetation Management Activities.
- Contine to develop opportunities for people of all ages, abilities, and backgrounds to become engaged in the support of the native flora and founa in their County Parks.

5.16 GRAZING PROGRAMS FOR WILDLAND SETTINGS

Meets Vegetation Management Objectives 1, 4, 9 and 11.

San Mateo County Parks is considering use of livestock grazing as one more management tool to help accomplish fuel load reduction, habitat restoration, and invasive plant management. Parks does not intend to allow commercial grazing or other large-scale grazing purposes on Park lands. Livestock can however be a useful tool in managing invasive weeds and habitat restoration in Park settings within the following parameters:

- Target plants (invasive plants, other nonnative plants) must be acceptable as forage;
- Grazing should be timed during a vulnerable time of the invasive plant's life cycle; and
- Livestock must be controlled (rotated, provided with supplemental feed etc) to minimize damage to favorable plants and other ecosystem component.

Selecting the correct livestock, and determining appropriate grazing levels for an individual habitat restoration or invasive plant control project may require the input of a professional livestock manager. We suggest contacting the Society for Range Management, the California Cattlemen's Association, or the California Native Grassland Association to get input on developing an appropriate grazing program for individual restoration projects. Refer to Appendix D for a list of useful resources.

Different types of livestock can have substantially differing effects on wildlands, depending on their diet and grazing habits. For example, sheep and cattle eat primarily grass, but sheep will not disturb wetlands, while cattle are known to wallow in wetlands, possible causing erosion and vegetation damage, as well as causing sedimentation of the water and possibly nitrification from fecal material entering water. Generally, cattle require a large and productive grassland area to survive and are therefore not useful in controlling small spot infestations of invasive plants. Cattle also require substantial infrastructure (fencing and water) to be effective in stewardship grazing programs. Goats on the other hand eat both grasses and shrubs, but their height limits the height of browse effect. Horses eat primarily grass, are selective grazers, and are very susceptible to naturally occurring plant toxins in such common invasive plants as yellow star-thistle therefore, are a poor choice for invasive plant control. Sheep are used in a manner similar to that of goats, in high animal number herds grazing at a site for brief periods of time. Sheep favor herbaceous and grassland vegetation will only lightly browse shrubs and other woody vegetation. Sheep are sometimes used by goat grazing businesses to augment grazing effectiveness.

For fuel reduction, invasive plant control, and overall brush control, goats are the overwhelming choice of landowners and land managers. Browse makes up approximately 60 percent of a goat's diet but only about 10 to 15 percent of a cow's. Another advantage of goats is that, unlike a bulldozer, goats control brush and woody plants without disturbing the existing grassy vegetation. However,

goats require active management – they must be fenced into a relatively small treatment area or they will not achieve the desired level of brush control. The goats are typically cared for and herded by shepherds using dogs, and are kept in place using electric fences on a 24 hour, seven day a week basis. The goats are typically trained to graze in dense herds, and are moved across a site through a series of temporary paddocks to direct grazing on the target invasive plant or woody vegetation that is targeted for removal. Typically, for invasive plant control or fire hazard reduction, many animals (e.g. between 400 and 700 goats per treatment area) are used to clear vegetation in the late spring and early summer. There are several companies that rent goat herds for brush reduction, invasive plant control, and overall habitat restoration. Goats will eat most of the target invasive plants as well as native plants found in San Mateo County, but are especially effective at controlling:

- gorse;
- French, Spanish, Scotch broom;
- Himalayan blackberry; and
- yellow star-thistle.

Goats are known to reduce the cover and vigor of other unpalatable plants such as coyote brush, Himalayan blackberry, cape ivy, English ivy, fennel, horseweed, poison hemlock, etc. Intensive grazing, almost down to bare soil, is necessary for goats to have an effect on shrub species (e.g., coyote brush, French broom). To effectively control tall shrubs and canopy species (for fuel reduction programs), additional costs are needed to cut and reduce brush to a size that is accessible to the goats. For planning purposes, the 2006 approximate cost of grazing goats is estimated at approximately $750 to $1000 per acre (Amme, 2002).

5.16.1 Grazing Program at San Bruno Mountain.

A pilot grazing and habitat management plan was prepared for San Bruno Mountain (Amme, 2002), but has not yet been fully implemented. We recommend that this grazing study be undertaken, and the results used to adapt management at the site where favorable results are detected. The pilot study is intended to investigate the efficacy of controlled livestock grazing as a tool to enhance and restore the health, diversity, and productivity of native grassland plant communities, thereby enhancing habitat for the endangered mission blue butterfly. The goal of the 3-year grazing program is "to enhance the native species composition of selected grassland areas".

The San Bruno Mountain grazing plan identified five priority areas of San Bruno Mountain to be grazed for a period of three years: Dairy Ravine, The Saddle, Northeast Ridge, Tank Ravine, and the Brisbane/Army Road Interface along Brisbane's western boundary. Utilizing goats and sheep together is intended to impact both grassland and low-lying shrubs. The initial (First Year) recommended number and combination of animals is 120-150 animals comprised of 60% goats and 40% sheep. Temporary grazing areas or cells will vary between one to two acres per day. The grazing program will determine and adjust the size of the grazing cells. The livestock will graze small areas for the shortest duration possible. A shepherd will provide 24 hour supervision. The animals will be controlled and moved with the use of movable electric fences. Prescribed grazing treatments will be periodic: either once in the late fall (October-November) or the early spring (March-April) growing season, or both. The grazing treatments will be applied to approximately 35-40 acres of selected grassland areas each year. Monitoring plots will be established and recorded prior to, during, and after the grazing treatments over the three-year project. The cost of the three year project is estimated at $150,000. (Amme 2002).

East Bay Municipal Utilities District and East Bay Regional Parks also both have very active and successful grazing programs for habitat restoration and fuel load management that could be adapted

to San Mateo County Park lands if desired. Contact these agencies directly to get information in their grazing programs. Refer to Appendix D for a list of helpful grazing resources.

5.17 PROJECT MONITORING

The following section discusses what to monitor, how to develop a monitoring plan, how to conduct monitoring for each type of monitoring situation, and what to do if projects do not meet success criteria.

Several types of monitoring are recommended (and referenced) in this plan. These include:

- **Forest condition monitoring** (Hazard tree assessment, fuel load assessment, disease detection, overall forest condition changes over time);
- **Invasive plant monitoring** (to identify and eliminate as soon as possible);
- **Restoration project monitoring** (part of Establishment Care);
- **Performance monitoring for grazing management areas**/grazing lease compliance;
- **Ongoing Sensitive Resource Monitoring** (e.g. detection of trends in populations of target sensitive species, changes in condition, amount, or distribution of sensitive habitats over time);
- **Trail Condition Monitoring** (vegetation encroachment and erosion problems);
- **Water Quality Monitoring/"Stormproofing"** (e.g., monitoring of culverts, stream crossings, bridges, detection of undersized culverts, debris, clogged roadside ditches, undercutting or erosion problems); and
- **Park Hazard Detection** (e.g., poison oak monitoring in highest-use areas, detection of other park hazards).

CHAPTER 6 SUMMARY OF LONG-TERM MAINTENANCE NEEDS

Park lands require ongoing management and maintenance. This cannot be overemphasized because many land management agencies have in the past underestimated and under-funded ongoing maintenance, often with adverse effects. As a rule of thumb, approximately 10-20% of the total cost of each project should be assigned to ongoing maintenance and management. The cost and time required for maintenance should be included in the project description.

This section describes the ongoing maintenance needs that are related to vegetation management. This section is intended for park staff to factor in maintenance staffing and costs into the project planning process.

6.1 STEWARDSHIP OF HABITAT RESTORATION AREAS

Habitat restoration areas will require ongoing maintenance and inspection following completion of the restoration site work. Follow-up weed control treatment and monitoring can be conducted by a combination of volunteers, staff members or independent contractors. In steep, inaccessible areas, sustained staff or contractor support will be critical to maintaining weed control efforts. Volunteer stewards can play an important role in performing a number of restoration actions within accessible areas, specifically in areas where the majority of habitat restoration and weed infestation control efforts have been completed, and only 'small stuff' remains to be treated.

Stewardship of habitat restoration sites is recommended for 3-5 years, (10 years for large and insipient invasive plant populations and forested areas) following the initial restoration activities.

Follow-up maintenance activities including the following:

- **Monitoring of plantings,** Recording mortality, health and vigor (evidence of new growth, reproduction) of planting materials;
- **Annual site maintenance,** (e.g. weeding around planting sites, installing replacement plantings if plant mortality exceeds success criteria, installing herbivore protection structures as necessary, repair of any detected erosion problems, follow-up invasive plant control, installing any additional fencing, signs needed to protect planting sites); and
- **Photo-monitoring and reporting,** including recommendations for future actions that might be required to successfully restore the site.

Refer to Appendix A for more detailed information about how to conduct ongoing site maintenance, and to Appendix B for sample maintenance and monitoring evaluation forms.

6.2 TRAIL MAINTENANCE, UNAUTHORIZED TRAIL REMOVAL, AND HUMAN USE

Several types of trail maintenance will be required following completion of new trails and closure (decommissioning and rehabilitation) of unauthorized trails. These activities can be performed by a combination of Park staff and contractors, possibly with assistance from volunteers (e.g. "Adopt-A-Trail" Programs or similar):

- Initial monitoring of closed and revegetated unauthorized trails to ensure that revegetation is successful (2 years following revegetation);
- Ongoing monitoring and maintenance of the main trail systems to detect normal use problems (erosion, wear and tear, localized failure or damage etc);
- Annual control of poison oak, brush control, and other trail maintenance activities;
- Ongoing monitoring of the formation of new unauthorized trails in undesirable locations; and
- Ongoing unauthorized trail closure and revegetation as needed to control visitor use and maintain integrity of the trail system.

The following section provides an overview of possible actions that could be required to stabilize and maintain the trail system into the future:

- Inspect and repair damage (e.g., erosion, culverts, restore rolling dips or water bars);
- Install additional brush piles, signs, and scattered brush to keep visitors off restored unauthorized trails;
- Install additional plants, especially large shrubs and shrubs with thorns that will discourage visitors from trespassing into restored areas;
- Inspect and maintain erosion and siltation control devised, install additional devised as necessary (e.g. silt fences, straw wattles, water bars, seed-free straw);
- Inspect and maintain fill areas that are settling or eroding. If additional fill is necessary, using only fill that is certified weed free, is compatible with local hydrologic and ecological conditions, and is appropriate for the enhancement of listed species and restoration activities;
- Avoid over-compacting fill soils (except on trail areas);
- Inspect sites for secondary invasive plants, control (hand pull, spray, volunteer work events) as necessary; and
- Inspect signs, especially directional signs and trail closure signs.

6.3 FOREST HEALTH MAINTENANCE AND FIRE CONTROL MANAGEMENT

Ongoing forest health maintenance (including hazard tree detection and removal) and monitoring of overall fire risk is an ongoing responsibility of park staff. Ongoing maintenance activities will be required for the following:

Hazardous Tree Removal/ Tree Disease Control. Over time, trees will naturally age and may be damaged by wind, pests, disease, and mechanical damage. Trees that are located adjacent to trails and facilities should be routinely inspected by an experienced forest ecologist or arborist. Newly detected hazard trees should be removed as necessary to maintain the health of the forest. Likewise, an annual park-wide forest assessment should be conducted to detect tree diseases, and key trees removed, treated, or otherwise contained to reduce spread of the disease. Refer to Appendix A and D for information on how to assess a hazardous tree.

Small Tree and Understory Removal and Thinning. Forested sites that are restored or managed (e.g. fuel reduction programs, forest thinning projects, forest habitat conversion projects, and age-stand management projects) will require follow-up treatment of small trees and understory brush. Follow-up maintenance includes detection and treatment of saplings, seedlings, and re-sprouts, especially for stump-sprouting trees and shrubs such as eucalyptus and cotoneaster, and for species that produce copious amounts of seed such as French broom and acacia species that are difficult to control. If annual maintenance is done in spring, many of the new seedlings and re-sprouts can be hand-pulled using contract or volunteer labor. For stubborn infestations, chain-sawing or brush-cutting, followed by immediate herbicide application may be required. Covering the area with black tarps to solarize vegetation may also help control localized problem areas.

6.4 INVASIVE PLANT MAINTENANCE

Invasive plant control projects will require active management for many years following completion of initial removal activities. Sites should be monitored 2-3 times per year for the first 3-5 years, tapering off to annual monitoring over time.

In addition, all park lands should be patrolled annual to detect new invasive plants, and to detect re-infestations of target invasive plants that were previously treated and controlled. Park managers should regularly contact the Weed Management Area and the Agricultural Commissioner's office to see if new invasive plants are becoming problematic in San Mateo County or elsewhere in California.

6.5 GRAZING PROGRAM MANAGEMENT

If grazing is selected as a management tool, ongoing grazing management in County Parks for restoration, fire hazard reduction, and sensitive habitat enhancement will require a long-term management and funding commitment that includes upkeep of fencing, maintenance (and possibly periodic upkeep, development, and/or movement of water facilities), and monitoring of the grazing sites.

Grazing leases and grazing allotments that are implemented for vegetation management purposes will also have to be updated and checked to ensure that contractors or lessees who operate the livestock grazing programs on park lands are meeting the goals and objectives of the grazing program.

Annual vegetation monitoring of grazed restoration or invasive plant control areas should conducted to detect problems with grazing (e.g., unsuccessful of control of target invasives, harm to sensitive resources) so that the sites can be adaptively managed for natural resources.

Refer to Appendix A for more information on how to monitor grazed areas.

CHAPER 7 REFERENCES

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Appendix A: Standard Operating Procedures

Appendix A Table of Contents

A.0 Introduction

This Section provides practical "How To" information necessary to implement the management actions described in Chapter 5. Chapter 5 and Appendix A are meant to be used together, with Chapter 5 describing what is to be done, when, and where (recommended treatments), while this section describes how to accomplish the recommended treatments described in Chapter 5.

This Appendix provides guidance on how to implement the vegetation management activities, maintenance and project-specific work that are outlined in Chapter 5. These practices include maintaining, improving, and restoring vegetation and habitat, removing unwanted vegetation and establishing desirable plants.

It is important to note that while the Standard Operating Procedures were developed to the specific conditions and needs of the San Mateo Park System as a whole, individual work will ALWAYS need to be adapted to the local conditions by the staff in charge of vegetation management for each individual park.

A.1 Vegetation Management Project Planning

Vegetation management includes both routine maintenance and vegetation improvement projects. Guidelines for selecting which vegetation projects are appropriate for a park are outlined in Chapter 4 of the main document. The Managers of vegetation improvement projects, whether initiated by the park rangers, maintenance staff, or a volunteer group, should provide the County Planning Department with basic information on the proposed project., Project description, location, goals and objectives, proposed treatment, timing, staffing needs, and a description of any follow up or maintenance required should be included in the application. A standard project planning form is provided in Appendix B to facilitate project notification.

The Planning Department application also is intended to ensure that the project is in line with other priority projects that have previously been approved, and to make sure that the project has adequate resources (labor, funding, and materials) in place to successfully complete it. This step also facilitates basic communication between parks' work groups and County Planning and management staff that may not have regular contact.

After the project is implemented, the basic information in the project planning form should be used to measure and report how well the work met the project objectives. Ideally, the essential data on the form should be entered into a GIS database to help keep track of all the vegetation improvement projects in the Park system.

A.2 How to Plan a Habitat Restoration Project

A habitat restoration project can be broadly defined as a vegetation management project that includes active revegetation. In some Guidelines for selecting which restoration projects are appropriate for a park are outlined in Chapter 4 of the main document. After the decision on the types of restoration projects to embark on is made, this Section provides a decision-making approach to design specific projects. Direction is given on deciding when it is appropriate to plant, what to plant, and how to plant within park lands in San Mateo County. This Section is intended to be used by both scientists and laypeople - anyone interested in habitat restoration work!

This section is divided into the following topics:

1. **Overview of a Successful Restoration Project**
2. **Site Selection**
3. **Planning the Restoration Project**
4. **Determine Appropriate Restoration Approach (Active versus Passive Restoration)**
5. **Prepare Conceptual Planting Palette**
6. **Develop Appropriate Success Criteria and Site Monitoring Procedures**
7. **Prepare Draft Restoration Plan**
8. **Prepare Draft Restoration Budget and Schedule**
9. **Finalize the Project Restoration Plan, Budget, and Scheduling the Work**
10. **Obtaining Permits and Agreements**

1. Overview of a Successful Restoration Project

A successful restoration project has the following attributes:

- is ecologically sustainable over time;
- restores natural and historic ecosystem processes;
- enhances the overall wildlife and habitat values of the Park and County Park System; and
- is cost effective and simple to implement and monitor.

To help meet these desired attributes, it is important to consider the following during project planning:

- **Select an Appropriate Restoration Site** (i.e. one that can be successfully restored with a reasonable amount of effort and one that, if restored, will increase the floodplain functions and habitat values of the surrounding area);
- **Identify Habitats That the Selected Restoration Site Can Sustain**;
- **Select Appropriate Planting Palettes and Planting Techniques**; and
- **Provide Sufficient Staff and Funding to implement necessary monitoring and maintenance activities over time.**

2. Restoration Site Selection

Both historic (i.e., pre-settlement) and existing site conditions have a direct influence on the type of restoration required at a site; the amount of effort and funds necessary to restore the site; and the potential for the site to be self-sustaining following restoration. To ensure successful and cost-effective restoration, the Project Manager should identify sites that historically supported the target

habitats and that either do, or have the potential to, support the necessary ecosystem processes (e.g., flooding, sediment deposition, etc.).

A. Determine Past Site Conditions. Historic site conditions in many ways dictate the range of habitats that the site can sustain (Chainey et. al. 1989, Dawson 1984). The historic condition of a site forms the basis for true ecosystem restoration. Determining past site conditions exponentially increases the potential for successful habitat establishment and persistence. For example, if the site historically supported freshwater marsh habitat, it is likely that freshwater marsh habitat could be restored at the site if the ponding or flooding that originally created the habitat are restored by eliminating drainage systems, or by recontouring to encourage ponding or flooding. Conversely, a site that supported freshwater marsh habitat probably would not be suitable for establishment of upland habitats such as oak woodland or native grassland without substantial grading, draining, or recontouring.

Some of the historic site conditions that are important to consider when planning a restoration project are:

- **Topography**;
- **Floodplain Geomorphology** (i.e., channel incision and sinuosity, sediment load, flow velocity);
- **Hydrologic Function**s (e.g. flood flow patterns, drainage patterns, and channel plan form);
- **Past Disturbance Regimes and Disturbance Recurrence Intervals** (e.g., flooding, fire, grazing, erosion); and
- **Historic Climatic Conditions and Historic Rainfall Patterns** (i.e. What climatic conditions were present historically that allowed historic vegetation to establish at the site).

Assembling a good historic picture will often require gathering and careful synthesis of many types of data. A variety of information sources can yield historic information about a site, including historic maps and aerial photographs; written accounts of site conditions and site uses; rainfall logs and stream gauges from nearby areas; geologic maps, soil surveys; and other information on site geology, landforms and landform processes.

B. Evaluate Current Site Conditions. Current site conditions can provide important clues past site conditions, and to what types of habitat the site can support now. Wherever possible, the site should be visited to gather additional clues on past and present conditions, and to confirm the validity and applicability of recorded historic information.

Some of the existing conditions that are important when assessing a restoration site are (Dawson 1984):

- **Presence of one or more of the target habitats.** Do target habitats occur either within, or immediately adjacent to, areas to be restored?
- **Soil type and soil condition.** Are site soils appropriate for the target habitat and are they largely intact, or have they been plowed, graded, or topsoil removed?
- **Hydrologic functioning.** (i.e. how disturbed are water features, diversions, wells, and does the site still flood naturally?).
- **Site topography in context.** Does the site fit with the topography of the surrounding landscape, or is it lower, higher, sloped or leveled?

- **Indicators of past land use.** Are there abandoned ditches, water control structures, old foundations, or signs of homesteads, fig trees, or pepper trees (i.e., indicators of past homesteading/human occupation)?

C. Identify Site Constraints And Opportunities. Identification of constraints and opportunities presented by an individual site can be the basis for a "go/no-go" restoration decision. Therefore, constraints and opportunities should be evaluated early in the site selection process.

Some items that can pose constraints or opportunities for site restoration include:

- **Tenancy Status** (e.g. restrictions such as grazing easements, concessionaire agreements, and tenant agreements);
- **Utility Easements and Physical Locations of Utilities** (e.g. access agreements that restrict vegetation growth within the easement area; locations of underground utilities, especially old petroleum pipelines or fragile fiberoptic cables that may require repair or special site treatment);
- **Property Access Agreements** (formal and informal) with adjacent landowners;
- **Informal Land Uses** (unauthorized trails, fishing or hunting access, off road vehicle use, dumping, other undesirable public uses);
- **Invasive Weed Infestations**;
- **Age and Condition of Structures** (weirs, ditches, culverts, fences, berms, levees, buildings);
- **Presence of Historic and Prehistoric Resources** (historic structures artifacts, prehistoric artifacts);
- **Hazardous Materials** (e.g., old farm buildings, underground tanks, hazardous substances);
- **Sensitive Biological Resources** (endangered and threatened species, jurisdictional wetlands, streams and other waterways, other sensitive habitats);
- **Adjacent Land Uses** (e.g., herbicide, pesticide use, concentrated livestock stocking, water flow patterns); and
- **Size and Configuration of Parcel** (i.e. bigger is better, round or square is better than long and narrow to minimize "edge effect").

Presence of one or more of these factors is not necessarily a "project-stopper," merely something to be evaluated during the site selection process. The Project Manager will need to determine the "go/no-go" threshold for constraints as well as the relative weight of a given constraint when compared to the goals for the project. For example, the presence of buried natural gas pipelines at a potential site may highly constrain a portion of the site for the restoration of valley oak riparian forest; however, should the site be targeted for floodplain, grassland, or oak savanna it may be possible to easily incorporate the utility easement in the restoration project.

D. Evaluate and Rank the Site's Restoration Potential. After information on historic and current site conditions has been gathered and individual site constraints and opportunities assessed, it is valuable to be able to compare and contrast site attributes to determine which site is best suited to the type of planned restoration project. One simple method is to numerically "rank" the site attributes, then total the rankings to determine a site "score." Under this system, a higher score indicates a site that would be comparatively more difficult or expensive to restore, while a site with a lower score would be easier to restore.

Please note that ease of restoration should not be the only criteria for including or excluding sites from consideration. In some instances (such as the discovery of a single sensitive plant population), there are overriding considerations that are more important than ease of site restoration

E. Conduct Project Review Process with Restoration Team. Following the site constraint and opportunity evaluation process, the restoration team should convene and discuss the relative merits of each potential site. Ideally, members of the restoration team should include participants from a variety of natural resource and other disciplines (e.g., volunteer groups, planners, rangers and other land managers, hydrology, soil science, biology, etc.). A multi-disciplinary team is best suited to evaluate especially large-scale restoration sites, or sites that fit into a larger-scale restoration or conservation program, while a small team may be appropriate for small and simple projects.

3. Planning for an Individual Restoration Project.

A. Document Baseline Conditions. The existing conditions at a site can greatly influence the amount of time, energy, and funds required to develop and implement a successful restoration project. A basic level of information about the potential restoration sites was gathered during the site selection process (described above); however, planning restoration at the selected site will require a greater level of understanding of the selected site's resources. At a minimum, the following information should be collected:

- **Location and condition of existing habitats and vegetation communities**;
- **Location and condition of wetland areas** (if present);
- **Location and abundance of sensitive species** (e.g., nesting raptors, San Francisco garter snake, California red-legged frog, California tiger salamander etc.);
- **Soils and geology** (specifically, onsite soil investigations should be performed at selected locations throughout a site);
- **Hydrology** (i.e., flow conveyance, barriers to flow, duration of inundation, artificial water sources, etc.);
- **Invasive animal or plant species**;
- **Locations of trespass trails or problem access points**; and
- **Locations of structures**.

Adjacent land uses and habitat conditions should also be recorded when conducting the existing conditions inventory. Adjacent agricultural operations (e.g., irrigation, ground water pumping, pesticide application, etc.), industrial operations (e.g., sand removal), or residential development (e.g., trespass, dumping, domestic animals, groundwater pumping) may have a negative effect on site restoration.

Conversely, the presence of high-quality habitat adjacent to the proposed restoration site can be beneficial because the offside habitat can provide seed sources for natural recruitment and can add greatly to the overall habitat value of the restoration site.

When planning restoration on the edge of a park, the potential future land use for adjacent parcels should also be investigated to determine if future development might pose a constraint (for example, planned high density residential housing units).

B. Develop Site-Specific Restoration Goals and Objectives. Once baseline conditions are well-understood and potential constraints and opportunities are considered, the restoration planning team can develop goals and objectives specific for the selected restoration site. The overall goal is to restore a self-sustaining and viable ecosystem capable of persisting under normal conditions.

The development of goals and objectives can greatly aid in focusing restoration team discussions and planning efforts for larger and/or more-complex sites (i.e., sites with multiple habitat restoration opportunities). Clear and concise goals can also help other parties (e.g., public, regulatory agencies) understand what is envisioned for the project.

At a minimum the goals and objectives for a restoration plan should touch on the following items:

- **What is/are the target habitat type(s)?**
- **What is the total area to be restored?**
- **How will the restored area fit in the context of the surrounding landscape?**
- **How will the restored area fit into the "big picture"?**
- **What is the project timeframe? (e.g., How many years to implement the plan and how many years until the site is considered successful?).**

An example goal and objective statement: "The goal for this project is to establish 120-acres of live oak woodland over a span of five years. The objective of this project is to provide a nearly continuous high quality coastal live oak habitat area in 25 years".

C. Identify and Address Site Management Issues. In some instances, restoration site management can pose a significant cost burden, especially when unforeseen management issues arise. Invasive weeds, trespass issues, adjacent land uses (e.g., agriculture, residential, etc.) and erosion can all significantly affect the cost and difficulty of short- and long-term site management. Potential management issues need to be determined and addressed early in the restoration planning process so that surprises are minimized.

For example, a site that currently has a significant invasive plant problem will most likely continue to have an invasive plant problem until the target habitat type is well established. Management actions to control the invasive plant may require a considerable amount of time and energy during the first few years of site establishment and expenses associated with this control can be significant.

Similarly, a site that has traditionally had problems with visitor trespass and unauthorized trails will probably continue to have problems and therefore law enforcement and fence maintenance may become significant management issues.

D. Identify and Address Regulatory Constraints. Environmental regulations that may constrain restoration on San Mateo County Parks include:

- **The California and Federal Endangered Species Acts;**
- **Section 401 and 404 of the Clean Water Act;**
- **Section 1603 of the California Fish and Game Code (i.e., Streambed Alteration Agreement); and**
- **The California Environmental Quality Act.**

None of these regulations pose insurmountable hurdles to a restoration project; however, compliance may require a relatively substantial effort when wetland fill or endangered species are involved. Because sensitive species and wetland issues are likely to be the most significant regulatory constraints during restoration at the park they are discussed in more detail below.

Local planning ordinances and local permit requirements for preserving native trees, controlled burns, encroachment onto public lands, seed collection, herbicide or pesticide application, and other local requirements may also be required. Early determination of what permits are needed, and early submittal of permit applications can greatly expedite a project.

E. Determine Sensitive Species Issues. Sensitive species pose a constraint to restoration activities if the proposed activity has the potential to affect a sensitive species or its habitat. In general, species listed under either the California or Federal Endangered Species Act will pose the greatest constraints. If a listed species is present at, or adjacent to, the site, complete avoidance of the species and its habitat is recommended. Avoidance measures should be developed with the appropriate regulatory agency (i.e., U.S. Fish and Wildlife Service and/or California Department of Fish and Game). If complete avoidance is not possible it will be necessary to secure the necessary permit (Federal Endangered Species Act Section 7 or Section 10 Permit) or agreement (California Fish and Game Code Section 2081 Management Agreement) authorizing disturbance or take of a listed species or its habitat.

F. Wetlands. In many instances, wetlands will be adjacent to, or within, restoration sites and avoidance will be possible during restoration activities. However, in some instances minor modifications (e.g., grading, filling, recontouring) of onsite wetlands may be necessary to fix erosion, stabilize stream channels, repair culverts that are causing sedimentation, increase flood capacity, or promote site drainage. In these instances it may be necessary to obtain a wetland fill permit (also called a Department of the Army Permit) for the placement of dredged or fill material into jurisdictional waters of the United States. A complete discussion of wetland regulation is beyond the scope of this report; however, common sense should be employed when considering wetland impacts at a restoration site. The U.S. Army Corps of Engineers does have a streamlined permit process (i.e., Nationwide Permit Program) for restoration projects (specifically Nationwide Permit 27). Specifically, Nationwide Permit 27 (NWP 27) authorizes activities in waters of the United States associated with the restoration of former waters, the enhancement of degraded tidal and non-tidal wetlands, and riparian areas, the creation of tidal and non-tidal wetlands and riparian areas, and the restoration and enhancement of non-tidal streams and non-tidal open water areas. Authorization of a project under NWP 27 will require notification of the U.S. Army Corps of Engineers through submittal of a Pre-Construction Notification Package (PCN).

Rivers or streams, including riparian areas, up to the edge of the 100-year floodplain may also be under the jurisdiction of the California Department of Fish and Game and work (i.e., restoration projects) may require a Section 1603 Streambed Alteration Agreement (SAA) with the Department. The execution of one of these agreements also requires documented compliance with the California Environmental Quality Act.

G. Local Permits. Site preparation using prescribed fire or herbicides may require a County burn permit or pesticide application plan, respectively. Also, parks within the Coastal Zone (e.g., Mirada Surf, Fitzgerald Maring Preserve) may also be regulated by the Local Coastal

Commission. Refer to Chapter 1 of the main document for a review of applicable local laws, policies, and agreements that may require the Project Manager to obtain a local permit.

4. Determine Appropriate Restoration Approach

Perhaps the most important portion of the restoration planning process is to determine how the restoration will be accomplished. For some potential restoration sites there may only be one appropriate approach given the constraints present; however, there are often several feasible approaches for a given site.

Typical scenarios that will necessitate planting include:

- **Planting understory plants in forested areas that have been denuded;**
- **Erosion control plantings;**
- **Bank stabilization plantings for creeks and streams;**
- **Replanting after invasive plants and/or hazard trees have been removed from a site; and**
- **Re-planting high visitor use areas such as trailheads, facility landscaping, and other high-use recreational areas.**

In this section, the following approaches are discussed (listed in order of increasing invasiveness):

- **Passive Restoration (Natural Regeneration)** (i.e., allowing a site to revegetate itself naturally without active planting, may require invasive plant control);

- **Limited Planting** (i.e. actively plant the trees and large shrubs, but letting the rest of the plants (small shrubs, understory grasses and forbs) establish passively);

- **Active Habitat Restoration Without Earthwork** (i.e., plant all habitat layers and associated dominant species at once; work with existing topography and site hydrology);

- **Active Habitat Restoration with Limited Earthwork** (i.e., same planting as above; but including regarding a site to mimic presumed historic topography or to enhance site hydrology etc.); and

- **Active Habitat Restoration with Earthwork and Artificial Irrigation** (i.e., same planting as above with site grading to enhance natural hydrology and build irrigation system to encourage plant establishment).

To Plant or Not to Plant (Active versus Passive Restoration). The first decision to make is whether or not active planting is necessary. Natural regeneration (i.e. allowing native plants to establish naturally while controlling invasive plants) is often more desirable (i.e. less costly, has better plant survivorship rates, and produces healthier plants that require little or no active management) than actively planting a site. Passive restoration is most appropriate where there is already an established native plant community like a riparian woodland or oak savannah, and where some sort of disturbance has created a relatively small area that needs to be restored. In this instance, it is very likely that the disturbed site already contains sufficient quantities of native planting materials (e.g., seeds, acorns, rhizomes).

Depending on the condition of the existing plant community, plant restoration will include 1) a complete or near-complete re-establishment of native plants or 2) enhancement of the existing native plant population. In both cases this must be accomplished at the same time that the site is managed for invasive plants (refer to Section B-6 below). Following invasive plant removal, a restoration project may include the installation of native trees and plants.

Establishing a New Plant Community. A new plant community is needed in areas so overused, disturbed, or over-whelmed by invasive plants as to be nearly or completely devoid of native vegetation. Such areas will require a deep and energetic commitment from park management, and the community at large.

- Plant species are selected based on their capacity to out-compete other plants – especially invasive species. Such native plants will typically be robust growers capable of spreading vegetatively as well as from seed.
- When replacing invasive plants which bear prolific amounts of berries or seed it is important to plant natives which do the same.

Enhancing An Existing Plant Community. Many areas have an established native plant community but require some active planting to: a) control erosion or help stabilize a streambank; b)to help expedite the site's return to a mostly native plant cover; or c) to help control or slow the spread of invasive plants into the natural community.

Because site preparation often includes disturbing the soil or vegetation, enhancement activities can actually increase the rate of invasive plant infestation. That is why we recommend that enhancement projects include an invasive plant control program. It is also important to use locally collected or regionally appropriate native plants – native species adapted to Southern California or elsewhere will not necessarily do well in San Mateo County!

At this point, all the information that was gathered about the selected restoration site will need to be synthesized and reviewed to help identify the most appropriate technique given the existing and historic conditions at the site, as well as the goals and objectives of the restoration plan.

Each particular approach has its advantages and disadvantages. The relative advantages, disadvantages, costs, and public outreach opportunities of each approach are presented in Table B-2a A restoration plan can consist of just one approach or a combination of approaches, especially if one wants to investigate the efficacy of several restoration approaches in support of implementing some larger restoration effort. However, overly complicated or complex restoration projects often require complex or complicated maintenance and/or monitoring to be successful.

Table A-12a. Comparison of Restoration Approaches

Approach	Site Preparation Cost	Material Cost	Operation and Management Cost	Time to Achieve Target Attributes	Public Outreach
Natural Regeneration	None to Low (invasive plant control)	None to Minimal	Low (invasive plant control)	Longest ↓	None
Limited Planting (trees, shrubs)	Low to moderate (prepare planting sites)	Low	Low	↓	Minimal
Active Site Restoration without Earthwork	Moderate	Moderate	Moderate	↓	Moderate
Active Site Restoration, Site Requires Limited Earthwork	Moderate	Moderate	Moderate	↓	Moderate
Active Site Restoration, Site requires Earthwork and Irrigation System	High	High	High	Shortest	Moderate

Some items to consider when deciding on a restoration approach include:

- Level of funding;
- Site constraints and opportunities;
- Desired "establishment period" (i.e., how long until the plants are established, self-supporting, and no longer requiring intensive management);
- Public outreach opportunities; and
- Establishment period and long-term operations, maintenance, and management costs.

Recommendation: Pick the simplest restoration approach possible!

5. Prepare Conceptual Planting Palette

Once goals and objectives have been developed and restoration approaches decided upon, it is time to develop a conceptual planting palette. Similar to a paint palette, the planting palette will list all the plant species and their relative quantity (in percent) that will be used in the restoration project. The palette should include all the characteristic dominant plant species of the target habitat type (Dawson 1984). The quantities of each plant selected should be based loosely on their percent relative cover in the target habitat type. Plant quantities should be adjusted to reflect those species that are difficult to grow, grow slowly, are readily available from local nursery stocks, or are easily established through direct seeding. Plants that are difficult to establish from seeds or cuttings or that are not commercially available should not be included because the potential for success will be low. Table B-3a in Section 3 below provides example plant palettes for common plant communities of San Mateo County.

6. Develop Appropriate Success Criteria and Site Monitoring Procedures

After an approach (or several approaches) and a planting palette are selected, specific success criteria and monitoring procedures need to be developed for each approach. Each approach will require its

own success criteria because each will result in differing rates of survival, natural recruitment, and overall habitat establishment.

Generally, success criteria are established for percentage plant survival (during the first 5 years) and canopy cover (5+ years) simply because these are parameters that are relatively easy to measure in the field. Success criteria can be set on a species-by-species basis or for a site as a whole. For passive restoration projects where no active planting is planned, the success criteria should be based on natural recruitment patterns. For limited planting restoration projects, it is also recommended to establish qualitative success criteria for natural recruitment because it can be used as a rough measure of ecosystem function.

***Example 5th year Success Criteria*: "By the end of the fifth year 80% of the planted material will be alive and vigorous, tree canopy cover at the site will be more than 20% and natural recruitment of riparian associated native plant species will be occurring on over 50% of the recontoured stream bank."**

Monitoring procedures should be developed so that they, in the most direct and effective way possible, illustrate whether or not a site is progressing towards, or has met, its success criteria. Refer to Section B-4 below for monitoring procedures.

7. Prepare Draft Restoration Plan

Now it is time to compile all the information gathered to date and assemble it into a cohesive plan. The restoration plan should include the following items in roughly the order listed below:

- **Executive Summary** (optional, but useful if needed to apply for permits with regulatory agencies);
- **Introduction;**
- **Site Conditions** – Existing and historic, including vegetation, soils, hydrology, topography, invasive species, sensitive species, etc.;
- **Environmental Compliance and Permitting** (if needed);
- **Restoration Objectives and Goals;**
- **Site Selection** (i.e., why was this site selected);
- **Conceptual Restoration Plan** (usually includes a discussion of restoration approaches and techniques, site preparation and grading, plant palette, and planting instructions, a conceptual planting configuration, and rough details about grading and irrigation systems, etc.);
- **Success Criteria** (annual and overall);
- **Invasive Species Control Plan** (if necessary);
- **Monitoring and Management Plan**;
- **References**; and
- **Supporting Exhibits and Plans.**

A sample report outline was prepared by the Friends of Edgewood, and is included in Appendix B "Forms".

8. Prepare Draft Restoration Budget and Schedule

With the draft restoration plan prepared, a budget and schedule can be developed. Refer to the section below for guidance on determining the number of plants needed if specific costs for plant material and protection devices are required.

Preparing a schedule is important for effective restoration planning and implementation; often plant material acquisition must be initiated up to two years ahead of site planting. Set a schedule early and abide by it!

9. Finalize the Project Restoration Plan, Budget, and Schedule the Work

With the draft plan in hand, convene the Restoration Team to review and modify the restoration plan as appropriate. Particular attention should be given to the cost estimate and schedule to ensure that adequate funding, staff time, and budget are available to implement the project as planned.

10. Obtaining Permits and Agreements

Ideally, this step in the restoration process should be started one year or more ahead of implementation. Hopefully, the restoration project will not affect any resources that would trigger the need for a permit; however, on the occasions that a project does affect a wetland or listed sensitive species, permit compliance is a must before ground-disturbing activities begin.

A.3 How to Implement a Restoration Project

This section in intended to be a practical "how to" guide for implementing restoration projects. This section is intended to be used by both scientists and laypeople - anyone who will be implementing habitat restoration work!

This section is divided into the following topics:

1. **Planting Terminology**
2. **Collecting and Propagating Planting Materials (Seed Collection, Estimating Planting Densities and Numbers of Plants)**
3. **Planting Configuration**
4. **Preparing a Planting Site**
5. **Installing an Irrigation System (if Necessary)**
6. **Installing Plant Material**
7. **Installing Plant Protection And Erosion Control Structures**
8. **Installing Interpretive Materials and Site Maintenance Features**
9. **How to Amend Soil**

1. Planting Terminology

The following terms are used throughout this section:

- **Dominant Species -** Plant species that comprise 20% or greater relative cover within a target habitat type.

- **Planting -** Where a species is installed (planted) at a restoration site. In some instances a planting site will require planting of more than one individual plant, as is typically the case when planting herbaceous materials (i.e., mugwort or grasses) or weak and slow growing vines or shrubs (e.g., California blackberry, virgin's bower).

- **Initial planting density -** The number of live individuals per acre of each target species planted at the beginning of the restoration project. This number equals the desired Final Planting Density (defined below) plus a correction factor (usually expressed as a percent) that compensates for anticipated planting mortality from planting to the end of the monitoring period. Essentially, this initial planting density attempts to take natural mortality into consideration so that replacement plantings will generally not be necessary at the end of the monitoring period to meet the desired final planting density.

- **Final planting density -** A rough estimate of the number of live individual plants per acre (frequency) of each species of target plants at the point in time when the restored habitat is deemed successful and fully functional. Often this number is determined through interpretation of vegetation sampling data from healthy, mature, target habitat in the vicinity of the project (Dawson 1984). Part science, part conjecture, this number can be challenging to settle upon. Refer to Table B-3a below for some common planting densities for species and plant communities found in San Mateo County Park lands.

- **Establishment period -** The period of time between initial site planting and the time at which plantings are self-sustaining (i.e., no longer requiring supplemental

irrigation, weeding, maintenance, etc.) and plant mortality is negligible (roughly 3 to 10 years depending on habitats restored and site conditions) (Stanley et. al. 1989).

- **Planting mortality:** The percent of the installed plantings that are anticipated to die during the Establishment Period. This number will vary considerably among species, site conditions, and restoration techniques (i.e., direct seeding vs. rooted cuttings, irrigated vs. non-irrigated, etc.). Table 4-1 lists approximate percent mortality for several common riparian plant species over a five-year period under irrigated and non-irrigated treatments.

2. Collecting and Propagating Planting Materials

Successful ecological restoration often involves planting some, or all, of the target plant community to expedite habitat establishment. Ideally, plant material used on the San Mateo County Park lands should be derived from local stock, preferably from the local area to preserve the genetic integrity of the area. Some locally-derived revegetation material may be readily available from local nurseries however, readily available materials are often limited and in most instances it is most efficient from a cost and timing standpoint to have the necessary plant materials grown by a commercial nursery that specializes in native plants.

If you are going to use vegetation materials derived from local sources, keep in mind that it will take a minimum of one year, and more likely 1.5-2 years to prepare the plants for installation. Seed collection is typically done in late spring to early fall (i.e. from about May to September), depending on the life cycle of the target plants and on local climatic conditions. Once collected, seed may have to be prepared for germination (e.g., put into 'cold storage' or scarified to stimulate germination), then seeds must be potted, then tended until they are large enough to be planted at the restoration site. Different plants require different amounts of time to reach a stage where they can be planted, further, different landscape and restoration applications may require different sized plants to be prepared. A typical amount of time necessary to let plants grow to a size where they can be installed onsite is about 6 months to 1 year: that means if seeds are harvested in early summer, prepared for germination, then potted in fall, they would be ready for installation in spring to summer of the following year.

Seed Collection. The County of San Mateo requires a permit to collect native seed, therefore, ensure that whoever is going to collect seed for you has the proper permits in place, and also knows the species and quantities of seeds or plants you are interested in growing.

If there are more than one seed collection efforts underway, make sure to split up the geographic collection area of the various seed collectors to prevent local over-collection in any one area. Use someone who is knowledgeable about plant identification, and also about seed collection techniques – if seeds are collected too soon, they might not be viable, and if collected too late, may be infested with insects like weevils. To prevent depletion of local plant populations, it is best to go over the seed collection locations with the seed collector, limiting their collection to no more than 5% of the seed present in any location. The seed collector typically turns the seeds over to the contract nursery after collection. The selected contract nursery should have the proper facilities to clean, store, and germinate seeds properly.

Estimating Planting Densities and Numbers of Plants. This step in the restoration process often causes much uneasiness among restoration planners. Because this step involves making a series of educated guesses (and sometimes pure conjecture), there is a potential for error. The method presented below for estimating plantings assumes no, or minimal, replacement planting will

be conducted during the establishment period. One can plant a restoration site to reflect the final planting density (i.e., assume that each planting site will grow to maturity); however, it will require replacement planting on an annual basis to compensate for plant mortality. Following replacement planting the replacement plants will need to be monitored for the following 3-5 years during their establishment period which can result in a significant increase in monitoring and maintenance expenses. The replacement planting approach can result in a 5 to 10 year extension of the establishment period. Therefore, replacement planting is not always recommended. Refer to Table B-3a below for some suggested plant species and planting densities and numbers of plants per acre for common plant communities and species found in San Mateo County.

Because plant material, installation, and plant maintenance can be expensive, the restoration planner does not want to excessively over-plant; however, if he or she under-plants, the project may have a difficult time achieving success. Once again, the goal for the restoration site will need to be considered when making these estimates. Discussing the decision points and logic throughout this process with vegetation ecologists is essential to arriving at practical estimates.

When using rooted material, the steps for estimating the initial planting density and numbers of plantings are:

1. Sample mature target habitat type to arrive at estimates for the dominant species in each habitat layer (Dawson 1984). Estimate species frequency per unit area (e.g., individuals/acre) or basal area of dominant species. To do this, estimate species composition and cover within a logical sampling unit using a systematic vegetation sampling method. Or, as a simpler approach, you can just make general observations about a habitat type and arrive at generalizations about species frequency per unit area (less accurate but often just as effective). This is your estimated **Final Planting Density.**

2. Multiply **Final Planting Density** by the area of the chosen restoration site to be planted to arrive at the **Final Planting Number.**

3. Correct the **Final Planting Number** by adding plants on a species-by-species basis to compensate for establishment period mortality (see Table B-3a below) and post-establishment period mortality (add an additional 0-5% of the final planting number) to arrive at the **Total Number of Plantings** to be installed. Divide this number by the area of the restoration site to be planted to arrive at the **Initial Planting Density.**

4. To calculate the number of plants to be delivered prior to installation, multiply the number of plantings by the number of plants to be installed at each individual planting site (typically there is one plant installed at each site except for herbs or weak shrubs/vines). ***Because plant material tends to be damaged during shipping or dies while being stored prior to installation it is a good idea to add an additional 6 to 10 plants to the amount ordered for each species.***

5. As a general guideline for direct seeding (or acorn out-planting), allow 3 to 5 seeds (or acorns) at each planting site to produce one rooted plant. Likewise when collecting seeds for the preparation of rooted seedlings, assume 3 seeds collected for each seedling propagated for outplanting.

6. For broadcast seeding and large-scale seeding of grasslands and grasses and forbs, we suggest mixing grass seeds with dirt and possibly some fertilizer or a tackifier and water to create a 'slurry', then applying the slurry onto the site. Alternatively, the top layer of the site should be scarified with a rake, then a commercially available seed spreader can be used to broadcast-seed onto the site, then the surface-raked then waters to create good seed/soil contact. A typical seeding mix for grasslands is applied at 25 lbs/per acre to 75 lbs per acre, depending on the dominant species and the weight of their seed.

Table A-3a. Suggested Planting Lists and Planting Densities for Some Common Plant Communities and Species Found in San Mateo Park lands.

Common Name	Scientific Name	Percentage Observed in Habitat Type*	Typical Planting Density	Total Number of Plants per Acre
Northern Coastal Bluff Scrub				
Prostrate baccharis	*Baccharis pilularis ssp. pilularis*	8%	5 ft on center	241
Prostrate blue-blossom ceanothus	*Ceanothus thyrsiflorus*	7%	3 ft on center	211
Lizardtail	*Eriophyllum staechadifolium*	15%	3 ft on center	1,257
Cow parsnip	*Heracleum lanatum*	5%	Seed	1,000
Toyon	*Heteromeles arbutifolia*	4%	5 ft on center	121
Bush lupine	*Lupinus arboreus/chammisonis*	15%	3 ft on center	1,257
Bush monkeyflower	*Mimulus aurantiacus*	10%	3 ft on center	838
Coffeeberry	*Rhamnus californica*	7%	3 ft on center	586
California blackberry	*Rubus ursinus*	3%	3 ft on center	251
Yerba santa	*Satureja douglasii*	1%	3 ft on center	84
Sum		**75%**		**5,846**
Coastal Scrub/ Serpentine Bluff Scrub				
baccharis	*Baccharis pilularis ssp. pilularis*	8%	5 ft on center	241
prostrate blue-blossom ceanothus	*Ceanothus thyrsiflorus*	12%	3 ft on center	1,005
Lizardtail	*Eriophyllum staechadifolium*	17%	3 ft on center	1,424
Cow parsnip	*Heracleum lanatum*	2%	Seed	1,000
toyon	*Heteromeles arbutifolia*	1%	5 ft on center	30
Bush lupine	*Lupinus arboreus/chammisonis*	10%	3 ft on center	838
Bush monkeyflower	*Mimulus aurantiacus*	5%	3 ft on center	419
Coffeeberry	*Rhamnus californica*	5%	3 ft on center	419
California blackberry	*Rubus ursinus*	3%	3 ft on center	251
Yerba buena	*Satureja douglasii*	1%	3 ft on center	84
Wild strawberry	*Fragaria chiloensis*	5%	0.5 ft on center, clusters	152
Sum		**69%**		**5,863**
Coastal Prairie				
Purple needlegrass	*Nassella pulchra*	20%		approx 10 lbs
California fescue	*Festuca californica*	10%		approx 0.75 lbs
California oatgrass	*Danthonia californica*	15%	5ft on center in clusters	550
California melic grass	*Melica californica*	5%		approx 0.25 lb
California poppy	*Eschscholzia californica*	5%		1 -5 oz

Common Name	Scientific Name	Percentage Observed in Habitat Type*	Typical Planting Density	Total Number of Plants per Acre
bicolored lupine	*Lupinus nanus, Lupinus bicolor*	10%	5ft on center in clusters	302
buttercup	*Ranunculus californicus*	5%	5ft on center in clusters	151
blue eyed grass	*Sisyrinchium bellum*	5%	5ft on center in clusters	151
Footsteps of spring	*Sanicula arctopoides*	5%	5ft on center in clusters	151
Wild strawberry	*Fragaria sp.*	5%	0.5 ft on center, clusters	152
Sum		**85%**		**1,456**
Arroyo Willow Riparian Forest				
Arroyo willow	*Salix lasiolepis*	80%	Cane cuttings	2,431
creek dogwood	*Cornus sericea ssp. occidentalis*	2%	5 ft on center	60
California wax myrtle	*Myrica californica*	3%	5 ft on center	91
red alder	*Alnus rubra*	10%	5 ft on center	302
red elderberry	*Sambucus racemosa var racemosa*	5%	5 ft on center	151
Sum		**100%**		**3,035**
Arroyo Willow Riparian Scrub				
Arroyo willow	*Salix lasiolepis*	85%	Cane cuttings	2,583
creek dogwood	*Cornus sericea ssp. occidentalis*	1%	5 ft on center	30
California wax myrtle	*Myrica californica*	1%	5 ft on center	30
red alder	*Alnus rubra*	3%	5 ft on center	91
red elderberry	*Sambucus racemosa var racemosa*	3%	5 ft on center	91
coyote brush	*Baccharis pilularis*	3%	5 ft on center	91
Sum		**96%**		**2,915**
Freshwater Seep/Freshwater Marsh				
Spreading rush	*Juncus patens*	10%	0.5 ft on center, clusters	838
Baltic rush	*Juncus balticus*	15%	0.5 ft on center, clusters	1,257
Pacific rush	*Juncuse effusis*	10%	0.5 ft on center, clusters	838
Brownhead rush	*Juncus phaeocephalus*	5%	0.5 ft on center, clusters	419
Dense sedge	*Carex densa*	5%	0.5 ft on center, clusters	419
Slough sedge	*Carex obnupta*	5%	0.5 ft on center, clusters	419
Wire rush	*Eleocharis acicularis*	10%	0.5 ft on center, clusters	838
Seep monkey flower	*Mimulus guttatus*	5%	0.5 ft on center, clusters	419
Sum		***65%***		**5,445**
Mixed Evergreen forest, Native trees				
Overstory trees				
Coast live oak	*Quercus agrifolia*	15%	5 ft on center	453
California bay laurel	*Umbelluria californica*	7%	5 ft on center	211
California buckeye	*Aesculus californica*	5%	5 ft on center	151
California hazlenut	*Corylus cornuta var. californica*	3%	5 ft on center	91
Redwood	*sequioa sempervirens*	10%	5 ft on center	302
Toyon	*Heteromeles arbutifolia*	10%	5 ft on center	302
Madrone	*Arbutus menziesii*	2%	5 ft on center	60
Sum		**52%**		**1,569**
Misc shrub and understory species				
Ocean spray	*Holodiscus discolor*	3%	5 ft on center	91

Common Name	Scientific Name	Percentage Observed in Habitat Type*	Typical Planting Density	Total Number of Plants per Acre
Thimbleberry	*Rubus parviflorus*	3%	3 ft on center	251
California wax myrtle	*Myrica californica*	3%	5 ft on center	91
Coffeeberry	*Rhamnus california*	10%	5 ft on center	302
Ceanothus thyrsiflorus	*Ceanothus thyrsiflorus*	10%	5 ft on center	302
Ribes menziesii	*Ribes menziesii*	5%	3 ft on center	419
Snowberry	*Symphoricarpos albus*	3%	3 ft on center	251
Wild strawberry	*Fragaria chiloensis*	10%	0.5 ft on center, clusters	3,039
Bracken fern	*Pteridium aquilinum*	1%	5 ft on center, in clusters	200
Sum		**48%**		**4,945**
*(Source National Park Service records from GGNRA lands)				

3. Planting Configuration

Planting sites should be selected and arranged to approximate a natural pattern of placement rather than a geometric configuration. Take a look at existing habitat near your restoration site and get a rough estimate of plant spacing in the natural habitat. A good rule of thumb is that trees should be adequately spaced (i.e., no closer than 5 feet on center) to allow for maintenance activities during the establishment period (e.g., irrigation, mowing, herbicide application, etc.), and to allow trees to grow into a woodland or forest configuration. Likewise, a good rule of thumb is to plant shrubs no closer than 3 to 5 feet on center. Refer to Table B-3a above for general recommendations for most woodland and shrub dominated habitats of the San Mateo County Park System. Other plants (grasses, grass-like plants, and flowering plants) may require much closer spacing. Proper configuration from an ecological standpoint (i.e., slope, soil texture, proximity to water, etc.) is also essential for the long-term survival and viability of the plantings.

A drawing of the planting configuration should have been prepared as part of the restoration planning process (described above), and should show planting patterns for individual species, and planting locations. It may be helpful to install color-coded flagging at planting locations before you install planting material to check your plant spacing, installation pattern, and plant numbers BEFORE the plants are delivered to the site. This also helps to guide volunteer activities if volunteers are being used to install plants.

4. Preparing a Planting Site

In general, site preparation proceeds in the following sequence, with inspections by the restoration team leader or site foreman following the completion and before the initiation, of each step:

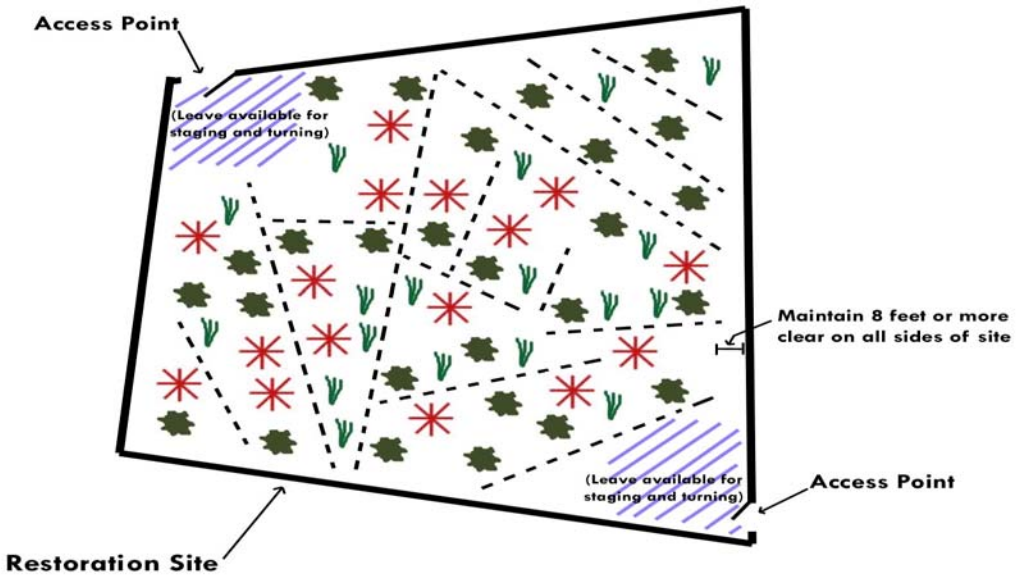
- **Identify and mark any nearby sensitive resources**
- **Clear and remove vegetation as necessary.**
- **Stake for grading.**
- **Perform site grading.**
- **Install erosion control or seed mix (if used).**
- **Mark planting locations by species.**

Following grading and using color-coded pin flags mark planting locations following the diagram prepared under Figure B-3a Planting Configuration. Easier than it sounds, individually flagging planting locations is a melding of landscape architecture and ecology. This step is best accomplished using two or four people working in pairs. The primary difficulty in marking the planting locations is maintaining appropriate spacing while ensuring proper ecological placement at the site (i.e. humans tend to place flags in straight lines at equal distances apart). Sometimes, it becomes apparent that the planting plan developed under Section 4 will need to be adjusted to accommodate site conditions following grading. Remember: Plant placement should be "field-fit."

Once all the planting locations are marked, the entire restoration team and personnel involved in the irrigation system installation (if used) and plant installation should tour the entire site together to identify problem areas or areas that may need to be redesigned.

After all parties have agreed on the planting locations, plant installation can occur.

Figure A-3a. Sample Planting Configuration.



5. Installing Irrigation Systems (If Necessary)

Depending on the complexity of the irrigation system this step may need to be conducted prior to marking plant locations; however, in many instances it is more cost effective to install the irrigation system following other site preparation activities.

Particularly complex or extensive irrigation systems should be designed by a qualified landscape architect and installed by experienced contractors. In these instances, the irrigation system should be installed during site preparation immediately following grading.

For simple irrigation systems, such as drip systems, the lines can be installed after the plants are installed.

6. Installing Plant Material

Plant materials (i.e., acorns, seeds, rooted plant materials, etc.) can now be installed. County Parks staff, professional landscaping crews, farm labor, volunteers, or any combination thereof can install plantings. However, if timeliness is a concern or if a contractual guarantee of plant survival through the first year is desired, a professional landscaping crew may be most effective. Correct installation and initial watering of the plant material is critical to plant survival. Everyone should be thoroughly trained about proper installation procedures prior to planting.

Generally, shrub and tree planting should occur between November and February, after the first heavy rains of the season have moistened the soil.

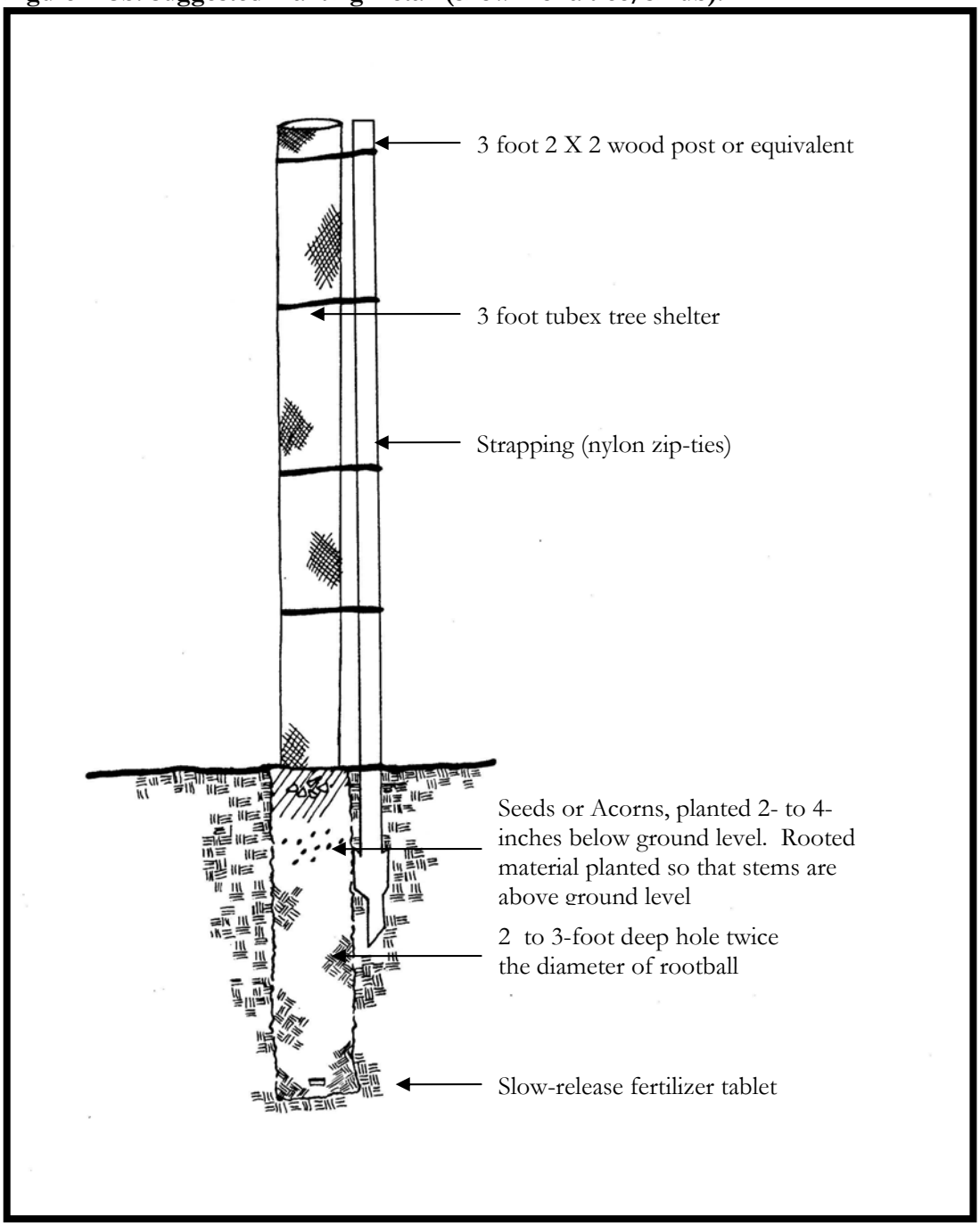
Prior to installing planting material, each planting site will be prepared. Refer to Figure B-3b below.

Planting site preparation should consist of:

- Clearing the soil surface of any remaining vegetation to reduce competition.
- Constructing a watering basin ±3 feet in diameter.
- Dig or auger a hole a minimum of 2 times the diameter of the planting material's pot (Harris and Dines 1998) to a depth of roughly 24-inches (3+ feet in heavily compacted areas) to break through any restrictive or compacted layers.
- Ensure the walls of the planting hole is thoroughly damp before planting. "Watering in" a plant is the preferable method, if water is available. To 'water in" a plant, place some backfill material at the base of the planting site. Drench the bottom of the hole. Install the plant and allow soil to settle, then back fill in 4"-6" layers, wet and tamp down soil, then repeat until the remainder of the planting site has been filled with native soil. Drench again, then once soils has drained until moist but not muddy, tamp down soil one more time - be gentle but firm. Don't tamp muddy soils as this will eliminate necessary air pockets in the soil.
- Backfill to within 2 feet of grade and place a slow-release fertilizer tablet in each hole.
- Further backfill holes to a depth of 2-4 inches below the ground surface for acorns and to an appropriate depth for rooted material (i.e., adequate depth to encompass the rootball). Mychorrhizal inoculants can be added here if desired.

Following the preparation, plant between three and five acorns (or any other seed), or the rooted material, in each hole.

Figure A-3b. Suggested Planting Detail (shown for a tree/shrub).



7. Installing Plant Protection and Erosion Control Structures

During, or immediately following planting it is advisable to install some type of plant protection structure to minimize herbivory and maximize planting survival during the establishment period.

Tubex brand tubes, or similar herbivory protection devices, should be placed over each tree planting site and zip-tied to 2-inch by 2-inch wood stakes inserted a minimum of 8 inches in the ground to protect seedlings from rodent and deer herbivory.

Shrub and some herbaceous planting sites will also need to be protected by installing a 2 foot tall 10- to 12-inch diameter wire mesh bag (e.g., light window screen material in the form of a cylinder with the top folded over) over each planted shrub to prevent herbivory during the first one or two years of establishment. These wire-mesh bags can be unfolded and easily enlarged as the plants grow.

Herbivory protection devices should be removed when they begin to crowd the plant.

Erosion control structures (straw wattles, hay, mulch, rock, etc.) should also be installed at this point.

8. Installing Interpretive Materials and Site Maintenance Features

Finish site installation by installing fencing and signage to inform the general public and to protect the site from disturbance or trespass. Sites directly adjacent to livestock grazing activities should be fenced with 4- or 5-strand barbed wire to ensure adequate protection from livestock.

Select fencing material to match your site characteristics. Hogwire, or similar types of field fence should not be used because this type of fencing may limit wildlife movement through the site. Likewise, in mission blue butterfly, and other sensitive butterfly areas, fencing should not disrupt flight (i.e. do not use erosion control fabric or other solid material fencing that insects might get caught in).

All gates should be lockable as should irrigation control valve boxes and pump controls (if used) to minimize potential for theft or vandalism.

Restoration sites adjacent to areas that receive public use should be posted with signs that inform the public that there is no trespassing and that the site is a sensitive habitat area under restoration since [date].

9. How to Amend Soils

Soil amendment should only be used to address special circumstances. Soil amendments are recommended for the following situations:

- Areas where irrigation opportunities are limited;
- Sites where soil compaction is problematic (i.e. you cannot dig in a planting hole or the soil is so compact that you do not think that you can successfully grow plants;
- Sites where the soils have been heavily disturbed and will likely not support plants (e.g., where the organic layer is absent, where the only remaining soils is the sterile mineral soils, unconsolidated rocks, pebbles, and sands, and exposed bedrock), and
- In high-use and developed landscape areas (such as lawns and playgrounds).

Applying Amendments.

Generally, the best way to add soil amendments to an area is to clear the site of vegetation (especially invasive species); aerate or scarify the soil as necessary; then spread the amendment (e.g. fertilizer, compost, or chemical soil amendments such as nitrogen or phosphorous or equivalent) on the surface throughout the planting area. Avoid applying soil amendments to root zones of mature trees. Application should be timed to reduce soils erosion (i.e. bare soils should not be exposed to winter rains and other runoff).

When aerating or scarifying the soil, remember that only the top few inches is typically rich in organic material – in most areas, raking or light disking is all that is required to 'break up' the soils surface so that oxygen and water can pass easily through the soil profile. In some areas,

such as planting sites, it may be easier and more effective to auger a small planting site rather than aerating, disking, or plowing an entire area.

Using Mulch.
In some areas it may be advantageous to apply a top-dressing of mulch after the soil has been amended. In this instance, the soils amendment (e.g. fertilizer) should be tilled into soil, then a surface layer of mulch (e.g., compost, woodchips) applied. Note: mulch can greatly increase the water-holding capacity of soils, protect and shade plant roots and the soil's surface. However, mulch can also add nutrients such as Nitrogen to the soil over time, increasing potential for weed invasions as the mulch breaks down.

Soil Amendments That Hold Water.
When plants are to be installed in hot areas that have limited irrigation and in non-irrigated areas, soil amendments can be used to help hold moisture near the plant's root ball to increase the chances of survival. Rather than attempting to alter soil characteristics by amending the soil, planting materials should be carefully selected to match existing site conditions. More information on selecting appropriate plant materials is provided below.

Amendments that perform this function include applying a thick layer of mulch around the planting site, or using a starch-based irrigation supplement or polymer hydro-gel granules. Starch-based irrigation supplements (like DriWater™) are containers of water combined with small amounts of food-grade starch to turn it into a gel. The container is opened and buried upside down at the time of planting. As soil temperatures warm during the summer, soil microbes decompose the starch, releasing the water contained in the gel. These supplements tend to be expensive on a per-plant basis, but may be effective where no other solution is feasible. Polymer hydrogel is a powder that is mixed in small amounts with native soil during planting. The polymer granules absorb water and swell exponentially. They hold water in gel form and keep moisture available to plant roots that come in contact with the gel granules. Polymers have a mixed reputation, partly because they are easy to overuse.

Alternative Ways to Supply Water.
Another possible low-tech solution to planting at dry sites is to place a 5 gallon bucket of water next to the planting site. The bucket should be pierced with a small nail hole to allow water to slowly drip onto the planting site. This option may require staff to refill the buckets regularly during plant establishment.

A.4 How to Maintain and Monitor a Restoration Site

Ideally, a well planned and implemented restoration project will require minimal long-term maintenance. A typical monitoring program is 3 to 5 years for grassland, shrub, and smaller, less diverse riparian and woodland projects, and 5-10 years for forest restoration, forest-stand conversion, and for larger and more diverse riparian and woodland habitats.

Maintenance periods vary greatly, depending on the type and invasiveness of weedy species in and nearby the project site, public use levels, and also on other site uses such as grazing. There is no standard maintenance period for restoration projects. For example, invasive plants can produce seeds that are viable for 10, 20 or 50 years – therefore sites with invasive plant problems may require decades of repeated monitoring and re-treatment to effectively eradicate the problem weed!

A good rule of thumb is that <u>all</u> park lands will require some level of active maintenance in perpetuity. The level of effort required will be intense at first (i.e. for the first 1-3 years following initial restoration), but will taper off greatly after that (assuming your restoration was successful!) to a low level.

The following section will help you decide what needs to be done to maintain your restoration site, and figure out how, using adaptive management principles, to most effectively maintain your site over time.

Plant Establishment and Care

Restoration projects are intended to require little or no active maintenance, once the plants are established. However, during the initial plant establishment period, it will be necessary to provide care for at least three years, more typically five years, to help ensure survival of the plants. At a minimum, the components of a plant establishment program are mulching, watering, weeding, and monitoring. (described in more detail below). A typical calendar of activities is also provided below in Table A-4.

Once the initial plant care period is over and the plantings have established, care for these areas should be incorporated into regular ongoing site maintenance activities.

In locations where invasive plants or site conditions make restoration especially difficult, intensive monitoring and establishment care may need to continue for 10 to 15 years. Some examples include:

- Areas with extensive, mature, or long-lived invasive plant infestations;
- Forest stand conversion projects (i.e. projects that seek to replace invasive trees with native trees and shrubs slowly over time to produce an un-even aged forest);
- Exposed and dry slopes, sandy or erodible soils, bedrock or thin soils sites; and
- Areas with high visitor use (e.g. entrances to trailheads, picnic areas etc).

Table A-4 Sample Three Year Establishment Care Calendar

Action	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
Initial Plant Installation									Grass, forb seeds	Install woody plants (rooted material) if irrigation is used	Install rooted material following 1st heavy rains	Install pole cuttings and rooted material following 1st heavy rains
Mulching												
Watering										XX	X	
Year 1												
Mulching												
Weeding												
Watering					XX	XXX	XXXX	XXXX	XXX	XX		
Year 2												
Mulching												
Weeding												
Watering					XX	XXX	XXXX	XXX	XX	XX		
Year 3												
Mulching												
Weeding												
Watering					XX	XX	XX	XX	XX	X		
Removing Inorganic Mulch												

LEGEND

Indicates time period when action may be taken, timing and frequency to be determined by site conditions

X Indicates specific time to perform activity

ADDITIONAL NOTES:

Mulching: See "Mulching"

Weeding: See "Weeding and Invasive Control"

Watering: If site access allows, all new plantings should be watered in at the time of planting. Regular three year watering, if given, should consist of at least 1" weekly for first two growing seasons, then taper to ½" weekly for plantings in natural areas. See 7.7 "Watering".

Removing Inorganic Mulch: Inorganic sheet mulch used in areas of severe invasive species problems should be removed during the dormant season after 3 years and the entire area should be mulched with 4-5" layer of wood chips. Depending on site conditions and concern about re-invasion by weeds, entire planting area can be sheet mulched with a double layer of cardboard underneath the wood chips. Application of these techniques is not typically advised and would probably be limited to planting areas with severe invasion problems that are around the edges of the hillside and therefore accessible for this intensive action.

Wherever possible, new plantings, particularly in dry areas and exposed and sunny slopes, should receive regular watering. Site access limitations can make watering labor-intensive. Some areas may be difficult or impossible to water from the park's existing irrigation system. Possible solutions include establishing a temporary irrigation system, water tank, or hand watering. In some instances, use of soil amendments such as hydrogel or installation of a 5 gallon bucket with a pin hole for drip irrigation can be used at individual planting sites.

Heavy mulching is recommended for dry sites. Weed control should be routinely conducted around the individual planting sites to reduce competition and shading from other plants, and to reduce competition for available water. Weed control should be done with diligence at any planted site, and in certain cases may be the only type of three-year establishment care that can be provided. Adjustments to the plant establishment calendar, in terms of actions taken, should reflect the particular project's site conditions. For all projects, monitoring of site conditions is crucial to success. Parameters may include: presence of invasive plants, extent of invasive re-growth, new plant survival and increase in height/spread, plant damage from humans, animals or pests, and water stress.

a. Mulching

Mulching is one of the easiest and most important maintenance practices for protecting and nurturing all vegetation types. When site access is possible, mulching is an essential component of any natural area planting project for suppressing weeds/invasives and thereby reducing root competition, to conserve soil moisture and keep soil cool, and to add organic matter to the nutrient-deficient soils.

Where large areas of invasives have been removed (e.g. ivy mats and blackberry thickets) and there are concerns regarding invasive regrowth, sheet mulching the entire planting area is an effective way to suppress invasive plant seed banks and discourage re-sprouting. Use a combination of cardboard sheet mulch overlain by 4-6" of wood chips to minimize re-invasion. Sheet mulching should not be done in the vicinity of mature trees. Plastic, landscape fabric or inorganic mulch should be avoided, except as specified for highly invaded areas, where it may be the only effective strategy.

In cases where specific plants or groups of plants are to be mulched, use guidelines below. This scenario will most likely be the case when conifers or groups of shrubs are being planted in dry uplands and follow-up watering is not feasible.

Trees

- Clear weeds and grass from under the tree.
- Spread 3-4" deep layer of organic mulch in a circle out to the tree's drip line or in a 3' diameter circle (whichever is greater).
- Keep mulch away from the tree trunk to prevent crown rot or insect damage.
- Maintain mulch annually for at least 3 years, or longer, as needed.
- Use a permanent mulch in heavy-use areas such as picnic areas to reduce soil compaction and prevent equipment injury to trunk and roots.

Shrubs

- Follow similar procedures as for trees, above.
- Spread layer of organic mulch 2-3" deep and 2-3' in diameter around shrub.
- Cover entire planting area with mulch where applicable.
- Keep mulch away from contact with crown of plant.

b. Watering

New plants must grow an entire new root system before they can survive in the summer dry season. In consultation with park staff, the project manager must determine what irrigation is most feasible and efficient for the project being planned. Some areas will be close to quick couplers so that hoses can be attached for overhead irrigation. Other areas may be close to a road or a path where a truck can deliver water with a water tank. In these situations, either hand-watering from the tank or hookup to an irrigation system may be preferred, depending on the personnel available for the work. Some areas will be away from reasonable water access. In these cases, soil amendments like hydrogel or compost should be considered (see previous section on Soil Amendments above); deep mulching and frequent weeding will be required. Watering can be done by portable containers to each plant, but this must be weighed against the cost of labor and the damage that repeated foot traffic can cause to the site.

A final option is to substantially over-plant such areas, anticipating water-related losses. Suggested over-planting for coastal scrub plant communities for example is 150% of the number of plants that you want to eventually establish at the site. All planting should be completed during late fall or winter where irrigation is problematic.

In general:

- Choose locally-collected and grown native species.
- Select drought-resistant species for sites with limited water availability.
- Install plants following first heavy winter rains (typically in November-December for San Mateo County). Timing planting this way will help ensure that natural rainfall will keep the soils moist during the critical first few months of the plant's establishment period. Also, plants are typically less active during this period, so use less water.
- "Water in" new plantings- i.e. thoroughly water the planting holes for new trees and shrubs.
- Water new trees and shrubs (weekly at least 1") during first two summers, tapering watering (to ½" weekly) in the third year.
- Begin supplemental watering at the beginning of May to prevent drought stress.

c. Weeding

Planting sites should be periodically inspected, and if necessary, weeded to help ensure successful plant establishment. Weeding is most important in the first 1-3 years while the installed plants are small and have shallow root systems. In most cases, hand removal of weeds within the planting basis is the most effective method for weed control. For large planting sites, mowing or careful use of a line trimmer can be used to 'knock-down' weedy species around planting sites.

Special attention should be given to detecting problem invasive plants that may establish in the newly-disturbed planting sites. Some problematic invasives, if left untreated, may take over a restoration site if left untreated. Special attention should be give to the following weedy species that tend to colonize in disturbed places such as planting sites:

- Yellow star-thistle;
- Mustards and thistles, radish;
- French broom; and
- Invasive grasses (Harding grass, velvet grass, rattlesnake grass).

A separate section is provided below detailing the invasive species, control techniques, and timing and frequency of control activities for the invasive species that are known to occur in San Mateo County Park lands.

This section briefly describes monitoring and maintenance techniques and approaches for controlling invasive plants following site restoration. Invasive plants are often a significant problem at restoration sites. Some restoration sites were selected to control an invasive species and replace it with native vegetation, while other restoration projects develop invasive plant problems as a result of the restoration process (e.g., soil disturbance and removal of vegetation typically opens up bare soil areas and releases seed banks that are already present at the restoration site).

Invasive plant species can be formidable competitors to the desirable native vegetation. The best approach is to a) inspect the restoration site early and often to detect and control an invasive species problem before it gets out of hand; and b)try to establish a dense cover of native vegetation as soon as is possible to 'shade out' and help native plants out-compete invasive plants. This approach may require more densely planted native plants than are normal. Restoration sites should be inspected throughout the year for invasive plant species (i.e. in late winter, early spring and late summer). New populations should be controlled immediately before they have the chance to spread or mature. Mechanical or hand weed control methods should be favored over chemical control methods; however, chemical control methods may be necessary with particularly stubborn weeds. Refer to Section B-6 for more information about appropriate invasive plant treatments.

d. Monitoring

Refer to Section B-4 below for more information on monitoring techniques and procedures. Monitoring is conducted to assess the success of various restoration techniques as well as to identify areas in need of maintenance or other remedial activities.

Monitoring can be as simple or as complicated as desired; however, at a minimum the following should be performed annually during the establishment period:

- Plant Survival Monitoring;
- Natural Recruitment Monitoring; and
- Photographic Documentation.

Performing these three activities will add tremendously to one's understanding of a restoration site and will help to use adaptive management to troubleshoot any areas of limited plant survival, less than desired plant growth, and invasive plant and other site management problems (e.g., trespass, herbivery etc).

Plant survival monitoring should be conducted during the first three to five years of establishment beginning the year following plant installation. For longer restoration projects such as forest stand conversions and complex riparian restoration projects, plant survival should also be monitored in years 10 and 15 to look at longer-term survival.

Survival monitoring for grasses, grass-like plants, and herbaceous flowering plants should be conducted in the spring when these species are readily identifiable (i.e. flowering). Survival monitoring for trees is typically conducted in mid- to late-summer prior to the onset of fall dormancy so trees can be observed during the period of increased water stress to determine whether or not supplemental irrigation is required. Plant survival should be tallied by species.

Natural recruitment (i.e. the volunteer establishment of desirable native plants within a restoration site) should also be noted and mapped during the survival monitoring. The presence or absence of natural recruitment is an important clue to how the site is functioning, and can also help to expedite site restoration exponentially. As mentioned throughout this section, passive restoration (i.e. natural

plant recruitment) is the desired restoration approach because it is less costly and more effective long-term than active restoration.

Several permanent photographic documentation points should be established at the restoration site so that they depict the general condition of the site with reference to the surrounding landscape. Photographic documentation will also be used to document natural recruitment and succession within the restoration areas. Photographic documentation should be conducted annually in years 1 through 5 and (for longer monitoring projects), also in years 7, 9 and 10, and possibly also in years 11, 13, and 15 for longer restoration projects such as forest stand conversions.

A.5 Ongoing Land Management

All San Mateo County Park land needs some level of ongoing management to maintain its biological resource and recreational values. Periodic monitoring, either annually or every 3-5 years is recommended for all park lands to assess visitor use patterns; trail condition and circulation patterns; assess culverts, drains, and waterway functioning; and assess natural resource values. Some examples of anticipated ongoing management include:

- Fencing may need to be maintained periodically to avoid trespass problems.
- Culverts and storm drains should be checked for proper sizing, obstructions, and any signs of siltation or overflow.
- Wildlands should be checked for target invasive species, and a list of areas to receive control developed each year.
- Forests should be assessed annually for health, and hazard trees requiring attention and noted. High fire risk areas should be checked for fuel load and other problems. As necessary fire breaks may be installed.
- Known populations of sensitive species should be monitored to detect overall trends in population, and to check for any problems with the species or its habitats that may need active management to correct.
- High visitor use areas should be checked, and landscaping and other amenities maintained and replaced as needed.
- Having aerial photographs of the site prepared every several years will help track the development of habitat on the site and can also help illustrate the site in the context of the surrounding environment over time.

Refer to Table B-5a for suggested scheduling of typical monitoring activities.

Table A-5a. Typical Maintenance and Monitoring Activities and Suggested Schedule

Action	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
Inspect fencing, trails	X	X	X									
Inspect culverts, bridges, creek crossings, stormdrains etc.	X									X	X	X
Monitor invasive plant populations			X	X	X							
Monitor rare plants			X	X	X							
Monitor rare wildlife			X	X							X	X
Assess fuel loads, inspect fire breaks, monitor forest health		X	X					X	X			
Monitor forests for plant diseases		X	X					X	X			
Update GIS database with information									X	X	X	
Habitat Restoration Monitoring												
Monitor plant survivorship						X	X					
Prepare photo monitoring					X	X						
Plant replacement plants										X	X	
Supplemental Watering						X	X	X	X			
Weeding, browse protection						X	X					

A.6 How to Control Invasive Plants

San Mateo County Parks have several invasive plant species, some of which have become problematic, and will require active management to control them, and eventually achieve either sustained control or eradication. Refer to Table B-6a for a list of problem invasive plants by individual park.

1. Overview of Invasive Species Control

This section provides a broad overview of invasive species control options, and recommends what is at present considered the most effective approach to controlling these species with the least level of environmental harm. Because invasive plant control techniques are constantly evolving, we recommend a brief literature search or contact with local weed control experts be conducted to help make sure the most up to date and effective methods and application techniques are being employed. A list of helpful resources is provided in Appendix D. .

Table A6-a. Invasive Species Known to Occur in San Mateo County, Presented by Individual Park*

Invasive Species	Coyote Pt	Crystal Springs	Edgewood	Fitzgerald	Flood Park	Huddart	Junipers Serra	Memorial/ Pescadero/ Sam McDonald	San Pedro	San Bruno Mtn	Wunderlich	Notes: Recommended Treatment	Optimal Treatment Timing
Acacias (*Acacia sp.*)	●	●			●		●			●	●	cut and paint with herbicide outside bird nesting season	Aug-Nov
Australian fireweed (*Erechtites minima*)										●		foliar spray with herbicides or hand pull	Spring before seed set
Australian tea tree (*Leptospermum laevigatum*)	●	●										cut and paint with herbicide outside bird nesting season	Aug-Nov
Blackwood acacia *(Acacia melanoxylon*)		●										cut and paint with herbicide outside bird nesting season	Aug-Nov
Blue gum Eucalyptus (*Eucalyptus globulus*)	●	●	●				●		●	●	●	cut and paint with herbicide outside bird nesting season	Aug-Nov
Bull thistle (*Cirsium vulgare*)	●	●	●			●	●	●		●		cut and paint with herbicide outside bird nesting season	Aug-Nov
Bailey's acacia (*Acacia baileyana*)		●										cut and paint with herbicide outside bird nesting season	Aug-Nov
Cape ivy/German ivy (*Delairea odorata / Senicio mikanioides*)	●	●		●			●	●	●	●		Cut and roll biomass, then spot spray with herbicides	Spring
Cotoneaster (*Cotoneaster sp.*)		●			●					●		cut and paint with herbicide outside bird nesting season	Aug-Nov
English ivy (*Hedera helix*)		●			●		●		●	●		Cut and roll biomass, then spot spray with herbicides	Spring
Ehrharta (*Ehrharta erecta*)										●		Mow, then mow and spray with herbicides	Early fall
Fennel (*Foeniculum vulgare*)	●	●					●	●		●		cut and paint with herbicide outside bird nesting season	Aug-Nov

Invasive Species	Coyote Pt	Crystal Springs	Edgewood	Fitzgerald	Flood Park	Huddart	Junipers Serra	Memorial/ Pescadero/ Sam McDonald	San Pedro	San Bruno Mtn	Wunderlich	Notes: Recommended Treatment	Optimal Treatment Timing
French broom (*Genista monspessulana*)	●	●	●			●	●	●	●	●	●	cut and paint with herbicide outside bird nesting season	Aug-Nov
Fuller's teasel (*Dipsacus sativus*)		●										Hand pull	Early spring
Garden nasturtium (*Trapaeolum majus)*				●								Hand pull, spot spray as necessary	Any time
Glossy privey (*Ligustrum japonica*)					●							cut and paint with herbicide outside bird nesting season	Aug-Nov
Gorse (*Ulex europaeus*)										●		Remove biomass, spot spray with herbicides (Garlon 4™)	
Harding grass (*Phalaris aquatica*)		●		●			●	●	●			Mow, then mow and spray with herbicides	Early fall
Heavenly bamboo (*Nandina domestica*)					●							cut and paint with herbicide outside bird nesting season	Aug-Nov
Himalayan blackberry (*Rubus discolor*)					●			●		●		cut and paint with herbicide outside bird nesting season	Sept-Oct
Iceplant/hottentot fig (*Carpobrotus edulis*)	●	●								●		Cut and roll biomass, then spot spray with herbicides	Spring
Italian thistle (*Carduus pycnoecphalus*)		●	●			●	●	●	●	●		cut and paint with herbicide outside bird nesting season	Aug-Nov
Monterey cypress (*Cupressus macrocarpa*)		●		●			●		●	●		cut and remove outside bird nesting season	Aug-Nov
Monterey pine (*Pinus radiata*)		●				●	●		●			cut and remove outside bird nesting season	Aug-Nov
Mustard (*Brassica nigra*)	●				●					●		cut and paint with herbicide outside bird nesting season	Aug-Nov
Myoporum (*Myoporum laetum*)	●											cut and paint with herbicide outside bird nesting season	Aug-Nov
Ox-eye daisy (*Leucanthemum vulgare*)										●		cut and herbicide	Spring
Oxalis/Bermuda buttercup (*Oxalis pes-caprae*)										●		cut and herbicide	Spring
pampas grass or jubata grass (Cortaderia selloana / *C.jubata*)	●	●	●	●		●	●	●	●	●		cut to remove biomass, allow to regrow, then foliar spray regrowth when 1-3 feet high	fall
Periwinkle (*Vinca major*)		●		●				●	●			Hedgetrim, then spot spray herbicides (Roundup Pro™)	early spring or late fall
Pine species (*Pinus sp.*)										●		cut and remove outside bird nesting season	Aug-Nov
Poison hemlock (*Conium maculatum*)		●		●				●	●	●		cut and paint with herbicide outside bird nesting season	Aug-Nov

Invasive Species	Coyote Pt	Crystal Springs	Edgewood	Fitzgerald	Flood Park	Huddart	Junipers Serra	Memorial/ Pescadero/ Sam McDonald	San Pedro	San Bruno Mtn	Wunderlich	Notes: Recommended Treatment	Optimal Treatment Timing
Purple loosestrife (*Lythrum salicaria*)										●		foliar spray with herbicides	spring prior to seed set
Radish (*Raphanus sativus*)	●									●		cut and paint with herbicide outside bird nesting season	Aug-Nov
Rattlesnake grass (*Briza maxima*)										●		Mow, then mow and spray with herbicides	Early fall
Scotch broom (*Cytisus scoparius*)		●					●			●		cut and paint with herbicide outside bird nesting season	Aug-Nov
Single-seed hawthorn (*Crataegus monogyna*)										●		cut and paint with herbicide outside bird nesting season	Aug-Nov
Smooth cordgrass (*Spartina alterniflora*)	●											Hand remove, or spot spray with herbicides	Low tide
Smooth cord grass hybrid (*Spartina alterniflora x S. foliosa*)	●											Hand remove, or spot spray with herbicides	Low tide
Spanish broom (*Spartium junceum*)											●	cut and paint with herbicide outside bird nesting season	Aug-Nov
Yellow star-thistle (*Centaurea solstitialis*)	●	●	●	●		●	●	●	●	●	●	Mow late fall, mow and spray summer	Late March to April, May-June
Velvet grass				●								Mow, then mow and spray with herbicides	Early fall
Wandering Jew									●			Cut and roll biomass, then spot spray with herbicides	Spring

* Source: Rana 2002.

Consistent with most successful control programs, the invasive weed management strategy should be to adaptively implement a diversity of control techniques, with the goal of sustained control. The information provided below is presented as a tool to help guide and prioritize weed control efforts within the San Mateo County Parks. The suggested techniques should be modified to meet site-specific, budgetary and compliance-based needs. Additionally, they must follow the Integrated Pest Management (IPM) procedures.

Best Management Practices should be employed during invasive plant control to minimize soil disturbance, and to help ensure that biomass is removed from the site, or sufficiently composted and stored out of sight. Removal of large infestations of weeds can result in the increased potential for erosion on slopes and stream banks. Therefore, an erosion control strategy must be in place before large-scale removal efforts are undertaken. In areas where invasive plants occur on steep and unstable coastal cliffs and bluffs, special control methods should be employed (e.g. contractor rappel and spray, broadcast spray and decompose onsite). To this end, Best Management Practices should be developed in coordination with the Agricultural Commissioner's office to ensure consistency with their policies and guidelines.

Selecting an Appropriate Herbicide. Herbicide selection will vary with the species to be treated and with site conditions. As with all herbicides, when selecting an appropriate herbicide, mixture, and application method, follow IPMP guidelines, and consult with the local Agricultural Commissioner's office and EPA guidelines for herbicide application near endangered species. Herbicide application should be conducted by County Parks staff or a local licensed QAL herbicide applicator who has extensive experience with wildland weeds. The following represents some common herbicides used throughout the state for invasive plant control. However, new, more effective, and less toxic herbicides are constantly being developed, so County staff are advised to check with the County Agricultural Comissioner's office and local practitioners before finalizing an herbicide selection for a project.

- **Glyphosate formulations** such as Roundup Pro™, (Rodeo™ or AquaMaster™ in areas near or in water), are the most commonly used herbicides in wildland settings, and especially in highly sensitive areas because of their minimal effects on surrounding areas and short environmental lifespan. Glyphosate only works on actively growing plant tissue and is most effective on grasses and forbs. Although somewhat less effective in controlling woody species, it can be effective if used in multiple applications, or when used in combination with other herbicides as a "cocktail" mixture. Some common mixtures include Roundup Pro™ with Garlon 3A™ or 4™, and Roundup Pro™ with Stalker™ for use on specific hard-to-treat woody species and though grasses such as pampas grass, giant reed, and broom species. If glyphosate is selected for use on woody plants, plan to monitor the treatment site, and re-treat the area as necessary to ensure success of the control effort.

- **Triclopyr formulations** such as Garlon 3A™, Garlon4™, and Pathfinder™ are often used to control woody species in less sensitive areas (i.e. sites that do not support sensitive plants, native communities, or rare species). Garlon 4™ has less effect on surrounding grasses and forbs. As mentioned above, one common treatment is to apply a "cocktail" of Roundup Pro™ with Garlon 3A™ or 4™ on specific hard-to treat woody species and through grasses such as pampas grass, giant reed, and broom species.

  Imazapyr formulations (Stalker™, Habitat™) are effective on both broadleaf plants and grasses. As mentioned above, a popular application is a cocktail of Roundup Pro™ with Stalker™ for use on specific hard-to treat woody species and though grasses such as pampas grass, giant reed, and broom species.

- **Clopyralid formulations** such as Transline™ are plant-specific herbicides that are effective on members of the Pea *(Fabacea)* and sunflower (*Asteraceae)* plant families (e.g., Scotch Broom, French Broom, Spanish Broom, Gorse, yellow star-thistle, and other thistles), however, this herbicide tends to have a longer activity period, and higher toxicity level than others, and should be used sparingly, applied with caution to very small areas, and only used in non-sensitive areas.

2. **Invasive Large Trees**

Several invasive trees used on San Mateo County lands for landscaping, windbreaks, and for other reasons are becoming problems in park lands because they are displacing native vegetation, are becoming unstable or hazardous (thereby threatening structures and public safety), and/or are

spreading from landscaped areas into wildlands. Small tree species are described in the next section of this document.

Invasive large trees that are problems on some San Mateo County Park lands include:

- Blue gum Eucalyptus (*Eucalyptus globulus*);
- Monterey cypress (*Cupressus macrocarpa*);
- Monterey pine (*Pinus radiata*); and
- Other Pine species (*Pinus sp.*)

The following section provides guidance for invasive tree removal activities.

1. Trees will be marked in the field, and public notification of removal will be initiated.

2. Trees will be photographed for documentation.

3. County Parks staff shall conduct necessary public awareness and notification procedures, including meeting with stakeholders, public meeting(s), and posting tree removal notifications.

4. County Parks staff shall conduct work or shall contract work through a licensed and bonded professional arborist with experience working in wildland settings. The scope of work shall include:

    a. Removal of invasive trees.

    b. Trees are to be removed and or trimmed in a manner that does not substantively disturb the surrounding soil surface, and minimizes erosion potential. Trees are to be removed outside of bird nesting season, from August 16th to January 14th (no trees are to be removed during bird nesting season, from approximately January 15th to August 15th without prior approval from County Parks staff). If tree removal is required during nesting season, County Parks staff or an approved biologist shall conduct a preconstruction bird nesting survey within 2 weeks of the start of tree removal. The survey will confirm that no active bird nests are present in trees scheduled for removal or within the area of impact, prior to the start of arborist's work. If active bird nests are found, tree removal will be delayed until young birds have left the nest, (typically by summer).

    c. Best Management Practices (BMPs) for tree trimming and removal shall be employed, depending on site-specific conditions. Prior to the start of work, the Arborist shall submit a plan for County Parks staff approval describing methods to be employed during tree removal. The arborist may use some or all of the following acceptable methods to remove hazard trees:
        - The use of a pulley system or a crane to lift the trees from steep slopes in sections or in their entirety from the removal site to a truck or staging area. Arborist is strongly encouraged to "net" the trees prior to transport to reduce potential for slash and/or soil disturbance.
        - Arborist may consider "limbing up" the hazard tree before the tree is felled to avoid damage to adjacent trees.

    d. The remaining stumps should be cut to no more than 6 inches above the ground surface. For trees such as Eucalyptus that sprout from the cut stumps, the cut stumps should be either stump-ground in place, and/or immediately painted with an

appropriate herbicide (typically Roundup™) to prevent re-sprouts. All woody debris (slash, duff, wood chips) is to be collected and removed from the site (unless otherwise directed by County Parks staff), and the areas surrounding the removal site shall be raked clean to the soil surface. If tree removal is conducted in an area with significant native species populations, existing natives shall be protected prior and during removal.

e. Erosion control shall be installed as necessary to prevent future soil erosion. Erosion control shall follow County Parks staff BMP standards, including use of certified seed free rice straw, straw wattles, or other acceptable erosion control materials that will decompose naturally over time and that will not introduce invasive plant species into the park.

f. Woody debris is to be removed from the site to a nearby staging area, or to a site determined by County Parks staff, or disposed of offsite (See Green Waste Disposal Section of the report). If offsite disposal is required, woody debris must be transported and disposed of at an approved disposal facility in accordance with County Parks staff procedures and state and federal laws.

g. County Parks staff may elect to re-use some or all woody debris materials in future trail building and habitat restoration activities. In some instances, and at the direction of County Parks staff, the arborist may be required to chip, cut, or separate woody debris into various sized debris piles. If required, this material will be separated from the rest of the woody debris, and stored onsite at an approved staging area.

h. Following tree removal, County Parks staff should undertake necessary invasive plant control to prevent secondary infestations between the end of tree removal and the start of any planned habitat restoration of the site. A containment line should be developed around larger tree removal sites, and the site periodically monitored for invasive plants.

i.

3. Invasive Small Trees, Large Shrubs, Small Woody Shrubs and Sub-Shrubs

Small invasive trees can be difficult to control because of their large distribution and density. The following invasive small tree and shrub species are considered problems in San Mateo County Parks because they can form a dense understory beneath the invasive forest canopy, resulting in increased fire risk and fuel load development. These dense brushy areas, when located next to roads and other population centers, may also inadvertently provide cover for homeless encampments. In addition, these small trees and shrubs can spread into native forests, scrub and grassland habitats and once established are even more difficult to eradicate.

Invasive small trees and large shrubs that were detected and mapped in San Mateo County Parks (Rana 2002) include:

- Acacia (several species, including blackwood acacia (*Acacia melanoxylon*) and Bailey's acacia (*Acacia baileyana*));
- Australian tea tree (*Leptospermum laevigatum*);
- Cotoneaster (*Cotoneaster sp.*);
- French broom (*Genista monspessulana*);
- Glossy privey (*Ligustrum japonica*);

- Gorse (*Ulex europaeus*);
- Heavenly bamboo (*Nandina domestica*);
- Himalayan blackberry (*Rubus discolor*);
- Myoporum (*Myoporum laetum*);
- Scotch broom(*Cystisus scoparius*);
- Single-seed hawthorn (*Crataegus monogyna*); and
- Spanish broom (*Spartium junceum*).

All of these species are perennials that reproduce primarily by seed, however, some also spread vegetatively by underground roots, or canes (e.g., cotoneaster, Himalayan blackberry). Many of these species can also sprout from underground roots or stumps ("stump-sprouting") after being cut (e.g. Scotch broom, Spanish broom, acacia, cotoneaster and others), consequently follow-up treatments are essential for successful control. Specific control options for gorse, French broom, Scotch broom, Spanish broom, and Himalayan blackberry are described separately following a general discussion of treatment options.

General Treatment Options for Small Trees and Shrubs

Park staff and other weed control practitioners have had success treating small trees and large shrubs using the "cut and paint" method. Plants chosen for this method are cut just above ground level, then the cut surface is painted with herbicides within 10-15 minutes after cutting to ensure that the stump adequately absorbs the herbicide. This method is most effective on small to medium sized infestations of small trees and shrubs, and should be undertaken when they are actively growing (i.e. late spring) to allow transportation of the herbicide into the root system. Larger stumps can be painted to cover the outer ring of cells (cambium layer). This can be accomplished by "ringing" -- separating the bark from the cambium layer in a complete circle around the tree-- making sure that at least 1-5 inches of fresh cambium is exposed in a band around the entire trunk, then painting the exposed band with herbicide.

Larger infestations can be foliar sprayed (i.e. applying herbicide to the entire plant surface) with a low-pressure nozzle to help ensure a small application area and to help prevent 'drift.' Following uptake and death of the plant, the dead biomass can then be cut and removed from the site.

If herbicide application is not appropriate, an alternative treatment would be to cut the tree or shrub to near ground level, then cover the cut stumps with barrier fabric (e.g. thick black plastic or similar barrier) to reduce resprouting potential.

Park staff and volunteers can remove smaller trees and shrubs in accessible locations by hand using weed wrenches. Smaller trees or shrubs, can be removed entirely, including the root ball, using hand tools, and then should be monitored for re-sprouting.

Follow-up treatment after either method described above should focus on hand removal of stump resprouts and seedlings (e.g. hand pulling or weed-wrenching), or, in cases where resprouts are located in inaccessible areas or are prolific, re-sprayed with herbicide. Smaller trees or shrubs, can be removed entirely, including the root ball, using hand tools, and then should be monitored for re-sprouting. If hand removal is not effective, re-sprouts can be treated with herbicide to achieve control.

Some small trees and shrubs are known to be especially difficult to control. Additional information is provided below for the following species:

- **Gorse (*Ulex europaeus*).**
- **Broom Species (French Broom, Scotch Broom, and Spanish Broom).**

- **Himalayan Blackberry (*Rubus discolor*).**

Gorse (*Ulex europaeus*). Gorse is a noxious evergreen, leguminous shrub that is native to central and western Europe. Because this species is so difficult to control and poses such a threat at San Bruno Mountain, additional information specific to control of this species is provided. Gorse is a problem shrub at San Bruno Mountain where it is displacing native habitats as well as habitat for the endangered mission blue butterfly and other sensitive species. Control of this weed at San Bruno Mountain is a key component of the San Bruno Mountain Habitat Conservation Plan (HCP). The HCP specifies that gorse control should be used only when it clearly improves the existing biological condition of an area.

Gorse plants produce large numbers of seeds at the rate of 500-600 seeds/square meter, with counts of up to 20,000 seeds/square meter in the top 2.5 cm of soil.[1] Seeds may remain dormant yet viable in the soil for up to 30 years, with one report of 70 years of dormancy.[2] Gorse reproduces primarily by seed, but it can also spread vegetatively, resprouting from stumps and or underground rhizomes.[3]

Treatment Options: Successful control of gorse requires two stages of treatment. First is the control of established plants. Second is the control of new plants emerging from seeds that may last more than 30 years in the soil. Establishing competitive pasture species, forest trees, or other crops helps prevent gorse and other weed invasions.

Machine Removal Methods. Machine removals are best suited to large, mature gorse infestations in non-sensitive areas. Machine removal has limited applications on steep slopes.

A pilot gorse removal project at San Bruno Mountain successfully used large machinery (e.g, a wide-tracked "Brontosaurus" or excavator) with various attachments (e.g. masticator, combo-bucket, roto-vator or brush-hog) to cut or pull the mature gorse vegetation. The machines were then used to mechanically chop plant material into small 1-3 inch long pieces for mulch. A smaller machine such as a bobcat, drum chipper and/or small brontosaurus can also be used to conduct mechanical removal efforts.

Hand Removal Methods.

- **Hand pulling** - effective on seedlings and plants up to one meter tall, and before seed production. Seedlings are easiest to remove after rain, when the whole root system can be removed.
- **Hand hoeing** – effective when gorse is growing with beneficial vegetation nearby. Hoeing, and cutting off the top of plants will expose them to the sun, drying them out.
- **Cutting** – before seed production will prevent further dispersal, but the plants will resprout from the stump. Cutting is a necessary step when working with large plants, to remove the above ground portion.
- **Hand-digging** – effective on small infestations and one way to control a plant's capability to resprout from the roots.
- **Chopping, Cutting or Mowing** – an option for flat areas. Several mowings may be necessary to deplete root reserves; if only one cut, it is recommended to use before flower production. Cutting is recommended before herbicide application. A cut

[1] Zabkiewicz and Gaskin 1978a, Hartley et al. 1980 (From San Bruno Mtn. report)
[2] Zabkiewicz 1976 (From San Bruno Mtn. report)
[3] from Hill, 1949, as cited in Hoshovsky 1989 (From San Bruno Mtn. report)

gorse plant will resprout from the crown in greater density if herbicides are not applied.

Livestock Grazing. There is considerable research into control of gorse using livestock. The most effective grazing program for gorse is use of intensive goat grazing for an extended period. Although goats can be effective in removing above ground gorse vegetation, control and elimination of the seed bank is problematic, especially because goat droppings tend to release nitrogen into the soil, increasing gorse seedling germination rates. One management suggestion would be an extended grazing program of 3-5 years, followed by spot application of herbicides for an additional 2-5 years.

Herbicide Application. It is important to note that research on herbicide effectiveness for gorse control is ongoing. Prior to selecting a final herbicide treatment for gorse, County Parks staff should review current research on control of the species, and also review the results of the San Bruno Mountain gorse study (if available) and as appropriate, follow final treatment recommendations. As with all chemicals, when selecting an appropriate herbicide mixture and application method, follow IPMP guidelines, and consult with the local Agricultural Commissioner's office and EPA guidelines for herbicide application near endangered species. Herbicide application should be conducted by County Parks staff or a local licensed QAL herbicide applicator with extensive experience with wildland weeds. During the course of work, extreme care should be taken to assure that all Habitat Conservation Plan (HCP) required mitigation measures are followed.

Preferred Herbicide Method of Control at San Bruno Mountain:

- Garlon 4™ (Trichlopyr) is currently used to control gorse at San Bruno Mountain. It penetrates both the plant and woody tissue of gorse and other woody shrubs, causing dieback. Garlon 4™ when used properly has limited affect to surrounding native perennial grasses, allowing for continued seed production and natural colonization.

- After mechanically cutting the shrubs, treat standing stumps with Garlon™ 4 at 25%, mixed with an approved diluent. Chemical should be painted on the stumps within 30 minutes of cutting.

- A 4 to 6-month follow up treatment of Garlon 4™ at 2% should also be applied to stump regrowth (known as "flags") when the plant reaches 16-24inches tall. This lower concentration of herbicide has a very effective kill rate when there is enough leafy material to translocate the herbicide, an auxin mimic, effectively. This application would be applied with backpack sprayers using appropriate low volume tips to ensure adequate coverage and reduce drift. This method greatly reduces the amount of herbicide that will need to be applied to the project site.

- Rodeo™ (Glyphosate) may be used as a substitute for Garlon 4 in wetland areas. Rodeo™ is less effective initially, but is an aquatic approved herbicide for areas that may be adjacent to wetland habitat. Multiple applications will probably be required to effectively control the plants.

- A spray rig will be used to treat areas where manual and mechanical methods become more difficult or a brown & decay method is acceptable. The Spray truck should be equipped with a minimum 125gal. Tank with at least 700 feet or more of

3/8 inch hose. An additional 4000' of hose would be advisable, from 3/8-5'8" in diameter, to treat areas where access is limited. This method is anticipated to be the most effective way to treat the more disturbed sites where the gorse infestations are greater than 50% cover and where a dense seed bank flush is observed.

Gorse Green Waste/Biomass Control. Treatment of biomass will depend on how much gorse is being removed. Individual plants can be left onsite to dry out. Biomass from small infestations can be collected, solarized by piling the material into green waste bins or small piles, and covering with a tarp to kill the vegetation before it is transferred elsewhere. DO NOT TRANSPORT ANY GREEN WASTE OR BIOMASS CONTAINING GORSE MATURE SEEDS OR SEED PODS! Small amounts of biomass can also be cut into small sections or chipped and left onsite as described for large projects. For larger projects with lots of biomass, the cut gorse vegetation material should be collected, then chipped and strategically spread onsite within a designated area. Mulch should be deposited no more than 4-6 inches deep (to facilitate natural solarization and rapid break down of the material). Mulch should be only spread in areas that were previously infested with gorse to contain the seed bank, and also to limit the area that could be affected by excess Nitrogen (Note: Gorse is a legume that fixes Nitrogen. When the plant breaks down, it typically releases a large amount of Nitrogen into the surrounding soil, a process that is likely to favor establishment of weeds). Following initial biomass treatment, the treatment area should be spot-checked two to three times per year, and seedlings and re-sprouts treated (foliar spray) with Garlon 4. No mulch piles should be created in the areas currently supporting grassland or sensitive species habitat. Rare and endangered and butterfly host plants should be avoided during chipped vegetative material distribution.

Follow Up Site Treatments, Treating Resprouts and Controlling Seed Bank. Following removal efforts erosion control BMPs should be implemented to limit erosion, particularly on steep slopes. Additionally, supervision of contractors may be necessary during all mechanical, manual, and long term management efforts to avoid impacts to native plant and animal communities.

A series of well-timed follow up control treatments are critical to controlling gorse. Re-treatments should be less intensive over time as the seed bank is exhausted, eventually resulting in either sustained control or full eradication of the species from the treatment area. Park staff and volunteers have found the following follow-up treatment regime to be effective in treating re-sprouts and seedlings. Conduct spot inspection of the treatment area and biomass control area 2 to 3 times during the first year following initial treatment. For Years 2-5, spot check these areas at least 2 times per year. Assuming these efforts are successful, spot checking can be reduced to once a year, until no more seedlings are detected, up to 30 years.

Any seedlings and re-sprouts should be hand pulled, cut and immediately painted with herbicides (Garlon 4), or foliar sprayed (Garlon 4). New gorse plants should not be allowed to flower or set seeds! If flowers or seed ponds are observed, increase frequency of follow up treatments.

Grazing may be considered as a tool to be used during the maintenance phase to control resurging growth. (Refer to the "Livestock Grazing to Manage Sensitive Habitats" section B.11 in this appendix). This treatment option should be confined to larger areas where dense stands of gorse have been removed.

Prescribed burning is not recommended since there are often windy conditions on San Bruno Mountain, making burning unsafe.

Preferred Treatment Methods: At present, gorse removal activities have been ongoing at San Bruno Mountain for 2 years. These control efforts have been applied on a 20+-acre "pilot" or experimental scale that was initiated in 2004 to (1) determine if they were biologically effective, (2) refine them so that they are both most effective and cost-effective and (3) determine whether they have any undesired effects not anticipated.

Although the results of the test studies are not yet complete as of the publication date of this report, some preliminary results can be used to guide future gorse control activities. Park staff and other weed control practitioners have had success treating gorse at San Bruno Mountain as follows:

- **Large Infestations in Non-Sensitive Habitat Areas.** In this situation, wide-track machines such as skid-steers and excavators with various attachments (e.g. masticator, combo-bucket, roto-vator and brush-hog) should be used to cut or pull the mature gorse vegetation, then machines can be used to mechanically masticate or chop plant material into small (1-3 inch long) mulch. A bobcat, drum chipper and/or brontosaurus should be used to conduct the majority of the mechanical removal efforts and mulching. Mulch should be deposited no more than 4-6 inches deep (to facilitate natural solarization and rapid break down of the material). Mulch should be only spread in areas that were previously infested with gorse to contain the seed bank, and also to limit the area that could be effected by excess Nitrogen (released from the breakdown of plant materials). Following initial treatment, the treatment area should be treated 2-3 times per year, and seedlings and re-sprouts treated (foliar spray). (See section below on selecting herbicides for use on gorse).

- **Medium or Small Infestations, Non-Sensitive Habitat Areas.** Use machinery (described above) or hand crews with chainsaws and brushcutters to remove vegetation biomass. Immediately following removal, paint the cut stumps with an appropriate herbicide to control re-sprouts (See notes below on selecting herbicides for use on gorse). Following initial cut and paint application, an additional 2 to 3 complete sweeps of the treatment area will be required to control re-sprouts and seedlings during the first, year, with subsequent spot treatment (described below) in subsequent years. In some instances, (usually for very sparse invasive plant occurrences), foliar spraying of herbicide followed by cutting and removal of the mature vegetation is effective. (See section below on selecting herbicides for use on gorse).

- **Individual Plants and Outlier Infestations, Sensitive Habitat Areas.** Individual gorse plants, and gorse infestations of sensitive habitat areas, (e.g, mission blue butterfly habitats, wetland habitats) should be hand-pulled. Hand pulling involves the removal of the entire plant, including the root system with a weed wrench or similar tool. This method is highly effective, but extremely time intensive, therefore should be used for small infestations and for very sensitive areas where use of mechanical methods is not appropriate.

  In sensitive habitat areas, herbicide application should be conducted to prevent impacts on species of special concern, including nectar and host plants for Mission blue, San Bruno elfin, and Callippe silverspot butterflies. Two methods of herbicide applications to consider in sensitive areas are direct spraying of the entire plant using

a low pressure small volume nozzle applicator onto target biomass, and cut and paint applications for larger woody species and species located in or near sensitive areas where herbicide drift could occur.

Shields and barriers need to be used when treating gorse plants that are located near plants of concern and/or butterfly host and nectar plants. For example, staff can hold up a Tyvek sheet or corrugated iron sheet to prevent herbicide drift, or can "wrap" or place a cone over nearby sensitive plants to prevent inadvertent effects. A 2-foot buffer zone between herbicide application and sensitive plants is a common rule of thumb. Herbicides should never be applied on windy days - a maximum 5 mph wind limit should be observed.

- **Limited Access Areas, Steep Slopes Subject to Erosion Problems.** Limited accessibility to some work units may limit removal technique to hand removal. For example, on steep slopes, the need to winch equipment along the steep areas may make machine removal infeasible. For small outlier infestations, and for infestations in sensitive habitat areas, it is advisable to use hand control methods as a first option. As an alternative, a very localized and careful foliar herbicide application can also be used.

French Broom (*Genista monspessulana*), Scotch Broom (*Cystisus scoparius*), and Spanish Broom (*Spartium junceum*). These three broom species are invasive perennial shrubs that spread quickly in grassland and scrub habitats. Plants establish quickly, and can flower in the first year following establishment. Individual plants typically produce large numbers of seeds that can remain viable in the soil for decades. These shrubs are reported to crown sprout, however, in practice, they usually re-sprout from underground roots. Spanish broom may also reproduce by stump sprouting. Spanish broom is the least widespread and considered the least problematic of the three broom species.

Treatment Options: Successful treatment requires one or more types of treatments over multiple years. For small infestations and newly established infestations, hand removal/hand pulling plants using a weed wrench is highly effective. For larger infestations, a combination of one or more of the following combined with diligent and repeated treatment of re-sprouts and seedlings is required to achieve control:

- **Hand Pull:** In many instances, Scotch broom, French broom, and Spanish broom seedlings and small shrubs are most effectively controlled by hand-pulling in early spring. Use weed wrenches for larger plants, and try to remove the entire plant, including the roots. Seedlings can also be scraped with a hula hoe. Volunteers or independent contractors may perform this activity.
- **Cut**: Most appropriate for larger plants that cannot be pulled in their entirety (described above). Cut the shrubs to the ground surface using pruning sheers, loppers, or brushcutters, ideally during the dry season to stress the plant. Cut stumps that are not sprayed with herbicide will re-sprout and will require follow-up treatment, Alternatively the plant can be girdled by cutting the bark from the circumference of the stem about 2 inches above ground level and peeling back the bark to ground level.
- **Mow and Treat**: Using a weed-eater with a blade, cut shrubs close to the ground late in the growing season followed by herbicide application. Glyphosate application (1-2%) (e.g. Roundup Pro™ or AquaMaster™) may be used with a wick-type applicator immediately after cutting. A follow-up herbicide application may be required after the plants have begun to grow back.

- **Cut and Treat:** Cut stems to near ground level and immediately treat stumps with 25-50% concentration glyphosate (Roundup Pro™ or AquaMaster™ depending on proximity to water) immediately after cutting. Most successful control occurs in the early spring.
- **Livestock Grazing:** There is considerable research into control of gorse using livestock. The most effective grazing program for broom species is use of intensive goat grazing for an extended period. Although goats can be effective in removing above-ground broom vegetation, control and elimination of the seed bank is problematic, especially because goat droppings tend to release nitrogen into the soils, increasing seedling germination rates. One possible application would be an extended grazing program of 3-5 years, followed by spot application of herbicides for an additional 2-5 years.
- **Flame:** Seedlings less than 1 inch in diameter can be flamed or blanched using a propane torch. Flaming must be conducted in winter when surrounding vegetation is wet to reduce risk of wildfires.

Preferred Treatment Methods: In many instances, French broom, Scotch broom, and Spanish broom infestations are small and can be removed by staff or volunteers using hand tools as described above. For larger infestations, we recommend hand removal with weed wrenches, or machine removal (typically brushcutting) followed by painting or spraying the cut stems with glyphosates (1-2%) (e.g. Roundup Pro™ or AquaMaster™).

Himalayan Blackberry (*Rubus discolor*). Himalayan blackberry is a perennial shrubby vine that reproduces sexually and by a number of vegetative methods. While it is a invasive species of concern in fragile native habitats, it does provide wildlife habitat values, and is not as high a priority for complete extirpation as other invasives. Himalayan blackberry's stout thorns make the use of protective gloves and clothing necessary during removal work. Where appropriate, Himalayan blackberry should be removed from native habitat areas as follows:

Treatment Options: Successful removal methods can include cutting back canes and digging out roots, brushcutting, and cutting and treating. These methods are described in greater detail below.

- **Cut and Dig:** Cut stems close to the ground and dig out the root ball, removing as much of the main rootball and lateral roots as possible.
- **Brushcutting:** Brushcut the canes and clear the vegetation, preferably when the flowers are in bloom but before the fruit sets.
- **Cut and Treat:** Cut stems to about 1 foot in length and treat stumps with 25-50% concentration glyphosate (Roundup Pro™ or AquaMaster™ depending on proximity to water) immediately after cutting. Most successful control occurs in the fall, late September through October, when stored sugars are being translocated in the plant from the leaves and stems to the roots. Herbicide should not be used in areas where people may pick and eat the berries. Sprayed areas should be appropriately signed and marked to alert the public.

Preferred Treatment Methods: In most instances, Himalayan blackberry should be removed by staff or contract labor due to the large areas of infestation within park boundaries. Staff or Contractors should use hand or machine removal (typically brushcutting) followed by painting of the cut canes as the preferred control method. The treated plants should be marked with caution tape or temporary fencing to prevent contact with visitors (i.e. berry harvest). Infestations shall be removed slowly, and to the greatest

degree feasible native blackberry or other similar stature native vegetation will be established concurrently to reduce possible impacts to birds utilizing Himalayan blackberry as habitat.

Smaller accessible infestations will be removed by volunteers using hand tools as described above.

4. Perennial or Biennial Herbaceous Plants

Several species of invasive herbaceous plants are found on San Mateo County Park lands. Many of them produce a large number of seeds that have long-term viability in the soil. They can invade and dominate the understory, shading out smaller native plants. Perennial or biennial herbaceous plants that have infested San Mateo County Park lands include:

- Australian fireweed (*Erechtites minima*);
- Fuller's teasel (*Dipsacus sativus*);
- Oxalis/Bermuda buttercup (*Oxalis pes-caprae*);
- Ox-eye daisy (*Leucanthemum vulgare*);
- Sweet fennel *(Foeniculum vulgare);*
- Poison hemlock *(Conium maculatum);*
- Purple loosestrife (*Lythrum salicaria*); and
- Prickly ox tongue *(Picris echioides).*

Australian fireweed (*Erechtites minima*). Little information is available on this species, although it is reported as an occasional weed along the coast at low elevations (<500 m) from central Oregon to Santa Barbara County and the Channel Islands. It is found primarily in disturbed areas, especially roadsides, stream banks, pastures, and following wildfire and other burns. The species tends to prefer grasslands, woodlands, and coastal scrub habitats (Hickman 1993). Likewise, little is known about the growth and reproduction of Australian fireweed. It reproduces by seed, and prefers disturbed areas, therefore removal efforts must be careful to disturb as little of the soils surface as possible. **Treatment Options:** Little is known about how to control the species. At the Channel Islands, the National Park Service uses volunteers to manually remove fireweed. There are some references in the literature to successful control of the species in Indonesia using glyphosate. We recommend that a test study be conducted to determine the most effective treatment. Check with a certified herbicide applicator to assess current chemical methods registered for the habitat type where fireweed removal efforts are planned.

Fuller's teasel (*Dipsacus sativus*). Fuller's teasel spreads rapidly along disturbed areas. It is a biennial in its native habitat, however, in California's temperate climate it often lives beyond its normal two-year life span. It is very drought-tolerant since it has a carrot-like root that remains in the ground all summer without drying out. Some of the roots are 12 inches long. It blooms between April and August. Each plant forms a single seeded dry fruit, which drops from the plant inflorescence as it dries. **Treatment Options:** A successful removal treatment used by the Friends of Edgewood Natural Preserve to battle thousands of teasel in six areas within the west side of their park was as follows: In early spring when new plants can be easily pulled from wet ground, spade them out. Make sure to remove the entire root from the soil to prevent resprouting. When the ground dries, making root removal difficult, use light-weight mattocks to cut off the crowns of plant just below the soil surface. At this point the seed heads have not yet matured. After the seed heads mature, carefully cut off each head and place in a bucket (seeds will spill out into the bucket). Dump bucket contents into a large plastic bag and have them removed from the park. Six weeks later, sweep the area to remove any remaining teasel. **Preferred Treatment Methods:** Use the manual

removal methods described above. The Friends of Edgewood Natural Preserve found that, initially, their teasel removal efforts seemed to have little impact, most likely due to seed from prior years remaining viable in the soil and continuing to germinate over a period of 3 to 5 years. By year 5 the area showed a big improvement, which underscores the need to repeat teasel removal efforts over a number of years.

Oxalis/Bermuda Buttercup (*Oxalis pes-caprae*). Bermuda buttercup is a perennial that grows in full sun in cool coastal areas, but inland it grows primarily in shaded areas. It grows from bulbs in fall and flowers in late winter or early spring. The plant forms a single, short, vertical stem that is mostly underground. Bermuda buttercup reproduces primarily by means of bulbs and spreads when soil contaminated with the bulbs is moved to uninfested areas. **Treatment Options:** Treatment options include cutting, solarization, herbicide application, or flaming followed by herbicide action.

- **Cutting:** Although the top of the plant can be controlled by cultivating or cutting it off, this will not kill the bulb. Cut Bermuda buttercup before it flowers and forms new bulbs. Repeated cutting or cultivation is necessary to reduce a population.
- **Solarization:** Before planting an infested area, soil solarization can be used to reduce Bermuda buttercup populations. Best results have been obtained if solarization is done for 4 weeks during the months of June, July, or August.
- **Herbicide Application:** Glyphosate effectively kills the top growth of this weed, but it is a nonselective herbicide that also kills ornamentals: be careful this herbicide does not drift onto desirable plants. Other herbicides are not effective on Bermuda buttercup beyond the seedling stage or on plants emerging from bulbs.
- **Flaming, followed by herbicide application:** The National Parks Services is currently considering using flaming to remove above ground parts of this species (and to weaken the plants resources, followed by spot-application of herbicides (glyphosates). We recommend contacting the GGNRA for results of this treatment.

Preferred Treatment Methods: For small infestations, we suggest cutting the above ground part of the plants, followed by herbicide application. Because Bermuda buttercup spreads mostly from bulbs rather than seeds, do not move soil from an infested site to one that is free of the weed. For large infestations, we recommend a foliar application of glyphosate, followed by spot applications in trouble areas.

Ox-eye Daisy (*Leucanthemum vulgare*). Ox-eye daisy is a perennial herb. It spreads through abundant seed production and vegetatively through rhizomes. Seeds are small and fall to the ground up to six feet from the parent plant. They are easily dispersed through water, human and animal foot traffic, and earth-moving machinery. Seeds germinate continuously as long as there is adequate moisture, and remain viable in the soil for at least two years. **Treatment Options:** Treatment options include manual removal, mulching, and herbicide application.

- **Manual Removal:** Hand removal is efficient for small infestations (less than 0.25 acre) or if the plants are widely scattered. Using a small hand pick, chip around the base of the plant several inches deep to loosen the plant. Then lift the entire plant out intact without leaving any rhizomes (stem pieces) behind. If the soil is flat and compacted, a sharp garden spade can be used to scrape the plant out of the soil. A hula hoe is also useful for scraping away masses of seedlings or small plants.
- **Mulching:** The most successful non-chemical method for removing large infestations in the Golden Gate national Recreation Area was to mulch heavily. Rice straw can be used to eliminate masses of mature and immature plants. Straw should

be applied in the fall at the onset of the growing season. One bale will cover approximately 100 square feet.

- **Herbicide Application:** When applied in the early flowering stages, picloram, imazapyr, sulfometuron methyl, and dicamba are effective at label concentration.

Preferred Treatment Methods: Manual removal followed by mulching are recommended. Mulched sites should be monitored so that another thick layer can be applied if any live plants are found under the straw. It is a good idea to add a second layer of mulch before flowering begins in May. In addition, certified rice straw should be used to avoid introduction of terrestrial weed seeds. If the species still persists, spot-spray with herbicides.

Poison hemlock (*Conium maculatum*) and Sweet fennel (*Foeniculum vulgare*). Sweet fennel is a perennial herb related to poison hemlock. Fennel reproduces by seed and, after cutting, by regenerative root crowns. Poison hemlock reproduces by seed only. Each poison hemlock plant can produce roughly 1,000 seeds. One sweet fennel plant can produce over 100,000 seeds within two years, and these seeds remain viable in the soil for several years. Both of these erect herbs can form dense stands and shade out native plants. **Treatment Options:** Treatment options for these two species are similar. They include pulling, cutting, mowing, brushcutting, and herbicide application. Note: BEWARE that poison hemlock is toxic to the skin and respiratory system. Wearing gloves and a mask is advised.

- **Pulling/Cutting:** Small seedlings can be pulled out by hand, though larger plants will require tools. If the whole root is unable to be removed, cutting into the root crown just before the plant sets seed reduces the number of resprouts. Be aware that soil disturbance will expose seeds and increase germination. Often hand removal is only partially effective.
- **Mowing/Brushcutting:** Additional treatments could include mowing/brushcutting 3-4 times a year, about every 1-2 months, beginning in March–April. Note: AVOID mowing during seed set, as it encourages seed spread.
- **Herbicide Application:** Foliar herbicide application (Roundup Pro™ or AquaMaster™) can also be effective for controlling these species. A 2 percent solution of glyphosate (e.g., Roundup Pro™ or AquaMaster™) has been effective when sprayed on the leaves of green seedlings emerging after dormancy in late spring.

Preferred Treatment Methods: Large infestations of fennel and hemlock should be treated with a foliar spray of 2% glyphosate (i.e. Roundup Pro™ or AquaMaster™). Small infestations and individual plants can be controlled by hand-pulling the entire plant, preferably in spring prior to seed set. Follow-up seedling control treatments should be conducted for 3-5 years following treatment (Harris Design 2005).

Purple loosestrife (*Lythrum salicaria*). Purple loosestrife is a perennial wetland herb that can rapidly degrade wetlands, diminishing their value for wildlife habitat. It flowers from late June through September, and the seed set begins in mid-July and continues through late summer. Seeds are copiously produced (more than 2,000,000 seeds per mature plant) and are viable for several years. **Treatment Options:** Treatment options include manual removal and use of herbicides.

- **Manual Removal:** Pull out younger plants (one to two years old) by hand in areas with individual plants and areas with small, localized stands of up to 100 plants. Do not pull out older plants because once they've flowered, this will

scatter their seeds. Older plants, particularly those in loose soils, can be dug out by loosening roots with a cultivator.

- **Herbicide Application:** The most effective herbicides available for areas up to four acres with clusters in excess of 100 plants are glyphosate (as Roundup® and Rodeo®) applied in spot applications. Herbicides should be applied to the foliage during the blooming season.

Preferred Treatment Methods: A combination of manual removal and herbicide application should be used, depending on the size of the infestation. Care should be taken to bag and remove all plant parts from the site since broken-off pieces can re-root. Plants can then be dried or burned. (Refer to the "How to Conduct Controlled Burning for Vegetation Management" section in this appendix.)

Prickly Ox Tongue (*Picris echioides*). Prickly ox tongue is a biennial herb that grows from an underground taproot. This species, although not particularly invasive or threatening to natural communities, it is of concern to park managers because it grows in high use lawns and picnic areas and along trails at several County Parks. The species spreads by dandelion-like seeds that are wind-born, therefore successful control must seek to control and then stop seed production, especially in high wind areas such as near the Bay. It also can regrow from root fragments, therefore weed eating and low mowing (activities that may fragment and spread the roots) can spread the species rather than control it. **Treatment Options:** Treatment options for this species includes spring hoeing, hand pulling, cutting, mowing, brushcutting, and herbicide application.

- **Hand Removal:** One of the most effective control methods is to use a hula-hoe or similar hoe and remove the entire plant in early spring (Feb) when soils are wet and prior to plant flowering. This is particularly useful in small areas, and can be implemented by volunteers.
- **Pulling/Cutting:** Small seedlings can be pulled out by hand, though larger plants will require tools. If the whole root is unable to be removed, cutting into the root crown just before the plant sets seed reduces the number of resprouts. Be aware that soil disturbance will expose seeds and increase germination. Often hand removal is only partially effective.
- **Mowing/Brushcutting:** Mowing or cutting the plant with a weedeater can be effective IF done regularly, starting in February before the plants set flower, and continuing EVERY time the plants try to re-flower, approximately 2-3 times per month from March until May. Note: AVOID mowing after seed set, as it encourages seed spread.
- **Herbicide Application:** Spot herbicide application (Roundup Pro™ or AquaMaster™) especially when combined with a mowing program is the most effective treatment for controlling these species. A 2 percent solution of glyphosate (e.g., Roundup Pro™ or AquaMaster™) has been effective when sprayed on the leaves of green seedlings emerging after dormancy in late spring. Each treatment will require a prescription from the park IPM Specialist.

Preferred Treatment Methods: Large infestations should be mowed or string-mowed with a weed-eater in February, followed by a 1-2 times per month mowing program combined with spot application of herbicide treatment of 2% glyphosate (i.e. Roundup Pro™ or AquaMaster™). Small infestations and individual plants can be controlled by hand-pulling the entire plant suing a hula hoe or similar equipment, preferably in February prior to flowering. Follow-up seedling control treatments should be conducted for 3-5 years following treatment.

5. Groundcover Plants

Invasive groundcover plants found on San Mateo County Park lands have become a problem. They can form dense carpets of both above-ground vegetation and matted roots that exclude native groundcover species and prevent the establishment of native tree and shrub seedlings. Ivies can grow in dense, continuous mats, blanketing native vegetation. Eventually even large trees can be killed by ivy climbing into and over-topping their canopies. Groundcover plants that have infested San Mateo County Park lands include:

- Cape ivy (*Delairea odorata*), formerly known as German ivy (*Senicio mikanioides*);
- Garden nasturtium (*Tropaeolum majus*);
- Iceplant/hottentot fig (*Carpobrotus edulis*);
- Ivy (English ivy (*Hedera helix*) and Algerian Ivy (*Hedera canariensis*));
- Periwinkle (*Vinca major*); and
- Wandering Jew (*Tradescantia zebrine*).

Treatment for each of these groundcover plants is described separately below. Some goundcover species are combined because they have the same or similar treatments.

Cape Ivy (*Delairea odorata*). Cape ivy (formerly known as German ivy, *Senecio mikanioides*) is a climbing and spreading perennial vine that reproduces vegetatively and by wind-disperesed seed. Seeds and stem fragments can sprout on the soil surface or when buried a few centimeters, and plants can re-generate from one-node fragments. The ability to sprout from seeds or small stem or root pieces requires consistent and meticulous removal efforts. Due to the resource-intensive nature of controlling Cape ivy, containment lines are often created around the perimeter of a patch as an interim measure before complete removal. Containment lines cut through surrounding vegetation require continual maintenance to remain effective and in the presence of viable, wind-dispersed seed are ineffective by themselves.

Treatment Options: In the past it was thought that containment lines were sufficient to control Cape ivy's spread. Now we know that management of populations with viable seed is a higher priority than populations which are only reproducing vegetatively. The following treatment suggestions apply to populations which are not producing viable seed…Park staff and other local practitioners (e.g. firms specializing in invasive plant control) currently control Cape ivy using the following techniques. First they cut a containment line approximately 5-10 feet wide around the infestation by clearing all vegetation to bare earth. Starting at the outer edge of the area, they either remove the cut plant material or pull all Cape ivy inward, working towards the center. If possible, they peel back the edges of the infestation where the vine is more lightly rooted, and roll the vegetation in on itself similar to rolling a carpet. Then all above ground vegetation and stolons are removed, and the top several inches of soil are raked to remove any remaining root or stem fragments. Cape ivy that is found growing on trees can also be treated by cutting out sections of the climbing stems with loppers and leaving the upper portion of the Cape ivy to die in the tree.

The removed Cape ivy biomass must be handled carefully to prevent inadvertent spread to other areas. Plant material should be bagged and removed from the site, composted in other infested areas, or dried on a tarp. Piled biomass should be checked at least 2 times a year in drier areas and 4-6 times a year in moist locations to ensure that no stems or roots are regenerating.

Following initial removal, resprouts in the treated area can be sprayed with Roundup Pro™ or AquaMaster™ if deemed appropriate, or re-treated several times using hand labor where

feasible. If continued hand removal efforts are undertaken, ensure that all roots and stems are removed every few months over a period of 2-5 years while working towards long-term eradication.

Preferred Treatment Methods: A determination of where viable seed is being produced within a management area is the most important information necessary for control of Cape ivy infestations. A park may have several Cape ivy patches, and if some are seed producers they should be prioritized for removal. Once the determination of viable seed locations is made and patches are prioritized, three general treatments are recommended for three distinct types of Cape ivy infestations:

- ***Cape ivy infestations greater than two acres in size*** shall be removed using contract labor (i.e. hand pulling or machine cutting, rolling the vegetation biomass, spraying the treatment area with Roundup Pro™ or AquaMaster™, and composting the biomass onsite). Contract labor shall be used to install all of the initial containment lines, remove Cape ivy systematically from within each defined patch (as defined by containment line) and remove resprouting ivy from cut areas for no less than 3 years after initial cutting.
- ***Cape ivy infestations 2 acres in size or less located on steep terrain or other unsafe locations*** shall be removed using contract labor either by hand or by chemical means as described above for a similar time period.
- ***Cape ivy infestations 2 acres or less in size located in accessible areas on safe terrain*** can be removed by hand by volunteers, rolling the biomass and composting biomass onsite. Optimal size for biomass composting should be at least 1 cubic yard to ensure that the pile sufficiently heats and breaks down, keeping resprouts to a minimum. Follow up hand removal treatments should be performed every 3 months for the first two years, and at least once a year for years 3 through 5. Herbicides may be applied to volunteer treatment areas if hand removal treatments are ineffective.

Iceplant *(Carpobrotus edulis)*, Wandering Jew *(Tradescantia zebrina)* and Garden Nasturtium *(Tropaeolum majus).* Iceplant, wandering jew, and garden nasturtium are grouped together as they are removed using similar treatment strategies. **Iceplant** is widespread throughout coastal areas because it tends to favor well-drained sandy soils, so is often found on remnant dune, coastal bluff, and disturbed sandy soils. It spreads both vegetatively and by seeds. Shoot segments can grow more than three feet per year, and can continue to grow if they are isolated from the parent plant. Flowering occurs almost year round, and seed production is high, with hundreds of seeds produced in each fruit. **Garden nasturtium** is a vine-like plant, spreading along the ground and climbing shrubs and trees. Plants may be annual or perennial. The plant spreads by seeds, vine-like runners, and cuttings. **Wandering Jew** is a creeping, succulent herb with a sticky irritant sap that forms dense mats. It reproduces by seed and roots from nodes. **Treatment Options:** Treatment options include hand removal, mechanical methods such as use of a bobcat or tractor, and herbicide application.

- **Hand Removal:** Iceplant and garden nasturtium are both easily removed by hand pulling. Since the plant can grow roots and shoots from any node, all live shoot segments must be removed from contact with the soil to prevent resprouting.
- **Mechanical Methods:** Removal by bobcat or tractor is efficient for areas where there are no sensitive resources. However, to prevent significant soil removal, the use of a brush rake attached to the scoop is recommended.

- **Herbicide Application:** An alternative treatment that may be best applied to steep cliffs and areas that are not visible to the public is to treat the iceplant with glyphosate, then allow it to decompose in place .

Preferred Treatment Methods: Remove small infestations by hand. Large infestations should be treated using a combination of hand removal and spot herbicide application. For iceplant infestations on steep seaside cliffs, treat with a foliar application of herbicide (typically glyphosate) and leave the treated iceplant to decompose in place in order to to minimize soil disturbance. In areas where iceplant occurs on steep and unstable coastal cliffs and bluffs, special control methods should be employed (e.g. rappel and spray, broadcast spray and decompose onsite). In high visibility areas when treated plants cannot be left to decompose in=place, we recommend rolling the biomass into tarps, then placing the rolls out in a sunny location to dehydrate and decompose. If the biomass will be removed from the work site to a different staging area, we recommend transporting after allowing the plant material to dry for a number of weeks following removal. Alternatively, the iceplant may be stored in large green bins onsite, then removed after decomposition (to prevent inadvertent spread to other areas).

Periwinkle (*Vinca major*), English ivy (*Hedera helix*), and Algerian ivy (*Hedera canariensis*). Periwinkle and ivies (English, Algerian) are grouped together as they are removed using similar treatment strategies. Like many weedy plants, periwinkle is a garden cultivated plant that has escaped into the wildlands. It is now quite common in forested and riparian communities throughout coastal and interior foothills, and spreads primarily from stolons. English and Algerian ivies are woody evergreen vines that reproduce both sexually and vegetatively. Algerian ivy is a relatively new invasive plant in the San Francisco Bay Area, but is quickly spreading in coastal wildlands. **Treatment Options:** Similar to iceplant, removal of large infestations of these weeds can result in the increased potential for erosion on slopes and stream banks. Therefore, an erosion control strategy must be in place before large-scale removal efforts are undertaken. Park staff and others have successfully controlled these species as follows:

- **Hand Pulling:** Infestations can be pulled by hand or with rakes. Ivy can sometimes be rolled up like a carpet and piled or hauled off-site.
- **Cut:** Woody stems can be cut and the larger roots (typically ivy roots that are less than 0.33 inches in diameter) will not resprout.
- **Cut and Treat:** For vines that are climbing into trees, cut the vine at or close to the base of the tree, and then remove a 12-16 inch section of the vine's vertical stem. The aerial portion in the stem will eventually die, and the lower portion's stump can be painted with herbicide (some land managers use a 50% solution of glyphosate) or cut out. Check for new seedlings 3-4 times a year and remove by hand.

Preferred Treatment Methods: These species should be treated using the pull & roll method described above. The treated areas should be monitored. If re-sprouts occur and cannot be controlled with repeated hand removal methods, they should be treated with herbicides using a low-pressure, low volume foliar spray application of Roundup Pro™ or AquaMaster™.

6. Early Colonizing and Annual Invasive Plants

Early colonizing invasive plants typically are the first to establish in newly disturbed soils, or in areas where large patches of groundcover weeds or small stands of invasive trees and shrubs are removed. These plants typically include a large number of quick-growing invasive annual plants. Treatments for the following species are included in this section:

- Black mustard (*Brassica nigra*);
- Bull thistle (*Cirsium vulgare*);
- Italian thistle (*Carduus pycnocephalus*);
- Wild radish (*Raphanus sativus*); and
- Yellow star-thistle (*Centaurea solstitialis*).

Most of these plants are widely distributed throughout the County Parks system. They occur in both dense and sparse infestations, consisting of a few individuals, or elsewhere as concentrated clusters. Yellow star-thistle will be discussed in more detail below because it's considered to be California's worst rangeland weed.

Treatment Options: For all the species listed above except yellow star-thistle (described separately below) treat as follows. Control efforts should focus on removal in conjunction with other invasive plant control and restoration activities, and in keeping larger infestations from spreading into restoration areas. If larger infestations are found in areas to be treated, additional actions may be required to control these species. This group of weeds generally reproduces by seed. Protective clothing and gloves are required when working with thistles to protect the worker from thorns. There are many removal options for early colonizing and annual invasive plants, each should be analyzed on a site-by-site basis before selecting the most appropriate method for the individual site location. Treatment options include hand-pulling, cutting, mowing, brushcutting, covering, heavy mulching and herbicide treatment as described below.

- **Hand Pulling:** In many instances, secondary invasive species, especially annual species, are easily controlled by hand-pulling the seedlings in early spring. Volunteers or independent contractors may perform this activity.
- **Cutting:** Most appropriate for larger plants that cannot be pulled in their entirety (described above). Cut around the base of the plant and dig out the roots. Mulch with an approximately 6 inch layer of rice straw to discourage resprouts.
- **Mowing:** Mow close to the ground late in the growing season. Glyphosate application (1-2%) (e.g. Roundup Pro™ or AquaMaster™) may be used with a wick-type applicator after the plants have begun to grow back. Alternately, mow at least 3 times, ensuring that plants do not flower.
- **Brushcutting:** Brushcut small patches and cover with landscape fabric or a 6 inch layer of mulch. Pull any emerging plants the following year.
- **Mulching, Tarping, or Otherwise Covering the Area:** Most appropriate for plants with short lived seeds. Active restoration can follow mulching.

Preferred Treatment Methods: This group of plants should be primarily controlled by hand-pulling, brush-cutting, mowing or mulching infestations. Volunteers will provide an effective resource for controlling small infestations. Following removal activities, areas should be monitored several times a year to remove new seedlings and re-sprouting plants.

Yellow star-thistle (*Centaurea solstitialis*). Yellow star-thistle is a deep tap-rooted winter annual (or short-lived perennial if adequate moisture is available) that reproduces solely by seed. Large plants can produce as many as 1,000 composite flower heads which together can produce almost 75,000 seeds in a single season. It is so widespread throughout the West that eradication is not longer considered a viable option. Depending on the infestation size and scale, a more realistic goal for San Mateo County Parks may be control followed by habitat conversion of target 'problem' infestations (such as those near high use areas such as picnic areas and ballfields); "opportunistic" spot treatment of individuals when treating other

weeds; and controlling the spread of established stands by establishing containment zones. A comprehensive website on yellow star-thistle is available from the UC Davis Weed Research and Information Center http://wric.ucdavis.edu/yst/index.html.

Treatment Options: Treatment options include hand pulling, mowing followed by herbicide spot treatment, and chemical control, as described below. Information on grazing and burning treatments can be found in Sections B.11 and B.13 of this appendix, called "How to Conduct Controlled Burning for Vegetation Management" and "Livestock Grazing to Manage Sensitive Habitats."

- **Hand Pull:** Manual removal is most effective for small patches of yellow star-thistle. Pull or dig individual plants by hand in May and June before seeds mature, when plants are bolting or as soon as possible afterwards. A 'hula hoe' is very effective! (Rosettes often break off from roots, which resprout.) Grasp the plant at the base and pull steadily, straight up. Cutting lateral roots and loosening the soil around the base also make it easier to pull. If you cannot pull up the plant, cut it or twist it off at the base. Wear heavy leather gloves to prevent toxins from soaking into the skin.
- **Mowing followed by herbicide spot treatment:** Mowing (or cutting with a hand scythe, brushcutter, or any cutting tool) is best when conducted after the plants have bolted and a small fraction of the buds (about 2 percent) have started to bloom (usually in spring, late March to April). Mow close enough to the ground to get the lowest buds (leave 1-2 inches above ground). Timing is critical -- mowing after this period will not prevent seed production, and mowing too early (during the bolting or spiny stage) will allow increased light penetration and more vigorous plant growth and high seed production. Two to three mows should be conducted in the first year to weaken plants. Following mowing, spot treat any resprouts with glyphosate prior to seed production (May-June).
- **Chemical control:** Chlorsulfuron (Tellar™) is reported to provide good results when applied as a foliar spray in winter (Dec-Jan). This herbicide can also be mixed with a broadleaf selective post-emergent such as clopyralid (Transline®, Stinger®) to provide longer-term control of seedlings and rosettes, as well as soil residual activity for at least one season. (**Note**: Check with a licensed herbicide applicators as some of these herbicides are not registered for use in rangelands or pastures and should not be used where livestock graze). Following the winter treatment, spot treat any remaining seedlings and resprouts in spring (March-April) with glyphosate (1 percent solution). The best time to treat with glyphosate is prior to seed production (May-June).

Preferred Treatment Methods: Yellow star-thistle cannot be controlled with a single treatment or in a single year. A combination of manual or mechanical control, follwed by closely timed herbicide applications is recommended as the most effective means of control.

7. Invasive Perennial Grasses

Several invasive perennial grasses occur in San Mateo County Parks, and may become larger problems if allowed to spread untreated. Smooth cordgrass deserves special attention because of its rate of spread and threats to saltmarsh ecosystems throughout the Bay Area and northwest. Jubata grass is also discussed in more detail below because it is highly competitive with native plants once seedlings become established and is a substantial threat to the ecological quality of preserves, particularly in coastal and grassland sites. Invasive perennial grasses that are of concern elsewhere in San Mateo County include:

- African veldt grass (*Ehrharta erecta*);
- Harding grass (*Phalaris aquatica*);
- Jubata grass (*Cortaderia jubata),* reported by Rana 2002 to be pampas grass- (*Cortaderia selloana)*);
- Rattlesnake grass (*Briza maxima*);
- Smooth Cordgrass and its hybrid forms *(Spartina alterniflora x S. foliosa)*; and
- Velvet grass (*Holcus lanatus*).

Most of these grasses occur as scattered individuals or as small cluster infestations throughout the entire Parks system, (with the exception of smooth cordgrass which is found only in saltmarsh and other brackish coastal areas). Treatment of invasive perennial grasses is similar for all the species listed above, with the exception of smooth cordgrass and jubata grass, which are discussed separately below. Most of these perennial grasses reproduce both sexually and vegetatively, therefore it is important to remove the entire plant (roots and above ground vegetation), and the optimal treatment timing is before the grasses set seed. Disposal of grass biomass should be carefully planned to prevent inadvertent spread. In most cases, grass biomass should be mulched in place, then transported to an offsite disposal area. If this is not possible, using bins for transporting the biomass to designated disposal sites and then monitoring the sites for resprouts and seedlings may be required.

Treatment Options: Removal options include cutting, mowing, brushcutting, covering, heavy mulching, and herbicide treatment as described below.

- **Cutting:** Cut around the base of the culms, root clump and dig out the roots. Mulch with an approximately 6 inch layer of rice straw to discourage resprouts.
- **Mowing:** Mow close to the ground late in the growing season. Glyphosate (1-2%) (e.g. Roundup Pro™ or AquaMaster™) may be used with a wick-type applicator after the plants have begun to grow back. Alternately, mow at least 3 times, ensuring that plants do not flower.
- **Brushcutting:** Brushcut small patches and cover with landscape fabric or a 6 inch layer of mulch. Pull any emerging plants the following year.

Preferred Treatment Methods: Perennial grasses should be controlled in the context of other invasive control activities. Perennial grass control can be conducted by Staff , Contractors, and/or volunteers. In inaccessible areas and areas with dense stands of perennial grasses, Staff or Contractors shall apply herbicide or mow infestations. Early colonizing perennial grasses will be removed from restoration sites by volunteers, using hand-removal techniques described above. Additionally, volunteers can be instrumental in controlling small infestations, and, where feasible and resources allow, volunteers can also mow or brushcut larger infestations. Herbicide applications of Roundup Pro™ or AquaMaster™ would be used only when hand treatments are found to be ineffective or cost prohibitive.

Smooth Cordgrass (*Spartina alterniflora*) and Smooth Cordgrass Hybrid (*Spartina alterniflora* x. *S. foliosa*). Cordgrasses are highly aggressive invaders that significantly alter both the physical structure and biological composition of tidal marshes, mudflats, and creeks. Clones spread laterally by vegetative shoots, often more than one meter per year. It can spread through vegetative fragments containing either root or rhizome material. A coordinated regional effort (among local, state, and federal organizations) called the Invasive Spartina Project has been initiated to preserve California's coastal biological resources

through the elimination of introduced species of cordgrass. An ongoing treatment of a known cordgrass infestation at Coyote Point by the Invasive Spartina Project is currently ongoing.

Treatment Options: Treatment options include hand pulling, solarization, and use of herbicides.

- **Hand Pull:** Hand pulling is the simplest option for small propagules (one to a few plants <0.5 m diameter). On soft substrates, plants can be removed by gently pulling rhizomes and roots from the mud. Make sure any rhizomes that have broken off are removed as well. On harder substrates a shovel may be needed, and some rhizomes are likely to be missed.
    - **Solarization:** If the infestation is small (one to a few patches 1-10 m diameter), burial of the plants under geotextile fabric or a black plastic tarp can be a means of eradication. Stems can be mowed with a weed whacker or similar device and then covered with 100 percent shadecloth (geotextile fabric) or heavy-duty black plastic. Completely covered patches may die within four months, but mortality is assured only by waiting a year or more before removing the cover.
    - **Chemical Treatment:** Large infestations (many patches >3 feet diameter) are best controlled with herbicide. Glyphosate (Rodeo®) is currently the only herbicide approved for use in estuarine wetlands, and it must be applied by a licensed pesticide applicator). For hand spraying, applications of 2 to 5 percent glyphosate along with a surfactant are recommended. Surfactants that have been used with some success by the Invasive Spartina Project Team and others include X-77 and LI-700. Rodeo® must be applied at low tide, when most plants are exposed to the herbicide for eight or more hours.

Preferred Treatment Methods: None. The infestation at Coyote Point will likely continue to be treated under the Invasive Spartina Project. Check with this organization on current and future treatment schedules.

Pampas Grass (*Cortaderia selloana*) and Jubata Grass (*Cortaderia jubata*). (Reported by Rana 2002 to be pampas grass *(C. selloana)* Pampas grass and Jubata grass are a rapid-growing perennials that reproduces asexually by apomictic seeds or vegetatively by tillers or fragments. Therefore, removal must be done precisely, as it can re-root from fragments left in the soil. Although both pampas grass and jubata grass produces thousands of seeds per plant, the seedlings do not easily establish and it is most important to focus control efforts on removing mature plants and discouraging soil disturbance (i.e. areas where seedlings can establish). Information on jubata grass distribution and control in California can be found at the UC Davis Weed Research and Information Center website:
http://wric.ucdavis.edu/information/pampasgrass.html.

Treatment Options: Park staff and other weed control practitioners have successfully controlled pampas grass and jubata grass as follows.

- **Manual Removal:** Seedlings may be pulled by hand or pried out of the ground using hand tools. Smaller clusters can be removed with hand tools, using care to make sure that all of the plant, including the root mass, has been removed. For larger plants, cut, bag, then dispose of all seed plumes (preferably when the seeds in the plume are immature- March or April is a good time). Next, cut stems and leaf blades to near ground level. Last, remove the root mass using a Pulaski, pick ax, or combination of hand and mechanical tools. Very large plants near a road or other

accessible area may also be pulled with a truck hitch and a choker cable around the plant.

- **Herbicide Application:** For plants that are growing on steep or unstable slopes, herbicide application of a mixture of glyphosate (Roundup Pro™) with imazapyr (Stalker™) is reported to be the most effective treatment for pampas grass. The herbicide can be applied in one of two ways – foliar spray of the entire plant, or cut and paint application, with the herbicide mixture applied to new growth of 1-3 feet in height following removal of mature growth. Herbicide should be applied in fall. The treatment area should be checked twice a year for re-sprouts for a period of 2 years, then annually in Years 3-5. Following removal, the site should be monitored for shoots and re-sprouts.

Preferred Treatment Methods: Pampas and jubata grass infestations may include large, single plants or small clusters of plants, often in remote locations such as sea cliffs. In most cases, pampas/jubata grass should be removed by contract labor or park staff as part of other invasive removal efforts within specified areas. Remove the majority of the plant biomass by cutting the plant to near ground level, and removing the cut material. Allow the cut plant to re-grow to about 1-3 feet, then spray the new growth with herbicides. Monitor for resprouting, and re-treat as necessary. In steep locations such as sea cliffs, repeated herbicide application may be the only feasible treatment option. In areas designated for volunteers, removal of pampas/jubata grass will primarily use hand removal methods, except where the infestations are not responding to hand removal treatments.

A.7 How to Mow in Sensitive Areas

Endangered and sensitive species and invasive plants occur together in several parks in the County Park system. Mowing currently occurs at seven of the San Mateo County Parks (Coyote Point Park and Marina, Flood Park, Huddart Park, Edgewood Park, Junipero Serra Park, San Bruno Mountain, and Sanchez Adobe), typically for weed control (mostly for prickly ox tongue), but also in recreational areas such as picnic areas and ball fields.

To avoid inadvertent injury or mortality of sensitive species during ongoing mowing, we recommend following the protocol described below. This protocol is largely based on timing mowing activities to avoid key blooming, nesting, or movement periods of sensitive species. Refer to Section 5 of the main report and to Table 5.6 in Chapter 5 of the main document for a summary of suggested mowing timeframes presented by park.

The protocol for mowing in sensitive areas is as follows:

- Maintenance workers will be informed of any protected species or habitats occurring in their work area and provided with a description (photo, text) of the sensitive species known from the park.
- Workers will be trained to identify protected plant species so that they can be avoided even if not flagged (if flags are missing or have fallen over).
- Mowing should occur outside of the bird nesting period (typically March-August) to avoid harm to ground nesting birds and their young. Most bird nests are protected under both state and federal law.
- For known species occurrence (for example a rare plant population), staff should mark the population and a buffer of 5-10 feet from the population with landscape flagging to assist maintenance workers in avoiding these sites.

Handouts that can be used in trainings to help workers identify protected species are found in Appendix C.

Specific plants to be avoided include:

(1) **Any mapped rare plant populations** (Appendix E).
(2) **Any mapped sensitive wildlife populations** (Appendix E).
(3) **Any areas mapped as serpentine habitats** (Edgewood Park)(Appendix E).
(4) **Wetland habitats and a 100 foot buffer** (especially in parks known to support sensitive wildlife including San Francisco garter snake, California red-legged frog, and California tiger salamander (Appendix E).
(5) **Shrubs and trees during bird nesting season** (March 1 to August 15th). If shrubs and trees must be cut, try to do so before March 1st, and if not possible, conduct a nesting bird survey to determine if birds are present. If present, wait until after young birds fledge (typically by August).
(6) **Habitat for several species of endangered butterfly (San Bruno Mountain, Edgewood Parks).** Perennial lupines, violets, and succulents such as dudleya at San Bruno Mountain State and County Park. Avoid mowing lupines and other sensitive plants that grow in the shoulder areas adjacent to Guadalupe Canyon Road. Avoid mowing in serpentine habitats that support these plants at Edgewood.
(7) **Any unmapped (new populations of) sensitive plants or wildlife** (Refer to Appendix C for photographs of sensitive species).

Recommendations for Bristly Ox Tongue.
Bristly ox tongue is common grassland weed. Because it is rather prickly and tends to inhabit high use areas such as lawns and picnic grassland areas, this species is often the subject of mowing control programs. Many County Parks mow grassland areas to control prickly ox tongue *(Picris echioides)*, however, the current mowing practice appears to be spreading the plant rather than controlling it.

According to a study conducted by Harris Design in March 2005, recommendations for controlling this species are to mow, hoe, and/or weed whip the species before it begins to flower. The report indicated the blooming period is March to May, therefore, a successful control program to this species would have to be initiated in February, and continue well into May at the minimum. Because of the summer fog drip, it is likely that the plant will continue to flower well past the reported flowering period, so a follow- up monthly treatment may be required in June, July, and August for heavily infested areas (Harris Design, 2005). A combination of mowing the plants prior to flowering, along with spot application of herbicides is recommended.

A.8 How to Detect Hazard Trees

The following section was excerpted from an online publication entitled "Tree Risk Management and Hazard Assessment: A General Review" prepared by the University of Georgia School of Forest Resources Athens, GA. University Outreach Publication, Kim D. Coder 2004 and is intended to assist park staff with understanding how forestry professionals assess tree risk. This publication is available online at http://www.urbanforestrysouth.org/Resources/Library/Citation.2004-06-10.0342

Refer to Appendix C for a visual guide to detection of hazard trees and Appendix B for standard forms for assessing hazard trees.

Managing forests is a process of assessment and then minimizing risks within the constraints of your management objectives. This process depends upon professional judgments and decisions (or lack of decisions). Every professional decision must be made for one or all the following reasons: asset protection, asset appreciation, minimization of liability risks (future), public safety (present), and/or to reach management objectives. Understanding the structure of trees, symptoms of impending structural failure, treatments available to minimize the chance of structural failure, and how trees finally fail are essential knowledge to a community forestry manager. Understanding the risks of structural failure is as important as any other component of a manager's job.

Definitions

There are three classes of trees in the landscape related to levels of risk. The first is a **"hazard tree."** The attributes of a hazard tree are it has a major structural fault that could lead to catastrophic loss and it has an identifiable target (people or property). The second class of tree is a **"tree at risk"** of catastrophic failure or with a significant target profile potentially leading to great injury and harm. A "tree at risk" has potential for becoming a hazard tree. The third class is all the rest of the trees present with known risk assessments, or as yet undetermined associated risks. The amount of acceptable risk is dependent upon the management objectives of the site and the owner's / manager's perceptions and expectations of tree performance.

Structural Faults

Hazard conditions have two components; a major structural fault and a target. Structural defects are dependent upon fault length, width, and depth, tree species, tree vigor, and associated compounding structural problems. Hazard assessment is only about structure, not about aesthetics or biology.
Structural defects can include:

- Large vertical (longitudinal) cracks;
- Large decayed areas, included bark zones;
- Narrow crotches or forks;
- Dead wood and branches;
- Large cavities;
- Large leans;
- Major root damage;
- Horizontal (tangential) cracks;
- Poorly connected living branches;
- Pest damaged or modified areas, and
- Disproportioned crown root ratio and stem strength for the given wind and gravity loading conditions.

Specific Cases of Structural Faults

There are many unique forms of tree failures. There are several structural failures that reap the much attention. One structural fault of interest is branch drop cause by longitudinal cracks. These cracks can form: along compartment lines of old pruning cuts or injuries; from structural failures along cell walls due to loading stress and strain (bending, tensioning, compression, and twist); and, from negative transpirational pressures. There are many other specific causes. Cracking leads to wound colonization by wood weakening organisms, decreases moisture content which facilitates more injury, and pest attacks which weaken the structural and defensive components of the branch or tree. The final result is the sometimes sudden loss of living branches.

Another structural failure for consideration is in the root plate or root pedestal area at the base of the stem. As trees sway in the wind and are loaded by wind and gravity, the basal roots and lower stem undergo alternating periods of compression and tension. Tree structure is two to three times weaker in compression than in tension. Where structural areas are loaded beyond their compressive limits, fault lines develop that will expand as more compressive load is added over time and will fail under compression or tension. For example, many trees damaged in storms show compressive failures which fail under tension. Root pulling and shearing across their cross-section are the result. Root collar problems are receiving much more (well deserved) attention from a structural standpoint. Bark and cambial damage, especially if repeated over many years can lead to many types of structural problems in the very place in the tree where stress and strain is concentrated. Injury at the stem base and in the root collar area can be hidden by soil and landscape features. Root collar excavations are becoming more common as a part of risk assessments.

One structural component fault that is sometimes overlooked is girdling roots. Girdling roots are hard to diagnosis and can lead to strength losses. The effect of poor root geometry development can lead to significant risks of tree failure after 10-20 years. Generally, root structural problems of any kind are difficult to ascertain, requiring additional care in assessments.

Leaning trees have plagued people since the first lean-to was erected. The perceptions and expectations of nonprofessionals when observing a leaning tree is highly variable and govern the amount of risk accepted. Leaning trees could stand for millennium or fall tomorrow. Professional judgment about the structural integrity of leaning trees many times takes a backseat to manager or owner anxiety about impending failure. Trees with progressive leans are clear candidates for removal. Trees that have not changed stem positions relative to the ground and surrounding obstacles for decades probably carry little additional risks other than in specific directional targeting. It is difficult to defend having left a tree with a significant lean when it fails.

Professional Observations

The amount of damage that can be visible and still allow a tree to remain is a professional judgment. Several application rules have been developed. The new pruning standards suggest when 1/2 the circumference is damaged, the tree should be considered for removal. From a mechanical structure standpoint, this is not conservative enough. Once circumferential damage reaches 1/3 or more, removal should be considered. Err on the side of human safety.

Remember in examining trees to determine structural integrity not surface appearance. Blemishes that lay-people might consider significant should be examined for structural consequences, but discarded if found to be only a blemish. Find what the most limiting structural component in the tree is and then estimate the risks associated with its failure. Experience of the assessor is critical to risk management evaluations. Do not send inventory counters to make risk assessments without training, practice, and spot-checking performance.

Structural failures in trees can generally be summarized as 40% in branches, 30% in stems, and 30% in root crowns and roots. This roughly even distribution suggests several things to a tree professional. The first is that trees are structurally designed to not fail at any given point more than any other. Trees are well equipped to handle stress and strain in their environments. The second suggestion is that failure patterns need to be learned and expectations drawn for prudent management. Careful observation is needed of all parts of a tree to effectively summarize risk levels.

Target Risks

Now that structural concerns have been reviewed, let us review the second piece of a hazard tree assessment which is the presence of a target(s). Risk assessment targets are people and property. Anywhere people would walk, drive, stand, lay, run, recreate, etc. could be a target area. Sidewalks, streets, parking lots, ball fields, golf courses and parks are all prime target areas. Property targets most often damaged by trees are cars, fences, buildings, roofs, pavement, yards, and gardens. Personnel injury targets and property targets are usually interrelated. Minimize risk to all personal injury targets. There are many types or classes of targets and some risk management systems try to prioritize management activities by target risk class. This type of target classification is dangerous in community forest risk assessment. Because of legal views of prudent and reasonable behavior by a manger, the only reasonable means of prioritizing by target are people vs. property. The more people, or the more valuable the property, the more target exposure.

Systematic Inspection

Systematic inspection demands observational discipline. The inspector must carefully examine a tree and make cumulative decisions about tree defects and associated target attributes. This inspection process should ideally include a root collar excavation, an aerial examination, and soil probing. Usually, some form of ground-based observation is used for cost-effectiveness.

Only tree professionals experienced in risk assessment should perform these evaluations. General tree inventory crews may not be technically or experientially qualified to examine trees and sites for hazards. To fulfill the legal aspects of a systematic inspection for risk factors, a precise and accurate methodology must be used.

A training system will be presented here that has been proven to assist the risk assessors and new students unfamiliar with trees risk assessments. The basic tenets of this training system are observations begin where the stress and strain on a tree are the greatest. Inspections begin at the base and expand outward and upward in order. An inspection should begin with a general overview of tree structural integrity to provide for the personal safety of the inspector and the people and property in the immediate area at the time of inspection. From a distance and as the inspector approaches the tree and site, any immediately hazardous conditions should be noted. The assessment should not continue until these conditions have been corrected. The next step in the risk assessment process is to survey the tree from at least three opposing sides, close enough to the tree to notice subtle structural reactions by the tree over the years. At each of these observation sites, examine the tree looking for simple or compound structural faults.

On each side of the tree begin the assessment where stress and strain is the greatest and structural faults could have the greatest impact on tree integrity and target safety. One way of thinking about this assessment process is to start at the ground and build a good tree. Go up and out from the tree base until you have accumulated enough structural faults to put the tree at risk of failure. Identifying major structural faults that could lead to catastrophic failure is the point of this assessment. Finding simple major faults, or compound faults where simple structural faults have coalesced into a combination of problems, is the goal of this assessment system. Of course the extent and seriousness of a structural fault remains the professional decision of the assessor.

Tree Risk Training Guide

For training people to use this assessment system, a removal threshold must be set after which the risk of catastrophic failure becomes too great. This threshold is dependent upon management regime, site history, and species. For general purposes, the value of three major simple faults or one compound major fault that could lead to catastrophic loss are used.

(REFER TO APPENDIX C AND A FOR TREE ZONES) Assessors count up in zone order until the threshold is reached and then cease further risk assessment and move onto the next tree. The zones for observation correspond to critical junctures or structural components in the tree. Zone 1 is the stems and root base four feet up the stem and four feet out from the stem. Zone 2 is the main stem from four feet above the ground up to where the main living branches begin. Zone 3 is the primary root support region extending out to 1/2 the drip line. Zone 4 is the primary branches out to l/3 their length. Zone 5 is the remainder of the structural roots. Zone 6 is the remainder of the crown.

Zone 1 comprises the bottom four feet of the stem and the roots holding the tree erect under compression out to the edge of the ZRT (zone of rapid taper) which is approximately feet. In this zone there should never be a compromise. If in doubt, take it out! If the base has multiple structural faults, it does not matter that the rest of the tree is perfect. Zones 2 - 4 are areas of the tree where structural faults can be correctable with large inputs of time, money, labor, materials and technical maintenance. Any corrections inserted to aid in the structural maintenance of the tree may call attention to a preexisting structural condition. Correction activities may decrease failure risks but increase the chances of successfully determining negligence. Zone 5 and 6 in the tree are areas where structural faults are not significant problems because they do not involve catastrophic tree loss and massive weights. Faults identified in this area are usually easily corrected. This does not mean that these zones should be ignored. A small branch falling from a long way can still provide life-threatening risks.

Level of Risk Acceptance

Once you have identified three major simple faults which could lead to catastrophic loss, accumulated in zone order for the tree, remove the tree. This is a risk assessment decision. There could be historic, social significance, biological and/or aesthetic reasons for accepting more risk, but that is a management decision that must be woven into risk assessment. Under some management regimes more risk can be accepted than others. There are many hazard tree and tree risk assessment methods.

Presented here is a simple training method to get people started and to insure systematic inspections. Many companies and public entities may have proprietary means of assessing risk. You need to look around at the different means of quantifying risk. One system is found in "A photographic guide to the evaluation of hazard trees in urban areas." (2nd edition) Matheny and Clark, authors. International Society of Arboriculture, is provided in Appendix C. Standard evaluation forms are provided in Appendix B.

Non-Removal Hazards

So far we have discussed events leading to complete tree removal for reducing risk. There are many reasons for a tree to be considered as carrying significant risk but these may not be enough for removal. These problems occur commonly in managed landscapes and are termed "non-removal hazards." Some of these non-removal hazards include: buckling of pavement by roots (do not sacrifice a tree for $25.00 worth of cement); damage to building foundations, cisterns, and septic systems (use root barriers, release pressure, fix engineering problems not biological); presence of surface roots; presence of small dead wood pieces and litter (fruits, flowers, twigs, leaves); trees are

living centers that house vertebrates and insects that present injury, disease, and nuisance risks to humans; entrapment in cavities, between branches, and in soil opening for animals and humans; face level branches (dependent upon means of conveyance -- bike, skates, walking); serve to block views and interfere physically with safe traffic movement; line of sight obstructions for safety and security concerns; and, risks for property damage (fences, walls, roofs, etc.). Clearly this is not a comprehensive list but does provide suggestions for building awareness among employees, managers, owners, and users of the community forest.

A.9 How to Detect and Treat Plant Diseases

The primary plant diseases and pathogens of concern for San Mateo County Parks are California Oak Mortality disease, pitch canker, and western tussock moth. Evidence of all three have been found within the San Mateo County Parks system, although to limited extents. One oak tree within Crystal Springs Park was found to be infected with California Oak Mortality disease (Rana 2002) and recently, some infected trees were detected at Huddart and Wunderlich parks (Sam Herzberg, pers. comm.) According to the San Mateo County Vegetation Resources document (Rana 2002), western tussock moth is infesting one area of San Bruno Mountain manzanita. In Junipero Serra Park, many of the pines have pitch canker. If several pines were killed by this disease, it could increase the potential of a fire in the oak woodland.

This section is designed to:

1) help park staff detect the occurrence and spread of these diseases within the San Mateo County Parks system, and
2) Park managers assess threat and treat or contain diseased trees as needed to control the spread of these diseases. Positive identification of these diseases often requires lab support, but the description of symptoms provided below will equip managers with enough knowledge to report suspected infections to the proper authorities and to take precautionary measures.

California Oak Mortality Disease

California Oak Mortality disease, formerly called Sudden Oak Death Syndrome (SODS), is caused by the plant pathogen *Phytophthora ramorum*. This pathogen has caused widespread diebacks (tens of thousands of trees) of tanoak and several oak species (coast live oak, California black oak, Shreve's oak, and canyon live oak) in California's central and northern coastal counties. Diseased oak and tanoak trees are often attacked by other organisms once they are weakend by *P. ramorum*. These secondary invaders can also kill the tree, and include such organisms as *Hypoxylon thourasianum* (a fungus that decays sapwood), and bark beetles. The *P. ramorum* pathogen also infects the leaves and twigs of common ornamental nursery plants, such as rhododendrons and camellias, which serve as vectors for pathogen dispersal. ***Refer to Appendix C for a pictorial guide to identifying the disease.***

Disease Detection: Successful disease detection is the first step in treating California Oak Mortality disease. For some of the affected species, SODS symptoms are either hard to detect or difficult to differentiate from other pathogens. The following are common symptoms of infected trees:

- Depending on the plant species, SODS infection may occur on the trunk, branches, and/or leaves. Leaf flagging is a particularly good indicator of disease.
- The most useful diagnostic symptom for SODS is the development of cankers on the trunk. Cankers are the most damaging, and often lead to death. Cankers have red-brown to black discoloration and seep dark black to red or amber sap. Cankers may range in size from a few cm in diameter to 3 m in length. They usually develop 1- 2 meters off of the ground, although they can be at soil level, or as high as 4 m or greater. Cankers will occasionally extend onto portions of buttress roots if the roots are above the soil line. Typically, canker formation begins with isolated bleeding spots on the main trunk of the tree. At the early stages of canker development, seeping will occur through the intact bark, without any noticeable physical wounding. In later stages, the bark can fracture and exudation occurs both through broken and intact bark. Later, the area will be stained reddish-brown. When liquid, the sap smells like the oak tannin odor of wine barrels. Dark wet cankers on oak

trunks with very foul smelling exudates are usually due to bacterial infections (wetwood), not SODS The sap from a SODS canker may dry and harden into a blackish crust during the summer months. Infection and discoloration is generally more extensive in bark and phloem tissues than in the xylem. In active cankers, the phloem is discolored various shades of brown, and cankers are delimited by thin black lines.

- There may be a rapid and complete browning of the crown, within 2 to 4 weeks. This is how the disease came to be called "Sudden Oak Death." In these cases, the dead foliage appears without a prolonged period of visible decline.
- Some infected trees may experience gradual leaf loss and death rather than a sudden browning of the crown.
- Often there is an extended period of disease (perhaps more than two years from the onset of infection) before the tree dies. The crown of the tree can appear healthy in early stages of the disease, although a bleeding canker is present on the trunk. The browning may occur several months to over a year after the pathogen has effectively girdled the whole stem.
- In oaks, only adult plants are significantly affected. Infection of seedlings is unreported in nature, and infection of saplings appears to be extremely rare.
- A number of insects are commonly observed on oak trees with advanced SODS infections. These include ambrosia beetles (*Monarthrum scutellare* and *M. dentiger*), bark beetles (*Pseudopityophthorus pubipennis*), and a sapwood rotting xylariaceous ascomycete, (.*Hypoxylon thouarsianum*).

Trees within the park that display these symptoms of sudden browning, gradual browning, and/or bleeding cankers should be sampled, and laboratory analyses performed to confirm the presence of SODS. The UC Cooperative Extension office or Agricultural Commissioner can be contacted to assist with sampling and analysis, which require specific techniques as referred to in J.M. Davidson (July 2003). Treatment recommendations presented below were developed largely from the SODS web site at http://nature.berkeley.edu/comtf/.

Disease Treatment

While there is as yet no cure for SODS, there are preventive measures that may protect un-infested plants, and a chemical treatment that has been shown to slow the progression of the disease in some hosts. As stated in Section 4.13 of the main report, treatment described below is relatively expensive and may be ineffective in preventing the spread of the disease. Some practical tips for a park manager include the following suggestions from local foresters:

- The disease spreads from tree to tree and persists in wet and damp places. It can accumulate on other tree species such as California Bay laurel which often traps moisture on its broad leaves, then spreads via wind or leaves or is transported by animals or humans to other trees such as oaks where it causes infection.
- Be aware of management and land use practices that might be spreading the disease. Wash equipment, vehicles, and shoes (a mild bleach solution is recommended) before leaving infected areas. Limit public access (e.g. temporarily close trails or cordon off areas) as needed to reduce potential spread by humans.
- Contact the Agricultural Commissioner's office and the California Oak Mortality Task Force to get up-to date information. (A helpful list of resources that can be contacted is provided in Appendix D).
- Contact a professional forester if treatment is required. As with other tree diseases there is no reliable cure for the infected tree, therefore treatment of outbreaks focuses on containment, then preventative treatment of nearby trees. Often, because it is cost prohibitive and possibly ineffective to treat a large area of possible infection around one diseased tree, the best treatment is containment of the diseased tree (i.e. cut and leave in place), and monitoring of surrounding trees until the disease has run its course in the area.

Treatment is typically spraying the nearby trees with a fungicide, and perhaps treating acidification of soils under affected stands (although the effectiveness of this treatment is unknown).

- Do not transport leaf litter, soil woody debris, firewood, or cut limbs from infestation areas.

Chemical Treatment Options

Agri-Fos (systemic fungicide) and Pentra-Bark (surfactant) were approved on October 1, 2003, by the California Department of Pesticide Regulation to treat oaks and tanoaks at high-risk of becoming infected with *Phytophthora ramorum*. The treatment is only approved for use on oaks (coast live oak, Shreve oak, black oak and canyon live oak) and tanoak trees. There is no evidence that the chemicals are effective in other species of trees.

Agri-Fos is a preventative, not a cure. and is only effective for helping to reduce potential for spread to uninfected or newly infected trees. Trees should be selected for preventive treatment based on the risk chart shown in the table below. Treatment is only recommended for trees that fall within risk ratings 1 and 2.

The treatment should begin before or within 1-2 months of the first signs of an infection (usually viscous brown droplets on the intact bark of the tree). The treatment is not recommended for trees that have had symptoms for six months or longer. In addition, there is a range of susceptibility to the California Oak Mortality pathogen within individual trees in the oak and tanoak species. For instance, the treatment may not help oak trees that are extremely susceptible to the pathogen. Trees with significant rot or other structural problems may not respond well to treatment.

Agri-Fos is systemic; it is translocated through the tree and enhances the tree's defensive mechanisms. Agri-Fos requires 3-6 weeks to be assimilated by the plant and start being effective against the pathogen. On true oaks, Agri-Fos may be used with Pentra-Bark penetrant and sprayed on to the exterior around the lower trunk for absorption through the bark. For tanoak, the material can only be adequately translocated if the material is injected into the tree. Currently in northern California two applications the first year is recommended, one treatment in November or December and a second treatment approximately six months later. After the first year, an annual treatment should be applied either in the fall or spring, as long as the timing is consistent from year to year.

Disease Spread Prevention

Because *Phytophthora ramorum* may be spread through the movement of host materials, regulations are in place at the state and federal level to control the potential spread of the pathogen to uninfested areas. Plants, plant parts, unprocessed wood and wood products, and other products of the affected hosts may not be moved from counties infested with *P. ramorum* without authorization of the local County Agricultural Commissioner. The appropriate contact information for regulations, quarantines, or permits in San Mateo County is:

Agricultural Commissioner's Office
San Mateo County Agricultural Department
P.O. Box 999
728 Heller Street
Redwood City, CA 94064-0999
650/363-4700 ph
650/367-0130 fax
Contact: Ronald Pummer, Deputy Agricultural Commissioner
rpummer@co.sanmateo.ca.us

In order to prevent the unintended movement of host material or soil from infested areas and to protect un-infested areas during tree removal and pruning, the following guidelines should be adhered to:

- Inform personnel if they are working in a California Oak Mortality-infested area and that unauthorized movement of plant material is prohibited.
- Provide crews with sanitation kits to sanitize shoes, pruning gear and other equipment before working in an area with susceptible species. The sanitation kit should contain chlorine bleach (1:9 mixture bleach to water) or Clorox Clean-up®, scrub-brush, metal scraper, boot brush, and plastic gloves.
- Work in pathogen-free sites before starting operations in infested sites.
- If cutting a diseased tree, fell tree and leave woody debris in place DO NOT TRANSPORT.
- If possible, conduct operations during the dry season to avoid contact with wet soil and mud that will readily adhere to vehicles, equipment, and boots.
- Utilize paved and graveled roads to the extent possible.
- Locate sites of equipment activity away from symptomatic host plants and trees.
- After working in an infested area, remove or wash-off accumulations of plant debris (especially foliage), soil, and mud from shoes, boots, vehicles and heavy equipment, etc. before traveling to an un-infested area. Consider establishing an equipment power wash station. The station should be: located within the generally infested area, paved or rocked, and well-drained so that vehicles exiting the station do not become contaminated by the wash water.
- Pay particular attention to locations where plant debris and soil may accumulate and blow off or clean vegetative material from equipment. Consider cleaning tools, equipment, and boots with Lysol, Physan, denatured alcohol, or similar materials.
- After cleaning host debris from equipment, cut or chip non-host material to further clean the equipment of host debris.
- Report suspected cases of *P. ramorum* to the San Mateo County Agricultural Commissioner.

Pitch Canker

Pitch canker is a disease of conifers (Monterey pine and other pine species) caused by the fungus *Fusarium circinatum* (= *F. subglutinans* f.sp. *pini*). In California, infections by *F. circinatum* occur largely through wounds caused by insects. Ornamental Monterey pine *(Pinus radiata)* and Bishop pine (*P. muricata*) are the tree species most commonly infected in California. Trees of all ages can be infected and eventually killed, although levels of infection and damage vary, with some trees surviving and recovering. Infestations are centered in the area from Santa Cruz County to south Alameda County. In some cases, after an initial outbreak of pitch canker activity, the incidence of new infections can decrease and eventually drop to an undetectable level, allowing tree recovery. ***Refer to Appendix C for a pictorial guide to identifying the disease.***

While there is as yet no cure for pitch canker, there are preventive measures that may protect un-infested plants, and a chemical treatment that has been shown to slow the progression of the disease in some hosts. As stated in Section 5.13 of the main report, treatment described below is relatively expensive and may be ineffective in preventing the spread of the disease. Some practical tips for a park manager include the following suggestions from local foresters:

- The disease typically kills the infected tree, but some trees recover after being infested. Insects typically transport the disease from tree to tree, however because of the large number of vectors that can transport the disease, treatment (i.e. pesticide application) on the affected tree is not effective in controlling the spread of the disease.
- Pruning infected limbs does not seem to reduce mortality of infected trees and is mostly cosmetic.
- As with other tree diseases there is no reliable cure for the infected tree, therefore treatment of outbreaks focuses on containment, then preventative treatment of nearby trees.
- Be aware of management and land use practices that might be spreading the disease or vectors (insects). Wash equipment, vehicles, and shoes (a mild bleach solution is recommended) before leaving infected areas. Limit public access (e.g. temporarily close trails or cordon off areas) as needed to reduce potential spread by humans.
- Contact the Agricultural Commissioner's office and the Pitch Canker Task Force to get up-to date information. (A helpful list of resources that can be contacted is provided in Appendix D).
- Contact a professional forester if treatment is required. Treatment is typically felling the dead tree in place, then monitoring and spraying the nearby conifer trees with a fungicide to help prevent spread. Chemical controls might be exploited under nursery conditions to prevent seedling disease caused by *Fusarium circinatum*, but, for larger trees, maintaining a sufficiently high concentration of the fungicide on all susceptible surfaces would be problematic, even if cost were not a consideration.
- Do not transport leaf litter, soil woody debris, firewood, or cut limbs from infestation areas.

A Pitch Canker Task Force has been created to limit the spread of pine pitch canker in California through management, research, consideration of regulatory actions, and education (Web site: http://www.cnr.berkeley.edu/forestry/comp_proj/pitchdocs.html). In addition, research is underway to find disease-resistant varieties of Monterey pine and other conifers.

Disease Detection: A number of insects, disease organisms, and environmental conditions cause symptoms that may be confused with pitch canker. Positive diagnosis requires laboratory isolation and culture of the pitch canker fungus from symptomatic tree tissues. The hallmark of the disease, as with California Oak Mortality disease, is a resinous canker. These and other symptoms are described below:

- The fungus initially infects branch tips, causing needle wilt and branch end dieback. Foliage becomes yellow, then red, and falls from the branch. This produces dieback that is often striking, with loss of all needles between the branch tips and the most recent branch and cone whorls. Typically branches throughout the crown are affected.
- Pine cones abort before or after reaching full size, and typically remain closed on infected whorls.
- Cankers resulting from an infection are found on woody portions of the tree, including roots, trunk, and branches.
- Cankers exhibit copious external resin flow. Crystallized, white resin produced by bole (trunk) cankers often coats lower limbs and several feet of bark below the infection.
- Infected bark and wood, including branch ends, are resin-soaked (appearing amber or honey-colored).
- Young trees and branches can be girdled and killed by cankers directly, whereas cankers occurring on the larger-diameter trunk of the tree typically are not girdling.

- Branches anywhere in the crown of the tree may be killed, distinguishing pitch canker from pest-caused damage that is restricted to weakened branches.
- Susceptible trees experience a progressive decline due to branch dieback and top kill.
- Bark beetles, twig beetles, and cone beetles may serve as vectors of the pitch canker pathogen and/or as wounding agents, contributing to tree mortality.
- Mechanical damage (such as root damage from mowing) and insect attack are typical sites of infection.
- The incidence of pitch canker tends to be lower on Douglas fir and ponderosa pine than on Monterey, Bishop, and knobcone pines. (This may be explained by the low colonization by twig beetles and the greater resistance of Douglas fir and ponderosa pine.)

Disease Treatment: There is no known cure for infected trees. Disease management is, therefore, currently limited to control of inoculum, reduction of vector breeding material, and restricted planting of susceptible tree species. In addition, proper recognition, handling, and disposal of diseased material will help prevent the establishment of new infestations, as well as reduce local spread and intensification. The following points will help guide disease management efforts:

- Remove infected trees, keeping in mind that pitch canker severity varies considerably from one tree to the next. Highly damaged trees should be removed, but often trees with less severe damage can recover (Refer to Owen and Adams' (2000) rating system for whether or not to remove diseased trees).
- Trees that will be allowed to recover should have dead limbs and tops removed to improve appearance and safety of these trees. Pruning to remove infected tips will usually not eliminate the disease. However, if a lightly infected tree is relatively isolated from other diseased trees, removal of infected tips may slow the development of a new disease center.
- Sterilize pruning tools with Lysol^{tm} or household bleach before and after pruning operations.
- Infected or uninfected prunings and cut branches, and infected trees may contain or become infested with insects (primarily bark-inhabiting beetles) that carry the pathogen. To reduce the risk of further infection, this material should be chipped and spread or burned in place; chips should be spread in a thin layer (less than 6 inches in depth) to allow rapid drying and mulching.
- Logs and firewood cut in infested areas should not be moved from the region of origin.
- Seed collection is not recommended in areas where pitch canker is present.
- Avoid planting tree species that are susceptible to pitch canker (i.e. pines) in areas with current pitch canker infections, as this will likely result in new infections. Such plantings should especially be avoided in the vicinity of Monterey, Bishop, and Torrey pines.
- Report the occurrence of pitch canker in new areas to county Agricultural Commissioners' office or the California Department of Forestry and Fire Protection. Tree species, locations, numbers of symptomatic branches present on trees, and number of symptomatic trees in the area should be indicated.

Western Tussock Moth (*Orgyia vetusta*)

The western tussock moth (*Orgyia vetusta*) feeds on leaves, decreasing or eliminating a tree's photosynthetic capability and therefore limiting its growth. In an extreme outbreak, complete defoliation and tree mortality can result in a single season. According to the San Mateo County Vegetation Resources document (Rana 2002), western tussock moth was identified as infesting manzanita in one area of San Bruno Mountain. **Refer to Appendix C for a pictorial guide to identifying the disease.**

Being familiar with the life cycle and appearance of this insect can help park managers control outbreaks of western tussock moth. Adult moths are charcoal-brown. The flightless females lay eggs on the cocoon anywhere from August through October. Eggs overwinter in a mass, and are grayish in appearance. Larvae begin emerging as early as March and go through several stages of development. They hatch as tiny, hairy, black-headed caterpillars and may be dispersed to other trees by a "ballooning" effect, where the wind carries them on a strand of webbing for some distance. They develop into hairy larvae about one to two inches in length, with numerous red and yellow spots and long tufts of hair (four distinct tufts of white hair in the middle of the back, two "horns" of hair in front, and two tufts at the end of the abdomen). Mature larvae spin a cocoon and pupate from mid-August through September, emerging to mate and dies soon thereafter. Only one generation occurs each year.

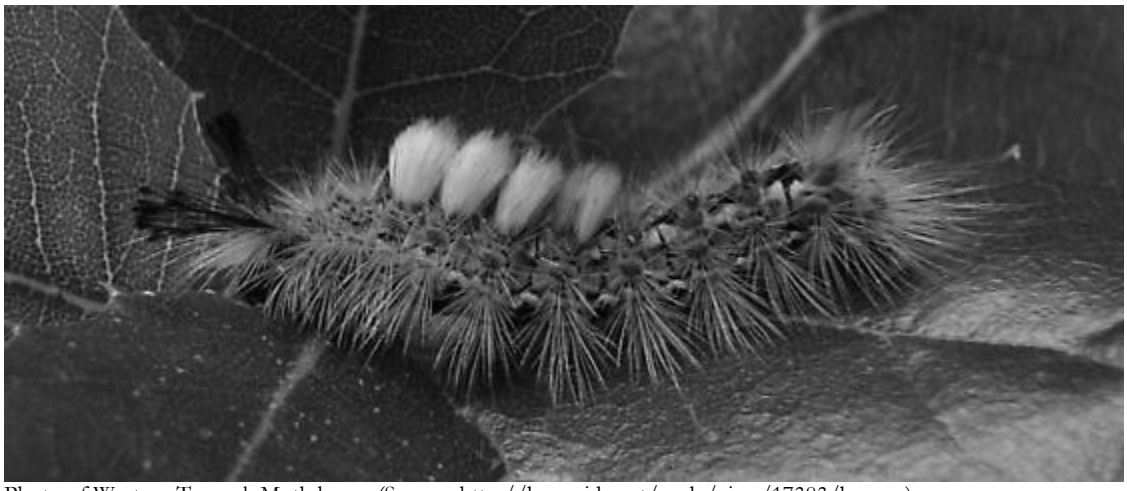


Photo of Western Tussock Moth larvae (Source: http://bugguide.net/node/view/17383/bgpage)

Disease Detection: Symptoms of infestation may include the presence of larvae and egg masses on foliage or branches. Loss of foliage, holes in foliage, or skeletonizing of leaves are other indicators.

Disease Treatment: Population buildups tend to be localized because the females are flightless. Localized infestations can be controlled by pruning and destroying foliage or branches covered with larvae and/or egg masses. Application of insecticides can also help to reduce western tussock moth populations. A study of the similar Douglas-fir tussock moth (*Orgyia pseudotsugata*) found that high density forest stands were more predisposed to moth outbreaks. Management, therefore, should include stand thinning.

Root Rot Fungus *(Armillaria mellea)*

The following information was excerpted from the Integrated Hardwood Range Management's web site: http://www.ipm.ucdavis.edu/PMG/r583100211.html. ***Refer to Appendix C for information on detection and treatment.***

When trees become stressed, the fungus can rot the tree's roots, resulting in death of branches or the entire tree. Infected plants have yellowing foliage, small and few leaves. Infection may be localized to only one or so roots at first. In advanced stages it may develop into the wood. Infected wood is firm at first, eventually decaying to a soft, watery consistency with the characteristic mushroom smell. Some infected plants deteriorate slowly over a period of years while others may wilt and die abruptly.

If it is found on a tree, or in the vicinity, the following treatments will reduce the rate of the disease loss by helping the host tree to become stronger:

- **Excavate any excess soil away from the root crown**.
- **Eliminate all forms of plant stress** possible, including insects, over- or under-watering, and anything that holds moisture near the roots of the tree.
- **Avoid watering mature trees.** Oaks and other native trees are adapted to the hot dry California summers and do not need supplemental watering. .
- **Focus On Disease Containment.** As with other tree diseases there is no reliable cure for the infected tree, therefore treatment of outbreaks focuses on containment, then preventative treatment of nearby trees.
- **Do Not Transport.** Be aware of management and land use practices that might be spreading the disease or vectors (insects). Do not transport soils, woody debris, or leaves that may contain the fungus. Wash equipment, vehicles, and shoes (a mild bleach solution is recommended) before leaving infected areas. Limit public access (e.g. temporarily close trails or cordon off areas) as needed to reduce potential spread by humans.
- **Contact the Agricultural Commissioner's office and the Integrated Hardwood Management** web site to get up-to date information. (A helpful list of resources that can be contacted is provided in Appendix D).
- **Contact a professional forester if treatment is required.** Topical application of fungicides has not been proven to effectively eliminate the disease. Soil fumigation may be recommended to sterilize infected soils, but it can also kill other plants in treated areas so should be used with care.
- **Introduce only highly disease-resistant plant species in affected areas.** Before planting susceptible or highly valued plants in infested areas this treatment may be useful.

A.10 Recycling Green Waste and Vegetation Biomass

San Mateo County Parks will need strategies for handling the large amounts of green waste and vegetation biomass that will be generated through general maintenance activities and through the control of invasive tree and plant species.

One of the Best Management Practices for Vegetation Management, as outlined in the County of San Mateo Watershed Protection Program Maintenance Standards document (April 2004), is to "recycle/reuse vegetative matter where practicable." This sentiment is echoed by the County's "Recycle Works" program, which assists San Mateo County Parks. According to "highest use" principles, plants that are able to be chipped and composted should not be disposed of in a landfill.

Recycle Works suggests the following for park management consideration:

- Have each park designate a green waste disposal area.
- Ensure each park has enough waste containers and adequate space for composting facilities.
- Ensure any green waste that is to be disposed of offsite is "clean" and not mixed with trash.
- Invasive weeds and infested trees mush be separated and disposed of differently than native plants, grass clippings, and leaves.

As described in Section 5.9 of the main report, the following alternatives for processing green waste are provided by Recycle Works:

1) Compost onsite (suitable for native plants, leaf litter, mowing and mulching grass cuttings, and chipping ground cover).
2) Compost off site (large amounts of biomass, some invasive weed. There are currently no sites in San Mateo County. Available sites that accept green waste include Z Best in Gilroy, Jepson Prairie in Davis, and Newby Island in San Jose.
3) Landfill disposal of green yard waste (typically hauled to Ox Mountain landfill).
4) Special circumstances for areas with California Oak Mortality Disease (i.e. Crystal Springs, Huddart/Wunderlich).

This section describes how to determine best and highest uses, and how to process the types of green waste that are likely to be generated by vegetation management activities at County Parks.

1. Estimating the Amount of Vegetation Biomass that could be Generated by a Project.
This section is designed to give the park manager with a very rough "back of the envelope" method to estimate the amount of biomass that may be generated by a vegetation management project based on reported average tons per acre for common vegetation types of the west.

There are several ways to estimate fuel loading. One is to take measurements of the current vegetation or debris. Brown's transects (Brown 1974) can be used for woody fuels, and clip, dry, and weigh can be used for grass fuels. Other methods include using fuel models (Fire Behavior or NFDRS, others), photo series, or ocular estimates. There are several mathematical models available online that can accurately determine fuel loads and biomass volume for forest systems. Consult a professional forester and refer to these more accurate biomass estimation methods if precise accuracy is required for your project. Refer to the Table B-10a below for rough tons per acre estimates for some common types of vegetation that are present in San Mateo County Park lands.

Table A-10a

Vegetation type	Approximate tons per acre*
Grassland	0.5 to .75 average
Shrublands, Chaparral, Brush	5 to 23
Forested areas	5 to 25
Slash (loose-not piled)	9 to 46

Source: Anderson 1982.

2. Assessing the Type of Vegetation Biomass Being Generated and Determining the Most Appropriate Disposal Method.

Different types of vegetation should be disposed of differently, as described in Section 5.9. of the main report. To summarize disposal options include:

1) **Dispose of onsite** (suitable for brush and downed wood cut into sections and store out of site in small brushpiles under shrubs of below forest canopy cover. Allow to break down naturally. Suitable for disease-free trees and shrubs).
2) **Compost or Mulch at Onsite Facility** (suitable for native plants, leaf litter, mowing and mulching grass cuttings, and chipping ground cover).
3) **Dispose of at Off Site Green Waste Facility** (large amounts of biomass, some invasive weeds. There are currently no sites in San Mateo County. Available sites that accept green waste include Z Best in Gilroy, Jepson Prairie in Davis, and Newby Island in San Jose.
4) **Landfill disposal of green yard waste** (typically hauled to Ox Mountain landfill).
5) **Special disposal methods** for biomass in areas with potential for plant diseases such as California Oak Mortality Syndrome (i.e. Crystal Springs, Huddart/Wunderlich).

Determining appropriate disposal methods will require park staff to make a judgment based on the type of vegetation, how fast it can be expected to break down or mulch, and the potential for the biomass to contain viable seeds and roots that could cause inadvertent spread to other areas. As stated above, trees and invasive plants should be disposed of differently than lawn clippings. Refer to Appendix A for details on methods to process and dispose of various types of vegetation biomass.

Types of vegetation biomass:

a) **Trees** should be cut into manageable pieces and the logs separated from the branches and duff. In some instances, the wood may have economic value such as redwood, oak, and Eucalyptus trees. In this case, trees should be felled whole, then their best and highest disposal use determined. Large redwood may be bought by lumber companies. Oaks may be sold as firewood or in some cases (if trees are very large and straight) to lumber companied for flooring. Eucalyptus have a variety of uses, including firewood, chips (for use within the park as mulch, for dust control in picnic areas), and possibly for transport to cogeneration plants to create energy. Some commercial firewood companies may purchase Eucalyptus and oak for firewood if the wood is cut and split. (NOTES: Some companies require firewood to be dry before they will accept it, necessitating 2-3 years of storage before firewood can be disposed of. Further, some companies will offhaul firewood for free, while others require firewood to be delivered. Park managers should carefully consider the requirements of each possible commercial firewood partner before agreeing to provide firewood). Because the best use of wood is market driven, decisions on how best to dispose of wood should be made on a case by case basis. Refer to Appendix D for a list of useful resources.

b) **Mulch or Compost Leaves, Lawn Clippings, And Other Fine Biomass** that is expected to break down quickly onsite where feasible. If not feasible, offsite disposal options include the landfill at Ox Mountain, and possibly the sites listed above that accept green waste. As mentioned in the main text, the County is considering acquiring 2-3 "Brush Bandits", at a cost of approximately $45,000 per unit. The new equipment would allow County Parks to reduce its offsite disposal by as much as 50% (Dave Moore, pers. comm.). (NOTE: Make sure to check with the individual facility managers for specifics on the types, quantities and conditions of the green waste that they will accept before you decide on off haul as a viable option. Disposal facilities regularly fill up, close, or change their acceptance policies). A centralized composting area is often established (officially or unofficially) by park staff. In general, compost piles need to be managed (i.e. not allowed to grow too big, include layers of branches in between finer biomass to create air pockets and speed up the breakdown cycle, and be turned (using a pitch fork, commercial turning bin, or backhoe) for up to 1 year before composting is complete.

c) **Invasive Plants** should be disposed of in a manner that does not spread them to other areas. Proper handling of invasive plants MUST be determined on a case by case basis based on the characteristics of the individual plants. For some invasives, transport to Recycle Works is appropriate (especially if the plant is removed before seeds are mature or if the material has already been solarized to kill seeds and roots. Some invasive plants should be cut, and then solarized onsite to 'kill' seeds and roots by piling the cut material onsite and covering it with a plastic tarp to allow the plants to decompose before being transported. In some cases, invasives SHOULD NOT BE TRANSPORTED, but rather should be chipped and spread right back onto the removal site where they can be managed for seedlings and resprouts, and can break down without spreading to other sites. For example, Gorse biomass at San Bruno Mountain was cut, chipped, then spread onsite no more than 6 inches thick (to facilitate rapid breakdown). This plant was not transported offsite because of potential to spread seed, and also because the breakdown would substantially increase the Nitrogen content of the surrounding soils, a process that would encourage weed establishment. One final suggestion is that wherever invasive plants are disposed of, the disposal site should be monitored to detect new seedlings and sprouts, and these promptly treated to prevent spread. Therefore, a centralized, convenient disposal site is recommended for invasive plants.

3. Finding an Appropriate Onsite Disposal Site

County Parks staff should designate a green waste disposal site or sites for each park. Mulching or compost facilities, as well as invasive plant biomass storage sites should be located in an out of sight, screened or fenced areas away from high public use areas, wetlands, and sensitive areas. They should be located along existing roads in easily accessible areas.

4. Monitoring Onsite Disposal Facilities

Onsite disposal sites will require regular monitoring and management to help ensure they are functioning properly and that green waste dose not support invasive plants or other undesirable characteristics (insects, smell) that will require remediation. For invasive biomass disposal sites, we recommend inspection 2-3 times per year, and spot-treatment with herbicides as necessary to control new weed seedlings and resprouts. For mulch and composting facilities, a regular management schedule will be required, as described below. Three options are provided for composting facilities; 1) a small (5 to 10 feet square) compost "cube' that is commercially available can treat small amounts of

compost, 2) a medium sized compost storage area (usually a cement-lined 3 sided structure in which material is stored, then turned using a backhoe or bobcat, and 3) a large commercial sized composting facility with specialized equipment to process compost. If a large facility is required, consider developing a composting area at Ox Mountain or possibly a transfer station that can serve all of San Mateo County Parks.

5. Suggestions on How to Process Trees and Related Woody Debris

Trees and woody debris can be used in a variety of ways:

- **Firewood.** (Eucalyptus, oak) cut into 8-12 inch rounds, split (possibly season). Use in park campgrounds or sell to commercial firewood distributors.
- **Lumber.** (Eucalyptus, redwood, some pine)– Remove branches, limbs, leaves. Contact professional foresters and/or local lumber companies for details.
- **Erosion control, brushpiles, natural fencing.** (All trees)Cut into appropriate lengths for use. For erosion control, 6-8 foot lengths- remove branches and leaves. Use with packed earth to stabilize slides and restore trail erosion. Brushpiles, cut branches into 4-6 foot lengths, pile onsite for wildlife habitat, also as a deterrent to prevent trespass and unauthorized trail building. Natural fencing- cut into 6-8 foot lengths, remove limbs, split. Alternatively cut logs into rounds for use as stepping 'stones', other uses.
- **Wood chips, wood fiber, other mulch (Eucalyptus, pine).** Trees can be chipped into woodchips, wood fiber, or finely ground into a mulch for use around landscape plantings, for dust control in picnic areas, or as a landscaping treatment. Eucalyptus should be used in areas where weed suppression is desired as it tends to restrict growth of other plant species. Oak should not be used.
- **Composting.** Refer to the section below. Grind trees and woody debris in a tub grinder and compost with high nitrogen green waste such as grass clippings.

6. How to Mulch or Compost Leaves, Lawn Clippings, And Other Fine Biomass

There are two types of onsite green waste recycling options: composting; or shredding or grinding materials to be stored and used as mulch. The major difference between the two operations is how the finished product can be used. Compost is more stable, and has a wider range of uses, from soil amendment to top dressing or mulch. Shredded or ground material that is not composted can only be used for mulch, and because it is not as stable as finished compost (that is, weed seeds and other potentially problematic materials are not destroyed by the composting process).

The following information is intended to be a general description of a municipal composting procedures. It will be necessary to have a waste management professional to develop a detailed site plan for individual parks.

The following information was obtained from the U.S. Environmental Protection Agency publication NO. EPA530-R-99-016 entitled: Organic Materials Management Strategies. (U.S. EPA 1999).

Composting facilities for yard trimmings range from medium-sized, low-technology operations, where piles of leaves are turned periodically with front-end loaders or bobcats, to large high-technology operations, where size reduction equipment, dedicated windrow turners, and screening equipment are used to process large amounts of biomass and green waste. Very small composters are also commercially available for very low capacity use. An advantage to using high-technology processing methods, aside from producing a higher quality product, is that compost can be produced and moved off site within a year, making space for the following year's material. Low-technology operations generally require more time to complete the composting process and consequently more land area to accommodate more than one season's material. Available land, therefore, is a key criterion for determining the most appropriate composting method for a given site. The following

Table B-10b will assist park staff in determining the necessary size of a composting area (Source: R.W. Bech, Inc., 1999. Letter report to the City of Indiana regarding proposal to develop a waste management system for green waste). Available online at:
www.dep.state.pa.us/dep/DEPUTATE/AIRWASTE/WM/Recycle/Tech_Rpts/Indiana.pdf)

Table A-10b

ESTIMATED VOLUME/ACREAGE REQUIRED FOR A COMPOSTING SITE

ARTICLE I. Article II. REEN WASTE (IN TONS)	**Total Pounds**	**Approximate Total Cubic Yds.***	**Active Composting Area Required(acres)**	**Total Composting Area (acres)****
2,000	4,000,000	10,050	3.5	7.45
4,000	8,000,000	20,100	7.0	14.9
5,000	10,000,000	25,190.48	8.40	18.2
7,500	15,000,000	37,785.71	12.60	25.6
10,000	20,000,000	50,380.95	16.79	33.2

*Assumes 300 lbs. per cubic yard average for approximately 40% of tonnage, 525 lbs. per cubic yard for the balance of the material.
**Assumes 2 acres for staging area, storage area sized at approximately 50% of active composting area, and 50 foot buffer.

Materials to be composted should be deposited into rows of approximately 10-15 feet wide x 4-6 feet high. The rows should be turned two times per month on a set schedule using a front end loader (or a windrow turning machine or other specialized equipment). Piles should be kept at a temperature range of 90 to 140 degrees Fahrenheit, and a moisture content of 40 to 60%.As the size of the rows decreases because of decomposition, two or more rows should be combined to maintain the optimum row dimensions for decomposition. The decomposition process will take approximately 350 days, during which the piles should be turned twice a month. Water should be added as needed during turnings and between turnings if needed to maintain sufficient moisture for decomposition. Additional green material may be added to maintain optima temperatures. Following the decomposition, the material should be allowed to cure for an additional 30-35 day period prior to use. (Source: R.W. Bech, Inc., 1999. Letter report to the City of Indiana regarding proposal to develop a waste management system for green waste). Available online at: www.dep.state.pa.us/dep/DEPUTATE/AIRWASTE/WM/Recycle/Tech_Rpts/Indiana.pdf)

If brush is used in composting, it must be reduced in size prior to composting. Small quantities of brush can be processed through a chipper, A tub grinder is recommended to process large quantities or woody debris. It should be composed with a with high nitrogen material such as grass. Brush chips can also be stored separately and used for landscaping or can be composted with high nitrogen material such as grass. Leaves and grass also can be size-reduced in a tub grinder to reduce the time required to complete the composting process.

In addition, access to the site must be controlled, so the site must be in a location where such control is possible. Vehicle access points must be gated or protected by some other barrier. Sites with natural barriers or those that are somewhat remote are preferable because they are less visible and therefore less prone to be entered by unauthorized persons, and generally less likely to cause problems because of proximity to occupied dwellings or businesses.

7. How to Process Invasive Plant Biomass

Invasive plants should be disposed of in a manner that does not spread them to other areas. Proper handling of invasive plants MUST be determined on a case by case basis based on the characteristics of the individual plants. For some invasives, transport to Recycle Works is appropriate (especially if

the plant is removed before seeds are mature or if the material has already been solarized to kill seeds and roots. Some invasive plants should be cut, and then solarized onsite to 'kill' seeds and roots by piling the cut material onsite and covering it with a plastic tarp to allow the plants to decompose before being transported. In some cases, invasives SHOULD NOT BE TRANSPORTED, but rather should be chipped and spread right back onto the removal site where they can be managed for seedlings and resprouts, and can break down without spreading to other sites. For example, Gorse biomass at San Bruno Mountain was cut, chipped, then spread onsite no more than 6 inches thick (to facilitate rapid breakdown). This plant was not transported offsite because of potential to spread seed, and also because the breakdown would substantially increase the Nitrogen content of the surrounding soils, a process that would encourage weed establishment. One final suggestion is that wherever invasive plants are disposed of, the disposal site should be monitored to detect new seedlings and sprouts, and these promptly treated to prevent spread. Therefore, a centralized, convenient disposal site is recommended for invasive plants.

A.11 Using Livestock Grazing to Manage Vegetation

As discussed in Section 5.16 in the main report, selecting the correct livestock, and determining appropriate grazing levels may require the input of a professional livestock manager. We suggest contacting the Society of Rangeland Scientists, the California Cattlemen's Association, or the California Native Grass Association to get input on developing an appropriate grazing program.

This section is intended to give practical tips on how to set up and manage a livestock grazing program at your site. Site preparations include:

- **Select an appropriate site.** Make sure sensitive resources such as rare plants, wildlife and wetlands have proper protection.
- **Install proper fencing to contain the type of livestock selected**. Goats and sheep require fine mesh wire ('hogwire' or must be trained to stay within an electric fence, horses and cattle can be contained with 3-strand barb wire, electric fencing, or other similar fencing).
- **Determine the type of desired livestock management** (rotational grazing, seasonal grazing, supplemental feeding, watering procedures).
- **Develop a contract or grazing lease** with an outside contractor that specifies seasonal, animal unit, or vegetation condition restrictions to help reduce potential for improper site use/grazing levels. Grazing should be conducted to benefit natural resource values, not maximize livestock yields (traditional livestock management methods). A typical brush reduction program using goats will use up to 500 goats.
- **Monitor** the site to determine ecological effects. Usually grazing monitoring is conducted in late spring or early summer, using ocular estimates of residual dry matter (RDM). Also note the condition of the overall site, fences, and especially note over-utilized areas such as feeding stations, salt licks, and watering locations. Move as necessary or cross fence to reduce over utilization of any one area.

East Bay Municipal Utilities District, and East Bay Regional Parks both have very active and successful grazing programs that could be adapted to San Mateo County Park lands if desired. Contact these agencies directly to get information in their grazing programs. **Refer to Appendix C for articles about livestock grazing to control invasive pants and to Appendix D for a list of helpful grazing resources.**

Here are some key points to consider when developing a grazing program:

- Grazing should be conducted to benefit natural resource values, not maximize livestock yields (traditional livestock management methods).
- Livestock should be seasonally grazed, depending on sensitivity of the resource being managed. For example, an oak restoration site should not be grazed during the first 3-5 years of seedling establishment, then should be seasonally grazed from years 5-15, then cattle removed before they begin to ingest oaks seedlings.
- Grazing of wetland habitats should be prohibited, or severely restricted to a fenced portion of the wetland. Limit cattle grazing near wetlands in during warm summer months, when cattle are more likely to 'wallow' in the wetlands to cool off.
- Wherever possible, consider rotational livestock grazing. Several research projects are underway suing high intensity, short duration grazing. These studies seem to indicate that such grazing promotes natural regeneration of wildflowers, native grasslands, and oak woodlands (K. Reeves, pers. comm..). This type of grazing

management will require cross fencing (mobile electric fencing), and/ or more active herd management to move animals from place to place several times a season.

- Post-fire grazing, grazing programs for invasive plant control, and brush control in grassland settings are effective alternatives to controlled burning and mechanical or hand removal and should be considered when designing a project.

Monitoring Grazing

The following information was adapted from the U.S. Forest Service Publication No. 8092 entitled: California Guidelines for Residual Dry Matter (RDM) Management on Coastal and Foothill Grasslands, available online from the U.S. Forest Service at:
www.casrm.org/ANR%20Publication%208092.pdf

Residual Dry Matter (RDM) is a standard used by land management agencies for assessing the level of grazing use on annual rangelands and associated savannas and woodlands. Residual dry matter is defined as the plant material that is left at the end of a growing season. It indicates the combined effects of the previous season's forage production and its consumption by grazing animals of all types. The standard assumes that the amount of RDM remaining in the fall, subject to site conditions and variations in weather, will influence subsequent species composition and forage production.

A variety of means are available for the estimation of residual dry matter. An easy and quick method is to visually compare photo standards (Figures 1 through 3) with conditions on the landscape prior to the first effective fall rains, usually in August or September for San Mateo County. Reference photos of grazing intensity standards are based on the Central Valley foothills, but can be applied elsewhere in California. The ***moderate* l**evel of grazing is considered ideal for grazing leases on the San Mateo County Park lands. The other grazing intensities, described as ***light* and *heavy,*** are considered examples of too much and too little utilization. ***Refer to Appendix C for RDM monitoring procedures.***

ANR Publication 8092

Figure 1. Light grazing results in high RDM levels.

Figure 2. Moderate grazing results in the recommended moderate level of RDM.

Figure 3. Heavy grazing results in low RDM levels.

A.12 Procedures for Establishing Fuel Breaks and Reducing Fuel Load

Fuel load and fire hazard reduction are important to the health and safety of the parks system. At the same time, it is important to keep in mind that some of the woody debris that is typically removed to reduce fuel loads (e.g., woody debris and snags) help create a forest's structural complexity, and are correlated with high wildlife diversity and abundance. Control methods, therefore, need to be balanced in their approach to allow for wildlife habitat in addition to promoting fire protection.

Wherever possible, the following should not be extensively removed:

- Large snags (> 10" dbh), which are used by a wide variety of species including nesting raptors; and
- Downed logs and stumps, which are used as nesting and refuge habitat by snakes and amphibians, including salamanders.

The primary control methods that are used to establish fuel breaks and reduce fuel load are:

- Controlled burns and flaming.
- Physical removal of vegetation suing work crews (chainsaws, mowing, brush cutting).
- Physical Removal of vegetation using livestock (grazing management).
- Mechanical creation of fire breaks (discing, plowing, large scale perimeter mowing)
- Selective Forest thinning.
- Underbrush and Invasive plant control (mostly small tree and shrub removal).
- Use of fire resistant landscaping.

This section provides information on how to implement these control methods.

Controlled Burns. Controlled burns will require a fire permit and approval from regional Air Quality Control Boards. Contact CDF and local fire districts for more information. In most cases, it is best to have CDF or local fire staff conduct any necessary controlled burns. Because of the windy conditions at many County Parks and the increasingly strict air quality standards, using controlled burning is not always and option. Controlled burns are usually started with a drip torch, creating a line of fire that is planned to burn in a certain area. The controlled fire is heavily controlled with fuel breaks, fire staff, water trucks, and other methods to make sure it is contained within the planned area. Controlled burns usually burn hot, but pass relatively quickly through an area, leaving trees and large shrubs relatively unharmed, but removing smaller underbrush and grasses. The idea is to eliminate fuel 'ladders' so that when wildfire occur, they are more easily contained and less likely to burn out of control. More information on this topic is provided below in the section entitles "How to Conduct Controlled Burning for Vegetation Management".

Flaming. An alternative to controlled burns is 'flaming' whereby a propane roofer's torch is used to 'boil' plants, effectively killing the cambium layer of the plant and killing it in place. Flaming does not usually require a burn permit as there is no fire, only a flame from the torch. It is a good idea to contact neighbors and park users who might see the smoke and steam from the operation and become alarmed. The local fire department and CDF should also be notified, and should be 'on call' just in case of emergency. Flaming can be done by maintenance staff, volunteers, or contractors under supervision of park management. Materials are readily available from home improvement stores and lumber lards. You will need the following equipment:

- A 5 gallon (or smaller) propane tank;
- A 'roofer's torch or wand (typically used to seal seams on tar roofs);
- Safety glasses and fire resistant gloves;

- A "striker" to safely create a spark to start the fire; and
- A wrench to hook up the equipment.

Flaming should be done in winter when vegetation is wet, and preferably during a light rainstorm to help reduce potential for wildfires.

Flaming is most effective for herbaceous (non-woody) vegetation, and for woody vegetation 1 inch or less in diameter (especially seedlings). The workers should pass the flame over the vegetation until the leafs wilt or 'weep'. It is not necessary to completely incinerate plants, usually passing the flame over a plant for a few seconds (longer for plants with tough stems and leaves) will effectively boil the plant. Monitor the site approximately 2 weeks after treatment- retreat any plants that were not effectively killed during the first treatment.

Physical removal of vegetation (chainsaws, mowing, brush cutting)
Fuel reduction programs typically assess forest conditions, then determine high risk fuel loads that need treatment. This procedure is often conducted with CDF and/or local Fire Departments as part of a regional fire management strategy. Once an area has been determined to be a priority for fuel reduction, park staff should determine is the area supports sensitive species and should take measures to protect these species during fuel load reduction activities. Avoidance measures may include working outside key seasons for nesting birds, rare plants, and sensitive wildlife. Try to remove vegetation outside of these key seasons wherever possible. When it is not possible to avoid key seasons, park staff should carefully review proposed routes, and survey for species. Avoid sensitive species using staking rerouting, or protective fencing. Fuel reduction programs typically use work crews, including contract, volunteer, staff, or other labor (e.g. correctional facility, AmeriCorps or California Conservation Corps work crews) to physically remove brush with chainsaws, machetes, and brush busters.

Refer to the Section B-10 Green Waste Management" for information on how to treat cut biomass.

Physical Removal of Vegetation using Livestock
Refer to Section B-11 for more information on this topic.

Undergrowth and Invasive Species Removal
Refer to Section B-6 for more information on this topic. ***A reference paper is included in Appendix C related to controlling invasives using fire.***

Fuel and Fire Breaks, Fire Resistant Landscaping
There are well-established procedures in place for establishing and maintaining firebreaks, therefore the procedures for doing so will not be described herein. It is important to point out that, especially when establishing new fire breaks, park staff should be aware of avoiding impacts to sensitive species, in particular rare plants and sensitive snakes, frogs, and salamanders. Try to create/maintain firebreaks outside of these key seasons wherever possible. When it is not possible to avoid key seasons, park staff should carefully review proposed routes, and survey for species. Avoid sensitive species using staking rerouting, or protective fencing.

Park managers should consider establishing fire resistant landscaping, especially around high use and high value areas. The following section briefly describes how to establish a fore resistant landscape. It is important to note that any plant will burn if the conditions are right. Some plants are considered to be extremely flammable while other plants are considered to have some resistance to fire. Verifiable tests of fire exposure characteristics for all specific ornamental landscaping plants is not available. The best available plant information is contained in a publication available from EBMUD

entitled "Firescape: Landscaping to Reduce Fire Hazard" (Refer to Appendix D for contact information).

The basic concepts of drought resistant landscaping apply to landscaping around structures, but can be modified to high use areas of parks. The basic concept is to develop and maintain the following Zones in order to establish increasing fire safety closest to structures and facilities. *The following was excerpted from the EBMUD brochure entitled "Firescape Landscaping to Reduce Fire Hazard (EBMUD, 2003).*

"Firescaping", as described by EBMUD includes establishment of the following zones:

- **Zone 1,** within thirty feet of structures, should not contain any vegetation over a few inches in height. Firewood and other combustible materials should not be stored in this critical area. Decomposed granite or gravel mulches are recommended. Wood chips and mulch should be limited. Plantings in this zone should be mostly fire resistant low-growing shrubs, lawns, and groundcovers. Trees, if any, should be small, preferably evergreen. Leaf litter should be regularly removed from this zone.

- **Zone 2**, from 30 to 60 feet from structures and facilities, is a transitional area between Zone 1 and surrounding wildlands and open space. Drought-tolerant groundcovers and drip irrigation systems are recommended. Larger shrubs and trees can be planted, but should be widely spaced, and separated by lawns, groundcover, gravel or mulch. Avoid any arrangement that facilitates movement of fire along the ground or from the ground up into the house or tree canopy.

- **Zone 3,** from 60 to 100 feet from structures and facilities, forms the edge adjoining the wildland or open space. Vegetation is managed native vegetation. Plants in Zone 3 may or may not be irrigated, but they should be actively managed (e.g., understory plants removed, trees pruned, area mowed etc. As in Zone 2, larger plants should be spaced widely and interspersed with low grassland or groundcover plants

A.13 How to Conduct Controlled Burning for Vegetation Management

Fire can be an effective means of reducing weed infestations, particularly for shrubby weeds and in native communities that evolved with fire. In some cases fire may be the only element necessary to give native species a chance to recover. Fire may also be used to eliminate old vegetation and litter in areas infested with perennial herbs, such as sweet fennel, prior to treating the area with herbicide. This allows more herbicide to reach the living leaves and stems of target plants, potentially enhancing its effectiveness. Fire can also be used to induce seeds of some species to germinate so the seedbank can be flushed and the resulting seedlings can then be killed with another fire or some other method.

Conducting a prescribed burn can be risky. Escaped fires are costly and can be disastrous. **WARNING: For San Bruno Mountain, prescribed burning is not recommended.** Frequent windy conditions at this site make burning unsafe. For sites that are amenable to control burning, the following measures should be taken:

- Managers should be trained and certified.
- Managers should work closely with the local office of the California Department of Forestry and Fire Protection.
- Coordinate with air quality agencies.
- Time the burn with respect to wind and moisture conditions.
- Coordinate all work crews so that logistics run smoothly.

Situations Appropriate for Prescribed Burning:

(1) Disposal of invasive plant biomass that has already been manually or mechanically removed from the soil (purple loosestrife is one such candidate).

(2) Burning to control invasive plant populations. In some cases consecutive burns can reduce the seedbank of the invasive by more than 95% while increasing native plant diversity and perennial grasses. For yellow star-thistle, burning should be conducted after native species have dispersed their seeds but before yellow star-thistle produces viable seed.

(3) In combination with other invasive plant control techniques. Often a combination of methods is more effective at controlling the current population and suppressing seed production. For yellow star-thistle, prescribed burning followed by spot application of post-emergence herbicides to surviving plants can prevent the rapid re-infestation of the treated area.

(4) Disposal of infected plant/tree tissue. Infected trees, cut branches, and prunings may contain pathogen-carrying insects. Wood infected with sudden oak death syndrome or pitch canker should be chipped, spread in a thin layer to allow for rapid drying, and then burned in place.

Burning Methods for Small Areas:

Blowtorches and flamethrowers can be used to burn individual plants or small areas. Flamethrowers have been used to heat-girdle the lower stems of scotch broom shrubs. This technique has the advantages of being less costly than basal and stem herbicide treatments and suitable for use during wet weather. However, this technique can be time-consuming and is not viable in areas where wildlife is a danger.

Additional Warnings:

- Prescribed fires may promote certain invasive species. Invasive annual and biennial species, such as bull thistle, are likely to be favored in the years immediately following a burn and in repeatedly burned areas.
- Hot fires can sterilize the soil, volatilizing important nutrients and killing microorganisms on which native plants rely.
- Prescribed burns can increase soil erosion and stream sedimentation.
- Soil disturbance related to the construction of firebreaks can increase erosion and provide a seedbed for invasive weeds.
- Take precautions to protect sensitive species and habitats.

A.14 Trail Maintenance and Inspection

Trails can contribute significantly to stormwater pollution during the winter. Trail maintenance is performed to provide a safe surface for hikers, cyclists, and/or equestrians; prevent trail deterioration; and reduce adverse impacts to water bodies.

Trail maintenance crews should conduct regular inventories. Repairs should be prioritized and completed prior to the heavy use season, if possible. Maintenance activities may pertain to:

- Drainage
- Vegetation clearing
- Signage
- Surfacing
- Graffiti removal
- Structural repairs

According to the County of San Mateo Watershed Protection Program Maintenance Standards (County of San Mateo, 2004), vegetation on and adjacent to trails may be cleared to the width of the trail plus two feet beyond the trail on each side.

In addition to this routine maintenance, we suggest that park staff consider identifying problem trails, and over time as funding allows, reconfiguring the problem trails to permanently address the problem, and eliminating or greatly reducing the need for ongoing maintenance. Problem trails include those with erosion problems, including downcutting of the trail surface, trail failure due to cross drainages, slumps and slides across trails, and other water and erosion related problem. In many instances, trails that were established in the past did not take into account the long-term effects of rainfall, water crossings, and other wetland features, and trails were built that do not work with the land's natural contours to shed water from the trail surface. One solution is to re-grade problem sections of trails, especially those on steep slopes and switchbacks, to create 'rolling dips'. A rolling dip configuration is a series of rolls and out-sloped dips that create natural "segments' along a trail, eliminating the ability of rainfall and other water to pond on the trail or to flow down the trail, causing downcutting of the trail surface. Rolling dips are typically spread apart every 5-15 feet (depending on topography, then the surface is slightly domes, and outsloped to either the inside or outside of a trail (depending on site topography) so that water is forced off the trail into the vegetation every few feet. For more information on rolling dip design, contact a trail engineer. Refer to Appendix D trail building resources.

As stated in the Watershed Protection Program Maintenance Standards (County of San Mateo, 2004), culverts along the trails should be assessed, and resized as necessary to accommodate storm events.

A.15 Removing and Rehabilitating Unauthorized Trails

Unauthorized trails are non-designated trails that are created by human activity. Unauthorized trails are often exacerbated by surface drainage patterns that follow the down cut of the unauthorized trail pathway. Past trail studies have concluded that hydrology is typically not the driving factor causing trail instability; rather, it is human activity (Campbell Construction and May & Associates, 2004). Therefore, successful removal and rehabilitation of a unauthorized trail requires both 1) addressing the human use issue that created the trail in the first place, and 2) rehabilitating the trail in a manner that erases the "hydrologic memory" of the trail.

Unauthorized trail rehabilitation involves the following steps:

- Determine the cause of the trail (e.g. visitors trying to get to a vista spot, visitors getting around a wet spot in the trail etc).
- Manage the cause of the unauthorized trail (e.g. create a new trail to the vistas point or install trail closure signs and brushpiles to prevent trespass, fix the hydrologic problem spot etc).
- Rehabilitate the unauthorized trail.

Overview of Unauthorized Trail Restoration

Wherever possible, unauthorized trails should be closed and revegetated using passive methods to reduce overall costs. Passive restoration includes installing trail closure signs, brush piles or other physical barriers, and allowing the trails to revegetate naturally. If active unauthorized trail decommissioning and revegetation is required, restoration activities should be conducted in a manner that is least intrusive and results in the least amount of re-treatments. Barrier fencing should be used sparingly so as to maintain the wild and scenic nature of the Parks System. Barrier fencing may be temporary or permanent, depending on site-specific conditions and visitor use patterns. Temporary fencing should be preferred.

To rehabilitate and restore trails:

1. loosen the top 4 inches of soil along the trail using a Sweco trail tractor (or similar equipment), or scarified by hand using a rake, mattock, or similar hand tools.
2. Re-form the landscape back to natural contours, including recovering any soils on the sides of the trail and reincorporating the soils into the trail site to form natural site contours.
3. Compact soils. Note: this procedure is usually undertaken when soils are moist but not wet to help ensure proper soil compaction, typically in late spring or early summer. If this procedure is undertaken when soils are dry or excessively dry, a water truck may be required to re-moisten soils before they are compacted.

In most cases, unauthorized trail restoration should seek to have a balanced cut and fill (i.e. additional soils needed to create natural contours are obtained from regaining soils adjacent to the trail). If use of additional fill is necessary, additional soil should come from local sources. If sufficient local fill cannot be obtained, park staff may need to consult with a soil scientist to locate appropriate imported fill materials.

Soil compaction may be non-intensive, requiring only hand-dampening, or intensive, requiring use of a 'track-walker" to press the soil and a binder (typically seed-free straw) into the parent soil material.

Following the soil compaction, the newly restored area can be covered with brushpile to discourage human use until the site is revegetated. Brush piles area a thin layer of small woody debris (i.e. slash less than 4 inches in diameter). On flat to gentle slopes, the woody debris shall be distributed at 90-degree angles to the slope (i.e. perpendicular to the slope), and scattered thinly about the surface of the trail (Figure 4). This debris also helps to break up water flow on the new surface.

Special Condition Sites

Some sites will require additional structural or other treatment to fully restore the site back to natural conditions. The following provides a brief overview of some of the common types of additional structures and treatments that may be required. Contact a trail specialist for more details and to develop site-specific trail rehabilitation plans.

A.16 Maintaining Roadside Ditches and Culverts

Proper maintenance of roadside ditches and culverts will allow for improved water quality and fish habitat in San Mateo County Park creeks and streams by reducing sediment input to the watershed. Most sediment enters creeks from culverts and at stream crossings. Erosion from trails and landslide events are additional sources of sediment influx into streams and creeks.

In January 2002, San Mateo County Parks and Recreation contracted Pacific Watershed Associates to develop a sediment assessment of roads and trails within the Pescadero/Memorial/Sam McDonald County Park Complex (Pacific Watershed Associates, 2003). The report, completed in February 2003, estimated that road-related erosion control to prevent sediment from entering Pescadero Creek and its tributaries would cost $600,000.

The report concluded that the major sources of sediment in streams included:

- Undersized culverts;
- Undercutting at culvert crossings; and
- Debris-plugged culverts (Pacific Watershed Associates, 2003).

To protect streams, culverts and storm drains should be checked prior to major storm events for proper sizing, obstructions, and any signs of siltation or overflow. It may be necessary to:

- Replace some culverts with larger sized culverts that can accommodate flow during major storm events;
- "Armor" the outfall sites at culver crossings; and
- Add debris plates at culverts that become routinely plugged with debris.

Other measures to protect streams include re-grading trails to form 'rolling dips' to divert water off the trail surface (described under "Trail Maintenance"), active restoration of the streambank and stream corridor, and re-channeling roadside ditches to minimize parallel ditches, and increase perpendicular crossings along natural wetland contours to prevent downcutting, sediment accumulation, and road flooding.

As funds are available, park managers should make small improvements to these structures on an ongoing basis.

A.17 Non-Point Source Pollution Control and Erosion Control

San Mateo County has a very active and well-organized Stormwater Pollution Prevention Program (STOPPP) program. The San Mateo County STOPPP is a program that aims to partner with the county's residents and businesses to prevent pollution of our local water bodies; such as creeks, the San Francisco Bay and the Pacific Ocean. San Mateo County STOPPP have developed Best Management Practices (BMP's) for residents, businesses, and the community and Integrated Pest Management recommendations that are available online at: http://www.flowstobay.org/.

The following section includes BMPS specified in the STOPPP program, as well as other commonly used BMP's related to vegetation management that were synthesized from common practices recommended or undertaken at several federal, state, and local agencies, including the National Park Service, U.S Environmental Protection Agency, other County Park Districts, and State Lands.

A. Non-Point Source Pollution Control and Vegetation Management

As defined by the U.S Environmental Protection Agency, Non-point Source (NPS) pollution, unlike pollution from industrial and sewage treatment plants, comes from many diffuse sources. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water. The types of non-point source pollution that pertain to vegetation management include:

- Excess fertilizers, herbicides (and possibly insecticides);
- Oil, grease, and toxic chemicals (from vehicles and equipment used to manage vegetation); and
- Sediment from cleared land (e.g. tree and invasive plant removal sites, habitat restoration sites, streambank improvement sites).

The following list of BMP's pertaining to routine activities in San Mateo County Parks have been developed based on common practices at several federal, sate, and local agencies, including the National Park Service, U.S Environmental Protection Agency, other County Park Districts, and State Lands. Suggested BMP's are presented by alphabetically by category.

Drainage

Drainage features should be inspected prior to the rainy season, early October or November, to ensure proper function throughout the rainy season. Organic debris and excess sediment should be removed as needed to allow unrestricted flow and optimum storage volume.

Erosion Control

- Bare land should be carefully evaluated and appropriate vegetation established. At a minimum, a layer of organic mulch should be applied to the soil until the appropriate vegetation can be established.
- Management decisions should reflect the principles of plant succession leading to a multi-layered canopy, which ultimately provides erosion protection.
- Natural accumulations of leaf litter and other organic materials should be left undisturbed on erosion-prone sites whenever possible.
- Excessive runoff should be buffered and erosion controlled through a comprehensive watershed study followed by appropriate corrective action and maintenance.
- Bio-filtration of hard surface runoff should be attempted whenever possible.

- Managing for healthy plant communities is a major element in erosion prevention. The grass in a forest can provide adequate erosion buffering if it is healthy and vital.

Herbicide Application and Vegetation Management

- Apply herbicides and landscaping lawn and garden chemicals sparingly and according to label directions.
- Identify the pest or plant problem, and then choose the least environmentally damaging chemical and application method.
- Choose the least-toxic product available.
- Spot treat whenever possible.
- Restrict measuring and mixing of herbicides to designated areas, and require a certified herbicide applicator conducts these activities.
- Require a certified applicator with a valid QAL license to oversee application of all herbicides and pesticides. Require that they register with the County Agricultural Commissioner's office, and follow all state and federal laws.
- Restrict all herbicide, pesticide application within wetlands to the least environmentally damaging application methods (e.g. hand removal, cut and paint application with herbicides approved for use near water), establish a safe working buffer around the wetland, and require these methods to be used in the area.
- Require staff and contractors to fuel equipment and vehicles away from wetlands. Establish a buffer of at least 25 feet from wetlands, or designate refueling/storage areas that are in protected upland areas.
- Dispose of all herbicides, pesticides, equipment fuel and lubricants, properly, not in storm sewers or drains.
- Require staff or contractors to immediately clean up spilled brake fluid, oil, grease, antifreeze, herbicides, fertilizers, pesticides, and similar chemicals. Do not hose them into areas where they can eventually reach wetlands, streams, creeks, lakes.

Litter Control/Dumping

To keep natural areas free of litter and dumping, BMPs include:

- Inspect trailheads and streets/street-ends frequently.
- Respond quickly, to clean up dumped materials. Partner with other agencies or volunteer groups.
- Investigate dumped materials to identify the perpetrator. Follow up with sufficient evidence to seek prosecution or remedial action by the perpetrator.
- Involve Hazardous Materials Specialists when unknown chemicals are detected.
- Promote pack-in and pack-out through education and signage and recycling litter.

Mowing

The goal is to suppress vegetation as a means of fire control or to retain meadow grasses. The following are BMPs for mowing in natural areas:

- Mowing heights should be no lower than 4 inches.
- Mowing should be infrequent and only when necessary to reduce the potential for fires.
- One mowing every 2 to 3 years may be sufficient for woody vegetation control. Firebreaks require more frequent mowing.
- Timing should minimize impacts on wildlife nesting and habitation. Mow after August 15th.

Organic Debris
Organic debris from maintenance practices remains on site if it does not interfere with other landscape functions. Types of interference include blocking trails, forming unstable cornices, diverting drainage and smothering desirable vegetation. Whenever possible, use the following
BMPs:

- Organic debris should be cut and dispersed to maximize ground contact;
- Chipped woody debris is useful as long as the debris is left on site in depths to 6 inches or less.

Pruning
Pruning debris generated from vegetation management operations should be left on site whenever possible and placed away from wetlands. Do not place pruning debris along stream and riverbanks because high water can float debris downstream.

Trails
Trail maintenance is directly related to the construction and maintenance of proper drainage systems along trails. Trail surfaces can be composed of pavement, bare soil, wood chips, or crushed rock/gravel. Maintain the existing surface by adding like-kind material to current trail surface. Do not mix surface treatments.

Slide Areas
A geo-technical expert evaluates slide areas, or those suspected of being slide prone, before extensive restoration. Strategies can be developed to help maintain or even improve slope stability. While the standard practice of hydro-seeding slide areas is prudent, it does not restore structural stability to the slope. To restore stability and prevent further soil erosion, woody vegetation must be reestablished.

Steep Slopes

- Removing vegetation from the ground layer should be minimized. Plantings should be stabilized with appropriate bioengineering techniques.
- A geo-technical expert should evaluate slide-prone areas before extensive restoration.
- Storm water runoff must be prevented from saturating or loading slopes. The appropriate drainage system should be in place and adequately maintained to intercept run-off.

B. Soil Erosion

There are a wide variety of Best Management Practices that can be used to control sedimentation and soil erosion. Refer to Section 9.1 of the Watershed Protection Program Volume 1 Maintenance Standards (San Mateo County 2004) for a detailed description of erosion control methods that can be employed to control sedimentation and soil erosion, including brush packing, water bars, brush layering, cofferdams, coir fabricating, sediment barriers, diversion berms, energy dissipater structures, erosion control blankets, mats, netting, and wattles, slope protection devises, and other more detailed structural solutions to soil erosion and sedimentation.

"Storm-proofing" of road systems and trails (e.g. annual inspection and maintenance of culverts, outfall structures, and clearing debris at creek crossings) are preventative actions that can help ensure that future storm runoff will flow through the site naturally without causing harmful erosion or sedimentation. Road systems and trail systems are one of the most significant and most easily controlled sources of sediment production and delivery to stream channels. Chronic sediment inputs to the channel system from roads, trails, and other bare soil areas, are important contributors to

impaired habitat and reduced salmonid populations. This is especially true where sediment input is a limiting or potentially limiting factor to fisheries production, as is thought to be the case for Pescadero Creek (Pacific Watershed Associates, 2003).

The February 2003 study (Pacific Watershed Associates, 2003) identified sites near Pescadero Creek that had high priority for implementation of control measures. Problems include:

- Stream crossing erosion.
- Washouts.
- Fill failures.
- Ditch relief gully erosion.
- Stream diversions.

As with other non-point source pollution and erosion control issues, the suggested remediation's to these issues include standard measures as described in Section 9.1 of the Watershed Protection Program Volume 1 Maintenance Standards (San Mateo County 2004) for a detailed description of erosion control methods that can be employed to control sedimentation and soil erosion, including brush packing, water bars, brush layering, cofferdams, coir fabricating, sediment barriers, diversion berms, energy dissipater structures, erosion control blankets, mats, netting, and wattles, slope protection devises, and other more detailed structural solutions to soil erosion and sedimentation.

Soil Surfaces Disturbed by Maintenance and/or Construction Activities:

- Use temporary erosion controls at worksites to prevent soil and/or wind erosion where the soil will be disturbed for more than 2 weeks. Temporary erosion controls that can be used include straw logs, straw mulch, and netting.
- Require dirt and debris piles that are to remain onsite for more than 24 hours to be covered with tarps, and require the tarps to be secured with ropes and sandbags, or other weighting to help ensure the piles stay covered.
- At the conclusion of work, use permanent erosion controls, which include straw mulch; forest litter mulch; straw or straw wattles, coir logs*; erosion control netting, mats, or blankets; and revegetation (Do not use erosion control mats or blankets with plastic netting between the banks of any watercourse or in any area known to provide habitat for the salt marsh harvest mouse.).
- During the rainy season, treat the site within 3 working days.
- During the dry season, treat the site within 14 working days (or sooner if wind or traffic create airborne dust).
- In emergency situations only, plastic sheeting can be temporarily used to prevent additional rainfall or runoff from affecting the slope.

*Note: Straw logs are manufactured from straw wrapped in netting. Coir logs are similar, but are filled with coconut fiber rather than straw.

A.18 Integrated Pest Management

An integrated pest management approach (IPM) is recommended for controlling invasive plants, managing vegetation, and treating pests (plant diseases, insects, and other pests). Typical IPM programs establish goals, determine thresholds for control, provide guidance for selecting from a combination of control and removal methods, and recommend implementing one or more of these methods, monitoring results, and evaluating outcomes. Park managers should be aware of the IPM process, and should seek professional help from the County Agricultural Comissioner;s office, the STOPPP program, and/or an IPM professional when planning programs related to herbicide and pesticide use on County Parks.

San Mateo County has a very active and well-organized Stormwater Pollution Prevention Program (STOPPP) program. The San Mateo County STOPPP is a program that aims to partner with the county's residents and businesses to prevent pollution of our local water bodies; such as creeks, the San Francisco Bay and the Pacific Ocean. San Mateo County STOPPP have developed Best Management Practices (BMP's) for residents, businesses, and the community and Integrated Pest Management recommendations that are available online at: http://www.flowstobay.org/.

Recommended methods to control Non-Point Source Pollutants during vegetation management activities are listed above, under Section B-17 above.

Appendix B: Forms

San Mateo County Parks and Recreation Maintenance Unit

WORK REQUEST

I. DESCRIPTION OF WORK

Unit #	Park Name	Priority: Emergency, Urgent, Routine, As Possible, Estimate Only, Other
Work Location		Target Date

Detailed Work Description

Safety Hazard, or Attachments

Availability of Park Resources and Personnel

Proposed Charging Information

Organization #: Account #: Activity Code: Option Code: E.P.O.#:

Contact Name(s)	Contact Telephone #	Supervisor Approval	Date Approved

II. MANAGEMENT REVIEW

Reviewer	O.K.	Initials	Date	Comments
Park Superintendent				Cont.
Planning and Development				Cont.
Management Analyst				Cont.
Director of Parks				Cont.
Other:				Cont.
Other:				Cont.

III. MAINTENANCE REVIEW

Date Received	Pre-Work Conference	Maintenance Estimate Materials: $	Staff Hours: #	Other: $

Scope of Work

Cont.

Maintenance Review Disposition Schedule Priority (1-4): Refer Back to Mgr. Hold	Disposition/Comments

IV. WORK MANAGEMENT

Primary Worker	Additional Maintenance Staff	
Estimated Start Date	Estimated Completion Date	Park Contact Assigned

Materials Needed Ordered: By: Rcvd:

Additional Park Unit Staff Required Scheduled: By:

Contractors/Rentals/Permits/Other Needs Arranged: By:

Changes to Original Scope of Work

Cont.

V. WORK COMPLETION INFORMATION

Completion Date	Work Accepted By Date	Final Cost Materials: $	Staff Hours: #	Other: $

Comments/Misc..

Copies: Top - Maintenance Unit Final; Second - Unit Final; Third - Unit Planning; Fourth - Manager Review; Bottom - Unit Original

Suggested Ranking Criteria

Rankings within each criteria category should be between 3 and 0 with 3 being the highest possible ranking.

3 - this project meets all the applicable criteria for this category
2 - this project meets most of the applicable criteria for this category
1 - this project meets a few of the applicable criteria for this category
0 - this project does not meet any of the criteria for this category
n/a - this project does not have any relevance to this criteria category (e.g. a polygon that includes invasive plant removal only, would receive an n/a for the trails criteria).

Proposed Project	Ranking (0,1,2,3, N/A)	TOTAL
Protects And Enhances The Park's Most Sensitive Natural Areas		
a. T&E, special status species, locally rare species		
b. Wetlands		
c. Special Ecological Area, rare or sensitive vegetation communities, and/or unique geologic feature		
	Sum	
Controls And Reduces Threats To Natural Resources And/Or Cultural Resources And/Or Restores Natural Processes		
a. Controls and/or removes targeted invasive plant material		
b. Controls non-natural erosion & restores natural hydrology/drainage		
	Sum	
Trail and Visitor Use Improvements		
a. Trail and Visitor Use Improvements		
b. Project reduces need for trail maintenance		
c. Improves the integrity and circulation of the trail system		
i. Clear logical main trail		
ii. "Rib" connectors to destinations and communities		
iii. Trail heads and loops etc.		
d. Removes non-designated social trails		
e. Reduces sedimentation, erosion and resource trampling disturbance		
f. Enhances visitor experience (destinations, circulation, linkages)		
g. Improves Public Safety		
	Sum	
Public Engagement and Support		
a. Provides interpretive opportunities		
b. Provides for increased volunteer/stewardship opportunities		
c. Demonstrated or potential to garner significant public interest and support		
d. Improves intrinsic visitor and recreational experiences		
e. Increases understanding and support for natural resource values of Park		
	Sum	

Proposed Project	Ranking (0,1,2,3, N/A)	TOTAL
Potential for Funding		
a. Funding available (in part) through other programs/projects		
b. Funding potential		
c. Future leverage "quotient"		
	Sum	
Potential for Implementation Success, Project Feasibility		
a. Project can be accomplished within projected timeline Including permitting and CEQA ("project readiness")		
b. High level of outcome for resources expended		
	Sum	
Integrates With Existing Projects		
	Sum	
Consistency with Internal Programs and Staff Capacity		
a. Adds support to existing Park programs		
b. San Mateo County Park staff capacity/in line with Park values		
c. Reduces maintenance crises		
d. Compatible with internal organizational priorities		
	Sum	
TOTAL RANKING FOR PROPOSED PROJECT		

Suggested Ranking Criteria Example

Rankings within each criteria category should be between 3 and 0 with 3 being the highest possible ranking.

3 - this project meets all the applicable criteria for this category
2 - this project meets most of the applicable criteria for this category
1 - this project meets a few of the applicable criteria for this category
0 - this project does not meet any of the criteria for this category
n/a - this project does not have any relevance to this criteria category (e.g. a polygon that includes invasive plant removal only, would receive an n/a for the trails criteria).

Project example: *San Mateo County Parks department wants to update a bridge structure, remove encroaching non-native ivy and restore approximately 1-acre around the bridge to native vegetation. The bridge spans a creek that is a popular trail and California red-legged frog is known to be present near the project site.*

Proposed Project	**Ranking (0,1,2,3, n/a)** (3 = highest)	**TOTAL**
Protects And Enhances The Park's Most Sensitive Natural Areas		
a. T&E, special status species, locally rare species	3	
b. Wetlands	3	
c. Special Ecological Area, rare or sensitive vegetation communities, and/or unique geologic feature	3	
	Sum	9
Controls And Reduces Threats To Natural Resources And/Or Cultural Resources And/Or Restores Natural Processes		
a. Controls and/or removes targeted invasive plant material	3	
b. Controls non-natural erosion & restores natural hydrology/drainage	2	
	Sum	5
Trail and Visitor Use Improvements		
a. Trail and Visitor Use Improvements	3	
b. Project reduces need for trail maintenance	3	
c. Improves the integrity and circulation of the trail system	3	
i. Clear logical main trail	3	
ii. "Rib" connectors to destinations and communities	0	
iii. Trail heads and loops etc.	0	
d. Removes non-designated social trails	n/a	
e. Reduces sedimentation, erosion and resource trampling disturbance	2	
f. Enhances visitor experience (destinations, circulation, linkages)	2	
g. Improves Public Safety	3	

Proposed Project	Ranking (0,1,2,3, n/a) (3 = highest)	TOTAL
	Sum	19
Public Engagement and Support		
a. Provides interpretive opportunities	3	
b. Provides for increased volunteer/stewardship opportunities	3	
c. Demonstrated or potential to garner significant public interest and support	1	
d. Improves intrinsic visitor and recreational experiences	3	
e. Increases understanding and support for natural resource values of Park	1	
	Sum	11
Potential for Funding		
a. Funding available (in part) through other programs/projects	2	
b. Funding potential	1	
c. Future leverage "quotient"	1	
	Sum	4
Potential for Implementation Success, Project Feasibility		
a. Project can be accomplished within projected timeline Including permitting and CEQA ("project readiness")	1	
b. High level of outcome for resources expended	2	
	Sum	3
Integrates With Existing Projects		
Integrates with the goal of maintaining safe access to the public	3	
	Sum	3
Consistency with Internal Programs and Staff Capacity		
a. Adds support to existing Park programs	1	
b. San Mateo County Park staff capacity/in line with Park values	2	
c. Reduces maintenance crises	2	
d. Compatible with internal organizational priorities	3	
	Sum	8
TOTAL RANKING FOR PROPOSED PROJECT (highest ranking possible = 90)		62

COUNTY OF SAN MATEO
DIVISION OF PARKS AND RECREATION
455 County Center, 4th Fl., Redwood City, CA 94063-1646
Office: (650) 363-4020

Application For A Scientific Collection Permit

(Type or print clearly when filling out this application.)

Date of Application: _____ Expires: _____

Name: _____ Driver's License No. _____

Address: _____ Apt. No._____ City: _____

State:_____ Zip:_____ Telephone: Home ( )_____ Fax ( )_____

Work ( )_____ Ext._____

State Permit No._____ Permit No. _____

Start Date(s):_____ Time(s):_____

Project Description: _____

_____

_____.

(Please attach an additional sheet(s), if more space is needed.)

Project or Thesis Title: _____

Park: _____ Location(s) where you wish to collect:_____

_____

Approximate Date of Completion: _____.

COLLEGE AND HIGH SCHOOL STUDENTS, PLEASE HAVE THE FOLLOWING COMPLETED:

Name of College or High School: _____

Address: _____ City:_____ State:____ Zip:_____

Signature of Faculty Advisor: x_____ Title: _____

Please Print Name: _____ Telephone: ( )_____

TRA THOMAS REID ASSOCIATES
ENVIRONMENTAL CONSULTANTS
560 Waverley Street, Suite 201, P.O. BOX 880, Palo Alto, CA 94301
Tel: (650) 327-0429 ❑ Fax: (650) 327-4024 ❑ www.TRAenviro.com

Dear Permit Applicant:

Attached is the application you requested for a San Bruno Mountain Site Activity Permit. Please fill it out and FAX to the following parties for approval:

Sam Herzberg at San Mateo County (650) 599-1721
Thomas Reid Associates (650) 327-4024

Do not limit yourself to the space provided. Although some projects are small and the application may be completed on the form, more detail is usually required than will fit on the application form. Each category should be answered in detail, including personnel used, job schedule, and protective measures intended to limit impacts. Job schedules and personnel used during different phases of work are best communicated in a table. Protective measures needed to avoid impacts may include erosion control, careful timing of work, education and avoidance of sensitive resorces, and limitations on the equipment and personnel used.

Approval of the San Bruno Mountain Site Activity Permit does not render unnecessary other permits that may be required for your project, from other agencies or governing bodies (i.e. US Army Corps of Engineers, California Deparment of Fish and Game, US Fish and Wildlife Service, California Regional Water Quality Control Board, California Department of Forestry, Bay Area Air Quality Management District). It is the applicant's responsibility to have all necessary permits in order before beginning the project.

Proof of the landowner's permission for the project or initiation of the project is also required, if the applicant and landowner are not the same.

Sincerely,

Patrick Kobernus
San Bruno Mountain HCP activities coordinator

COUNTY OF SAN MATEO
Parks and Recreation Division
County Government Center
Redwood City, CA 94061

When completed FAX to:
Thomas Reid Associates (TRA) (650) 327-4024
Sam Herzberg, San Mateo County (650) 599-1721

SAN BRUNO MOUNTAIN
HABITAT CONSERVATION PLAN SITE ACTIVITY PERMIT

not a valid permit until approved below

PROJECT: _____ LEAD AGENCY: _____

PROPERTY OWNER: _____DATE:_____

APPLICANT:_____ CONTACT PERSON:_____

ADDRESS: _____

PHONE:_____ EMAIL:_____

HCP Administrative Parcel Number:_____

Project Description (include site maps - 1" = 200 ft. - discuss access, parking, equipment storage, spoils disposal, etc.): Attach maps, and a separate sheet or report if necessary.

Equipment required:_____

_____

_____

Personnel required:_____

_____

Onsite contact (name, telephone):_____

Job schedule (daily): _____

_____

_____

_____

_____

Scope of impact to habitat and proposed protective measures: _____

_____

_____

_____

If applicant and property owner are not the same, attach a copy of a document showing proof of the property owner's concurrence with or permission for the project, or initiation of the project, including a contract or other signed statement.

Applicant's Signature/Title: _____

****

FOR STAFF USE ONLY **PERMIT VALID UPON APPROVAL BELOW**

County Contact:_____ Phone:_____

Conditions of Approval: G Inform TRA and San Mateo County when work is completed or stopped

_____

_____

Signature/Title:_____ Date:_____

NOTE: Use Additional Pages for Further Description TRA: (01/06/2002)

This permit does not absolve applicant of responsibility to obtain all other applicable permits; this permit grants HCP Habitat Manager approval to projects within the San Bruno Mountain HCP. Other permits may be required.

SAN MATEO COUNTY MAINTENANCE NOTIFICATION
(FORM RM-E01)

SECTION 1: TO BE COMPLETED BY OPERATOR, SUPERVISOR OR MANAGER			
REQUESTOR/TITLE		PHONE NUMBER	
DATE OF REQUEST	PROJECT START DATE	CATEGORY OF WORK RM EO PRV	
LOCATION OF WORK (ROAD NAME, ADDRESS OR MILE MARKER, DISTANCE TO & NAME OF CROSS STREET)			
DESCRIPTION OF WORK (INCLUDING EQUIPMENT USED/NEEDED, AVOIDANCE MEASURES TAKEN, EROSION CONTROLS APPLIED, ETC.)			
WORK SITE DIAGRAM			
SECTION 2 – TO BE COMPLETED BY MANAGER			
PERMITS/NOTIFICATIONS REQUIRED:			
PERMITS/NOTIFICATIONS COMPLETED BY: NAME/TITLE DATE			

Distribution: Supervisor Maintenance ManagerDivision Manager Office File

EDGEWOOD PARK & PRESERVE MONITORING PROGRAM

By
Ricardo Trejo

INTRODUCTION

In compliance with County of San Mateo Agriculture Weed Abatement this monitoring program is intended to monitor the Exotic Plant Eradication and/or Habitat Restoration Programs.
To initiate the monitoring program, the following outline intention is for collection and recording data needed in order to evaluate the effectiveness and impacted that the park's native plant will incur during the eradication process or progress in restoration projects. All individual areas are to be mapped and data pertaining to an area is to be logged in a logbook.

MONITORING GUIDLINE

INTRODUCTION:

Description of the area that is to be studied/restored (marsh habitat, grassland etc.) and identified by placing boundary markers. Give information on the type of native plants to the area, and of the exotic plants to be eradicated.

GOALS AND OBJECTIVES:

Why and what is to be accomplished. Duration of study (start date and ending date, not to exceed one calendar year), so that the method and procedure can be evaluated and make adjustments if needed.

PROCEDURE:

1. Identify each area to be studied/restored and mark its boundary with stacks, give size of area.
2. In area to be studied, estimate the population of the different type of plants that exist (seasonal). Example; If area to be studied is 50 square feet, take two or three ten square feet readings of the different types of plants (native and exotic) that exist in the area by season.
3. How are exotic plants to be exterminated (hand pulled, chemicals, control burn etc.).
4. Assist nature in native plants restoration by planting seedlings (how many are planted and dated), by spreading native seeds (type and where were seeds collected), or by allowing native plants to restore naturally.
5. If seeds are collected from the park to grow seedlings in a control environment, record the weight of seeds collected and type.
6. What types of equipment/tools are to be used?

PRO/CON:

Example:

1. Given the procedures what can be expected.
   Pro: Extermination of exotic plants allows native plants to dominate area.
   Con: Mass number of persons in study area may cause excessive packing of soil and plant stumping.
2. Time and weather factors (spring vs. fall etc.).

DATA:

1. How many and type of exotic plants were removed and date.
2. How many native plants seedling planted and date.
3. Record interval schedules for plant population readings (native and exotic plants).
4. List of factors that may be affecting the results in the study.

CONCLUSION:

Are the native plants population increasing or not. Exotic plants continue dominating areas. Should alternative measures take place, if so what.

TRAIL RESOURCE TRAINING

OUTLINE

BY RICARDO TREJO

I. INTRODUCTION

A. Pass Procedures
B. Present View Point Awareness
C. Communication

II. REGULATIONS

A. CEQA
B. ADA
C. Local, State, and Federal
D. Resource/Habitat Sensitive
E. Monitoring Program

III. TRAIL RESTORATION

A. Generic vs. Local on site Specification
B. Repairs beyond trail tread
C. Trail Inventory

IV. FINANCIAL SUPPORT

A. Monitoring cost factor
B. Interpretive/Education Programs
C. Public/Special interest support groups
D. Grant information

PROJECT PRIORITIZATION SCORING SHEET

Ranking and Scoring Criteria: Rankings within each criteria category should be between 3 and 0 with 3 being the highest possible ranking.

3 - This project meets all the applicable criteria for this category
2 - This project meets most of the applicable criteria for this category
1 - This project meets a few of the applicable criteria for this category
0 - This project does not meet any of the criteria for this category
N/A - This project does not have any relevance to this criteria category (Example a project that controls invasive plant removal only would receive an n/a for visitor use/safety criteria).

	Consistency with Vegetation Management Objectives									Other Objectives					
Vegetation Management Actions and Projects*	Maintains Sensitive Species and Habitats	Maintains Diverse Recreational Uses of Park	Maitains Visitor Use, Safety	Achieves Sustained Control of Invasive Plants	Maintains Natural Plant Communities	Encourages Park Stewardship	Manages Forests/Improves Forest Heath, Reduces Fire Hazard	Protects Watersheds, Helps Reduce Eriosion/ Non-Point Source Pollutants	Consistent with Integrated Pest Management	Public Engagement and Support	Potential for Funding	Potential for Implementation Success, project Feasibility	Integrates with Existing Projects	Consistency with Internal Programs and Staff Capacity	**TOTAL SCORE (3,2,1,0, N/A)**
ALL PARKS															
Maintain fuel reduction along 100 foot property perimeter for fire protection															
Continue to reduce sedimentation and non-point source pollutants in all watersheds. Inspect culverts, road crossings, waterways. Restore streambanks with native vegetation															
Continue invasive control efforts															
Continue to manage forests for forest health and fuel load reduction.															
Monitor hazard trees, tree diseases. Treat accordingly (remove, contain, trim etc)															
Set mowing schedule based on sensitive biological resource constraints															
Continue to protect sensitive species, track populations and use adaptive management to improve habitat values. Monitor rates of habtiat conversion and use active management to control (example grassland conversion to shrubland)															
Monitor roads and trails, remove unauthorized trails															
Continoe work with Volunteer groups, expand opportunities for site stewardship															

Crystal Springs																
Control spread of California Oak Mortality Disease (formerly known as Sudden Oak Death). (52)																
Continue Mowing.																
Hazardous trees detection and assessment, pruning, and removal along trail and road.																
Trail and road inspection (including culverts prior to rainy season).																
Fuel load/fire reduction in areas bordering the watershed.																
Other projects (Add here)																
Coyote Point																
Incorporate plants into landscaping that help hold soils to minimize erosion, prevent invasive weeds from encroaching into the activity areas, and emphasize the use of natives. (74)																
Ongoing invasive Spartina control (in partnership with the Spartina Project). (52)																
Manage for invasives, including cotoneaster, acacia, and others. Control poison oak																
Other projects (Add here)																

Edgewood															
Continue long-term monitoring of Bay checkerspot butterfly and its habitat. (77)															
Continue to perform existing experiments to evaluate effectiveness of mowing and grazing. (77)															
Reconsider the practical and political aspects of using fire as a habitat management technique and possibly implement new policies and techniques. (77)															
Continue to rely on other agencies to provide fire suppression. (77)															
Use seed farming and seeding of natives to improve bay checkerspot butterfly habitat. (77)															
Support volunteer resource protection programs. (26)															
Continue weed eradication efforts															
Develop a scheduled trail maintenance program for trimming of plants and trees after blooming of flowers and plants.															
Implement Cordilleras Creek restoration including invasives removal and planting of native species in conjunction with the construction of an interpretive center. (75)															
Maintain a fuel reduction area along 100 foot perimeter of property for fire protection.															
Other projects (Add here)															
Fitzgerald															
Continue invasive species removal near San Vicente Creek.															
Manage access to user groups of 10 or more.															
Other projects (Add here)															
Restore creeks, remove invasive species, control erosion by planting natives, stabilize trail at creek crossings															
Work with Airport, surrounding landowners to reduce non-point source pollutants															
Fuel management in cypress forest and house site- remove non-natives															

Flood

Remove exotics where they threaten heritage trees.															
Assessment of all Heritage trees for hazardous conditions - Trim or remove as necessary.															
Maintain fuel reduction along 100 foot property perimeter for fire protection.															
Other projects (Add here)															

Huddart

Reduce sedimentation arising from various sources including road and trail erosion and creek bank erosion.															
Maintain access roads, fire trails, equestrian trails and pedestrian trails on an annual basis. In addition, inspect major access roads and fire trails after every major storm event during the winter and spring months.															
Work with PG&E to maintain the right-of-way throughout the parks and develop guidelines for trailside trimming procedures that preserve habitat and aesthetics as well as fire safety.															
Continue to employ current methods and practices to reduce the risk of ignition of fire.															
Continue to work with volunteers to remove French broom, scotch broom, bull thistle.															
Ensure key onsite personnel, including park rangers, maintenance staff, caretakers and non-profit organization staffs are trained in basic fire prevention.															
Include information regarding fire ecology and prevention at entrance and trail staging area kiosks, and in interpretive and educational materials.															
Meet with neighboring homeowner associations to collaborate on fire safety projects.															
Survey annually for tree hazards and poison oak in high use areas (campgrounds/ picnic areas).															
Other projects (Add here)															

Junipero Serra																
Gradually remove invasive plants especially the Monterey pine and blue gum Eucalyptus. Remove Eucalyptus near private residences on area boundary first, as they pose a liability problem. (35)																
Mow or green chop grasslands annually during the months of May-July for fire suppression. (35)																
Control invasive plants and problem species such as poison oak and Scotch broom. (35)																
Remove all invasive trees and shrubs from grassland including invasive native shrubbery (34). To be done every five years (35).																
Other projects (Add here)																
Memorial																
Provide a hazardous tree inspection in campgrounds, picnic areas, and trails.																
Remove invasive plants.																
Develop a scheduled mowing cycle for grass areas.																
Implement the erosion control projects that were recommended and prioritized for the Pescadero/ Memorial/ Sam McDonald County Park Complex. (79)																
Other projects (Add here)																
Mirada Surf																
Control bristly ox-tongue infestations.(88) Develop a mowing schedule for bristly ox tongue in grass areas with times of the year to mow.																
Remove coyote brush from grasslands on Mirada Surf West to maintain open grassland habitat																
Continue to follow construction recommendations for work done in creek area and other sensitive habitats. (89).																
Other projects (Add here)																

Pescadero Creek															
Stabilize banks by encouraging riparian growth. (55)															
Utilize burns and hand and mechanical clearing to reduce fire hazards. (55)															
Implement watershed monitoring program. (55)															
Remove weeds and restore the grasslands. (55)															
Other projects (Add here)															
Sam McDonald															
Provide a hazardous tree inspection in campgrounds and picnic areas.															
Remove invasive plants.															
Develop a scheduled mowing cycle for grass areas.															
Maintain a fuel reduction area along 100 foot of property perimeter for fire protection.															
Implement the erosion control projects that were recommended and prioritized for the Pescadero/Memorial/Sam McDonald County Park Complex. (79)															
Other projects (Add here)															
Control feral pig population															

San Bruno Mountain

Actions managed by San Mateo County Parks																
Control exotic species infestations of gorse, Eucalyptus, and others. (81)																
Monitor sensitive habitats that may be impacted by visitor use and then implement trail and area closures as conditions warrant.																
Promote the use of integrated vegetation management to control non-native species. (78)																
Monitori and prevent over collection of seed and plant collection																
Remove or restore unneeded trails, service roads, and fire breaks by regrading and revegetating with native species (if necessary). (78)																
Conduct a detailed study of all existing trails, service roads, and fire breaks and make recommendations. Assess these areas for endangered species habitat before rebuilding any trails. (78)																
Remove remaining, mature gorse that is adjacent to the Gorse Removal Project area in the Saddle.																
Identify and implement activities within the HCP and adjacent areas that reduce hazardous fuel loads and prevent wildfires. (4)																
Address erosion, drainage, and public use issues caused by undesignated trails. (78)																
Actions managed by outside sources under the San Bruno Mountain Habitat Conservation Plan (Thomas Reid & Associates , West Coast Wildlands, Shelterbelt Builders,Inc.etc.)																
Control exotic species infestations of gorse, Eucalyptus, and others. (81)																
Monitor the (offsite) mitigation areas, endangered species populations, research and pilot study progress, and conserved habitat enhancement programs. (90)																
Continue to research and utilize various vegetation management techniques for the preservation and expansion of habitat for the endangered butterflies. (90)																
Restore grassland habitat for the federally endangered butterflies covered by the HCP while maintaining historic prairies, grasslands, and scrub communities. (4)																
Create management plans, which could include pile burning, chipping, or hauling, for biomass that is left following vegetation management practices such as herbicide spraying and hand-pulling.																
Restore and create habitat for the endangered mission blue, callipe silverspot, and San Bruno elfin butterflies. (81)																
Perform ongoing weed abatement on Park lands that are within 100 feet of homes or other structures.																
Continue to restore areas that were burned in September 2002. (12) Create infrastructure that would allow for the introduction of rotational cattle grazing on the mountain.																

San Bruno Mountain (Continued)															
Current Restoration Projects															
Colma Creek Headwaters Restoration Project															
San Bruno Mountain Gorse Control and Revegetation Project															
Other projects (Add here)															
San Pedro															
Control poison oak. (7)															
Monitor and maintain existing areas of coastal scrub. (8)															
Maintain naturalized grasslands as open fields following the historical grassland boundaries and prevent the invasion of woody plants. (8)															
Maintain existing stands of manzanita. (8)															
Continue to implement erosion control of streambeds for enhanced steelhead habitat. (8)															
Monitor and patrol for unsanctioned access and elicit removal of fish by checking for social trails, trash, etc. (8)															
Conduct invasive species control with other alliances and continue to identify the status of these invasive species. (53)															
Utilize diversion ditch, seeding, and planting for erosion control. (7)															
Maintain fuel reduction at interface of property lines.															
Develop a hazardous trees inspection program.															
Remove Eucalyptus that is competing in the non-riparian areas and replant area with redwoods. (8)															
Other projects (Add here)															
Replace eucalyptus with Douglas fir, redwood															
Sanchez-Adobe															
Mow grass areas on schedule to reduce weeds															
Maintain native plant landscaping once installed															
Cut vegetation away from fences & overhanging branches near apartment building. Interact with property owners at common boundary.															
Other projects (Add here)															
Create and implement a creek restoration project															
Update landscape elements including native garden, creek overlook, etc.															

Wunderlich															
Utilize hand or mechanical removal of exotic species,and other methods to maintain the grasslands in the central meadow															
Control acacia and French broom invasive plant populations at Wunderlich															
Maintain access roads, fire trails, equestrian trails, and pedestrian trails on an annual basis. Inspect major access roads and fire trails after every major storm event during the winter and spring months.Conduct fuel reduction by cutting and chipping brush and trees and installing fuel breaks along service roads and trails.															
Clear service roads of understory, thin trees near service roads, especially in Wunderlich Park along the Loop, Alambique and the Meadows Trail.															
Mow grasslands along roads and selected boundaries (such as Bear Gulch Rd.) for a distance of 30 ft. where applicable															
Coordinate with Caltrans, County Department of Public Works, and Town of Woodside to ensure roadside management is conducted along Skyline Blvd., Kings Mountain Road, Woodside Road, and LaHonda Road.															
Work with PG&E to maintain the right-of-way throughout the parks and develop guidelines for trailside trimming procedures that preserve habitat and aesthetics as well as fire safety.															
Provide survivable space around each structure of 100 ft by mowing grass, pruning trees, and removing dead and flammable material from roofs, decks, grounds, propane tanks.															
Ensure the landscape plan minimizes wildland fire hazards and provides defensible space															
Install fire-resistant plants in a fire-safe design that consists of groupings isolated by hardscape or mowed grass.															
Remove invasive and exotic plants that pose a fire hazard															
Pursue habitat restoration with native plants in the disturbed areas with higher fire hazard															
Continue horse grazing in Wunderlich Park near stable where possible															
Maintain a fuel reduction interface at property lines.															
Other projects (Add here)															

Simultaneous Development Application (if any): _____ TRT # _____

San Mateo County Planning and Building Division ▪ 590 Hamilton Street, Redwood City California 94063 ▪ 363-4161

Application for Permit to Trim or Remove

Sections 11,000 et seq and 12,000 et seq of the San Mateo County Ordinance Code.

❑ HERITAGE TREE(S) ❑ SIGNIFICANT TREE(S)

Applicant: _____

Address: _____

_____

Telephone: _____

_____

Date of Application: _____

10 Day Period of Posted Notice

From: _____

To: _____

Address and/or parcel number where tree(s) located: _____

_____

Tree(s) Diameter or Circumference (at 4 1/2 ft height)	Kind of tree(s)	Health of tree(s)	Reason for Removal/Trimming

REMOVAL PLAN:

1. Method of removal: _____

_____

2. Equipment to be used: _____

_____

3. Method of tree(s) disposal: _____

_____

The information contained in the application is accurate and true to the best of my knowledge. I understand that an approved permit may be conditional. Further, the decision on this application may be appealed to the San Mateo County Planning Comission. Authority to remove or trim a tree is effective only after the appeal period has expired.

_____

Applicant's Signature

recycled paper

VEGETATION WORK REQUEST (Page 1)

I. DESCRIPTION OF WORK

Unit #	Park Name	Priority (Emergency, Urgent, Routine, As Possible, Estimate Only, Other):	Project Ranking (if available):
Work Location			Target Start Date:
Project Title			Habitat type(s):
Availability of Park Resources and Personnel		Species Benefitted (List):	

II. PROPOSED CHARGING INFORMATION

Organization #:	Account #:	Activity Code:	Option Code:	E.P.O.#:
Contact Name(s)	Contact Telephone #	Supervisor Approval		Date Approved:

III. MANAGEMENT REVIEW

Reviewer	**O.K.**	**Initials**	**Date**	**Comments**
Park Superintendent				Cont.
Planning and Development				Cont.
Management Analyst				Cont.
Director of Parks				Cont.
Other:				Cont.
Other:				Cont.

IV. STAFF REVIEW

Date Received	Pre-Work Conference (date)	Summary Cost Estimate:		
		Materials: $	Staff Hours: #	Other: $

V. DETAILED WORK DESCRIPTION

Description of Work:	**Acres**

VEGETATION WORK REQUEST (Page 2)

V.1 Work Needs Checklist (Circle)

	Baseline data collection	Permits, Approvals, Agreements Public Notifications (List)	Plant Materials collection /propagation (Attach list)	Herbicide application (type)	Tree removal /Forestry Assessment	Mowing/ Mantenance Crew	Rare Plant,Wildlife Surveys	Other Specialty Services (list)	Signage, Fencing, Erosion Control (list)	Performance Monitoring (type, frequency)
Details (Specify)										

V.2 Work Schedule, Frequency (fill in for each type of project):

Total duration										
Seasonal restrictions										
Optimal treatment timing										
Retreatment timing/frequency										
Proposed start date										
Projected completion date										

V.3 Waste Disposal Options

Green Waste Generated (amt):	Type: (grass clippings, wood debris, invasive plants)	Disposal Method:	Recycle Works Notification/Assistance Y/N
Maintenance Review Disposition		Disposition/Comments	
Schedule Priority (1-4):	Refer Back to Mgr.	Hold	

VEGETATION WORK REQUEST (Page 3)

VI. WORK MANAGEMENT

Primary Worker(s):	Additional Maintenance Staff (List Names):		
Estimated Start Date	Estimated Completion Date	Park Contact Assigned	
Materials Needed (list):	Ordered (Date):	By:	Rcvd:
Additional Park Unit Staff Required		Scheduled:	By:
Contractors/Rentals/Permits/Other Needs		Arranged:	By:
Changes to Original Scope of Work			Cont.

VII. WORK COMPLETION INFORMATION

Completion Date:	Work Accepted By:	Date:	Total Acres Treated:	Species Benefitted:
Staff Hours (Total):	Final Cost Staff:	Final Cost Materials: $	Other costs:	TOTAL COST:

Comments/Misc.

Revegetation Monitoring: Project Field Assessment Form (PAGE 1)

Date:	**Project Name:**
Observer:	**Project Number:**
Location (ATTACH MAP):	**Park:** **Project Manager:**

Type of Project (Circle 1)

Revegetation	Tree Removal/ Forest Improvement	Fuel Load Management Fire Management	Invasive Plant Control	Sensitive Species Habitat Enhancement	Erosion Control/ Non-point Source Pollution control	Mowing	Trail Maintenance	Winter Stormproofing /Culverts, Roads, Bridges	Other (Specify)

Status Of Project

Monitoring Year (CIRCLE ONE):	Baseline	Year 1	Year 2	Year 3	Year 4	Year 5	Other	

Active Restoration (Planting) Sites- Plant Survivorship Monitoring

Parameter	Measure	Site 1	Site 2	Site 3	Site 4	Site 5	**DEFINE Annual Performance Criteria** (Fill in from monitoring report- example: XX % survival in Year XX)	**DEFINE Overall Success Criteria** (Fill in from monitoring report- example: XX % survival by end of the project in Year XX)	**Target met? Y/N**
Trees	% Survival								
Shrubs	% Survival								
Groundcover/ Herbs	% Survival								

Active Restoration (Planting) Sites- Assessment of Growth, Vegetation, Canopy Cover

Trees	Average height, stem width or dbh								
	Vegetation or Canopy cover (Use Cover Class Estimates 1-5 on Page 3)								
	Evidence of new growth? Y/N?								
Shrubs	Vegetation or Canopy cover (Use Cover Class Estimates 1-5 on Page 3)								
	Evidence of new growth? Y/N?								
Groundcover/ Herbs	Vegetation or Canopy cover (Use Cover Class Estimates 1-5 on Page 3)								
	Evidence of new growth? Y/N?								

Revegetation Monitoring: Project Field Assessment Form (PAGE 2)

Date: **Observer:**	**Project Name:** **Project Number:**
Location (ATTACH MAP):	**Park:** **Project Manager:**

Ground Condition

Mulch installed depth (Inches):	**Other Ground Condition Problems (DESCRIBE)**-(e.g., watering, erosion, damage, deer browse)
Litter? Y/N: **Quantity present:**	
Thatch/Weeding Needed? Y/N **% ground coverage of thatch/weeds?**	
Other concerns: (shading/crowding the plantings)	

Invasive Plants

Are Target Invasive Plants Present ? If so, what species? Describe Location and Population size.	
Are Other Weedy Plants Present (grasses, annual weeds)? If so, what species? Describe Location and Population size.	

Environment

Trampling	**Describe Extent/Problem Here:**	**Describe possible solution here:**
Herbivery/deer browse, rodents	**Describe Extent/Problem Here:**	**Describe possible solution here:**
Poor drainage	**Describe Extent/Problem Here:**	**Describe possible solution here:**
Overly dry soils	**Describe Extent/Problem Here:**	**Describe possible solution here:**
Plant breakage	**Describe Extent/Problem Here:**	**Describe possible solution here:**
Insect Damage	**Describe Extent/Severity Problem Here:**	**Describe possible solution here:**
Disease damage/loss	**Identify Disease/Describe Severity/Problem Here:**	**Describe possible solution here:**
Other concerns	**Describe Extent/Problem Here:**	**Describe possible solution here:**

Revegetation Monitoring: Project Field Assessment Form (PAGE 3)

Date:	**Project Name:**
Observer:	**Project Number:**
Location (ATTACH MAP):	**Park:** **Project Manager:**

Remediation / Follow Up Action

Action 1:	**Assigned to:**	**Completed by:**	**Target Completion Date:**	**Actual Completion Date:**
Describe:	Park Staff:	Name:		
	Volunteer:	Organization:		
	Contractor:			
Action 2:	**Assigned to:**	**Completed by:**	**Target Completion Date:**	**Actual Completion Date:**
Describe:	Park Staff:	Name:		
	Volunteer:	Organization:		
	Contractor:			
Action 3:	**Assigned to:**	**Completed by:**	**Target Completion Date:**	**Actual Completion Date:**
Describe:	Park Staff:	Name:		
	Volunteer:	Organization:		
	Contractor:			

REFERENCES

Score	Cover class	Midpoint Value
1 =	0%-5%	3%
2 =	6%-25%	15.00%
3 =	26% -50%	38%
4 =	51%-75%	63%
5 =	76% - 100%	88%

Visual Estimate of Cover classes

Supporting Project Data

(Attach Project Maps , Baseline Data, Photos and Success Criteria Here)

Grazing Monitoring Form

Date:	**Lessee**
Observer:	**Lease #**
Location:	**Renewal Date:**

General Site Conditions (Describe overall condition of site, forage, brush, invasive plants, grass; fencing; number of animals present on day of survey, etc.)

Observed issues, Problems, Concerns (Describe anything of concern such as erosion caused by animals, over utilization, underutilization, damage to fencing, watering facilities, native plants, etc.)

Visual RDM ESTIMATES

(Attach Map of Sampling Locations)

Site No.	RDM Visual Estimate (See attached sheet for references)		
	High (3)	**Moderate (2)**	**Low (1)**
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Subtotal			
TOTAL			

Average for Entire Site (Add up all RDM Estimate values and divide by the total number of sample sites)

Remedial Actions Needed? Describe Recommendations (for example: reduce/increase # animal units, discontinue grazing, change season, add cross fencing, add additional water sites, etc.)

Figure 1. Light grazing results in high IDM levels.

Figure 2. Moderate grazing results in the recommended moderate level of IDM.

Figure 3. Heavy grazing results in low IDM levels.

Photo Monitoring Form

Date:	**Park Name:**
Observer: **Project Name:**	**General comments:**

Photo #	Date	**Location - ATTACH MAP** (Record Permanent Photopoint # or GPS data)	**Photo Direction** (compass bearing as degrees from North)	**Description of photo content** (i.e. what is subject, what species is in picture)

Photo Monitoring Form

Date:	**Park Name:**
Observer: **Project Name:**	**General comments:**

Attach Map of Photo Points here

HABITAT MONITORING Transect/Quadrat Monitoring Form

Date:	**Park Name:**
Observer:	**Project Name:**
Location:	**Contact Person/Manager:**
(Attach Map of Sampling Locations)	**Photo No.**

Transect/Quadrat Data

	T1	T2	T3	T4	T5
Habitat Type: (grassland, scrub, forest, etc)					
Q1					
Q2					
Q3					
Q4					
Q5					
Sum					
Average Cover Class (divide by 5)					
Cover Class Midpoint Value (refer to chart below)					

Reference:

Score	Cover class	Midpoint Value
1 =	0%-5%	3%
2 =	6%-25%	15.00%
3 =	26% -50%	38%
4 =	51%-75%	63%
5 =	76% - 100%	88%

HABITAT MONITORING Transect/Quadrat Monitoring Form

Date:	**Park Name:**
Observer:	**Project Name:**
Location:	**Contact Person/Manager:**
(Attach Map of Sampling Locations)	**Photo No.**

Transect/Quadrat Data

	T6	T7	T8	T9	T10
Habitat Type: (grassland, scrub, forest, etc)					
Q1					
Q2					
Q3					
Q4					
Q5					
Sum					
Average Cover Class (divide by 5)					
Cover Class Midpoint Value (refer to chart on next page)					

Reference:

Score	Cover class	Midpoint Value
1 =	0%-5%	3%
2 =	6%-25%	15.00%
3 =	26% -50%	38%
4 =	51%-75%	63%
5 =	76% - 100%	88%

HABITAT MONITORING Transect/Quadrat Monitoring Form

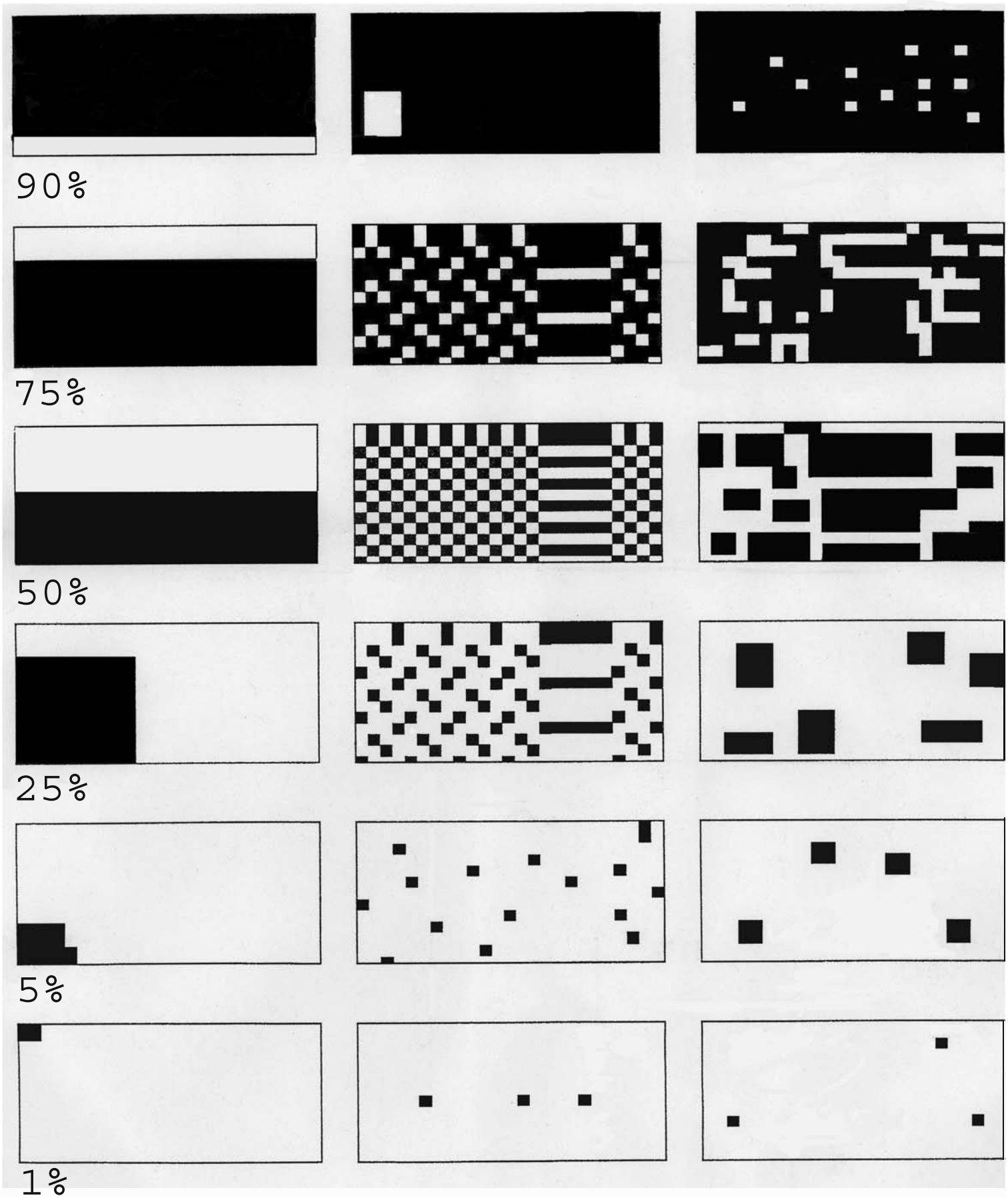
Date:	**Park Name:**
Observer:	**Project Name:**
Location:	**Contact Person/Manager:**
(Attach Map of Sampling Locations)	**Photo No.**

DATA SUMMARY: Transect/Quadrat Data (ENTER Summary Data (From Sheets 1 and 2)

Habitat Type: (enter type in boxes to right i.e. grassland, scrub, forest, etc)	**Grassland**	**Shrubland**	**Forest**	**Other (Add)**	**Other (Add)**
	(enter midpoint range for each transect in appropriate habitat column)				
T1					
T2					
T3					
T4					
T5					
T6					
T7					
T8					
T9					
T10					
Sum By Habitat Type					
Average Habitat (divide by sample number in each habitat type)					
Summary Habitat Cover Class Midpoint Value (refer to chart below)					

Reference:

Score	Cover class	Midpoint Value
1 =	0%-5%	3%
2 =	6%-25%	15.00%
3 =	26% -50%	38%
4 =	51%-75%	63%
5 =	76% - 100%	88%


90%
75%
50%
25%
5%
1%

university of georgia cooperative extension service forest resources unit training form

TREE RISK ASSESSMENT FORM

TREE NUMBER:
DATE:
ASSESSOR'S NAME:

TREE SPECIES:
TREE DIAMETER:
SPECIFIC TREE LOCATION:

OWNERSHIP:

OWNER'S NAME & PHONE:

BOUNDARY LINE TREE _____
SINGLE OWNER TREE _____

FEET FROM BOUNDARY (falling in / falling out):

RISK ASSESSMENT:

MAJOR STRUCTURAL FAULTS (describe type and location):

FAULT #1 (ZONE=):

FAULT #2 (ZONE=):

FAULT #3 (ZONE=):

OTHER STRUCTURAL FAULTS:

MINOR RISKS:

TARGETING (people / property / resources over space and time):

RISK ACCEPTANCE GIVEN MANAGEMENT OBJECTIVES (hazard thresholds):

ACTIONS:

_____NO REMOVAL
_____MANAGERIAL NOTICE OF RISKS
_____MINOR FAULTS AND CORRECTIONS / RISK REDUCTION
_____REMOVAL

**_____PRIORITY REMOVAL **

TREE RISK ASSESSMENT: SYSTEMATIC EVALUATION PROCESS

Dr. Kim D. Coder, University of Georgia 1990

ZONE 1: STEM / ROOT BASE (4 feet up and out) -- Bottom four feet of main stem and zone of rapid taper (ZRT) in roots stretching out four feet.
NO COMPROMISE -- NO DOUBT

ZONE 2: MAIN STEM (up to live crown and base of scaffold branches)
ZONE 3: PRIMARY ROOT SUPPORT (out to 1/2 the drip line)
ZONE 4: PRIMARY BRANCH SUPPORT (major branch base area plus the basal 1/3 of their length)

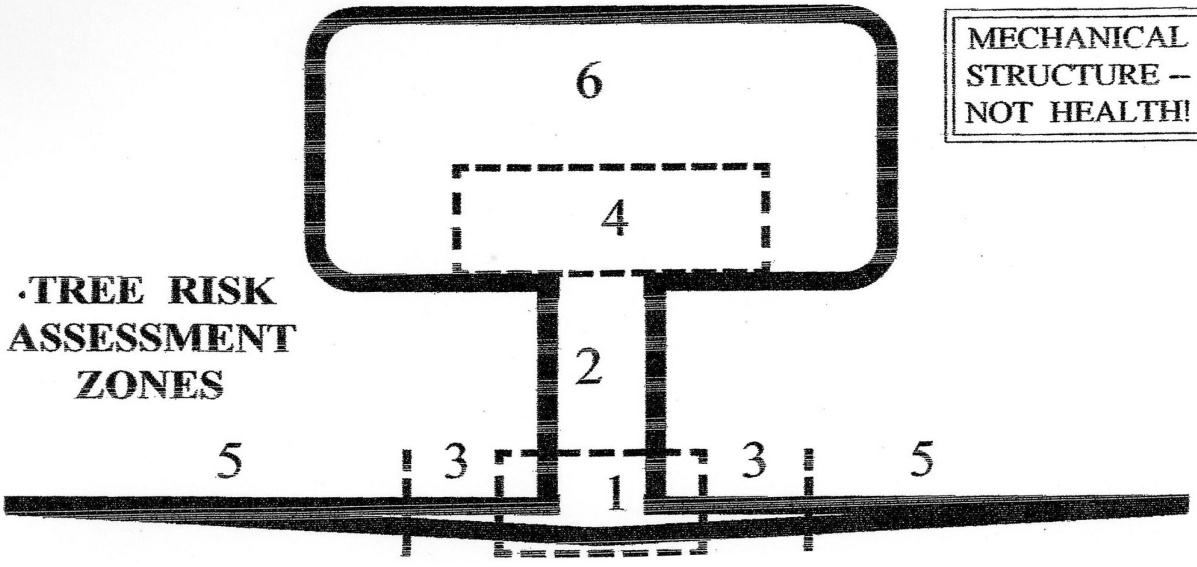
Faults in zones two, three, and four are correctable with large inputs of time, money, materials and technical maintenance. Corrective measures may represent a notification of problems.

ZONE 5: REMAINDER OF WOODY ROOTS (out to 1.5 times the dripline)
ZONE 6: REMAINDER OF CROWN

Zones five and six are not of primary structural concern but any faults still represent significant risks

---

Criteria: When three significant simple faults that could lead to catastrophic loss are identified (in zone order), or one significant compound fault that could lead to catastrophic loss is identified, stop and assess targeting aspects of the area, and reexamine site management objectives to determine a hazard designation and removal priority. Examine tree from at least three sides.



MECHANICAL STRUCTURE -- NOT HEALTH!

4.1 CDFA Weed Observation and Monitoring Form

Bold line items (also asterisked) are required; other lines are optional.

METADATA	
Collection date (mm/dd/yyyy)*	
Observer name*	
Observer contact information*	Address: City: State: Zip: Phone: Email:
Source of the data*	Organization name or WMA Code:
Hand-annotated map ID	
SITE DESCRIPTION	
Site name or ID*	
Site address or other description	
State*	
County*	
National ownership*	
Local ownership	Landowner name:
Quad name	
HUC number	
Land use type	Ag Rangeland Rural Res. Urban Indust/Comm. Other
Invaded vegetation type	Forest Woodland Chap/Scrub Grass Herb Aquatic-Fr Aquatic-Sa Marine
Gross Area	Area: sq. ft. sq. m sq. mi. acres ha
Disturbances & impacts	
Associated species	
WEED DESCRIPTION	
Weed genus and species*	
Weed common name(s)	
Presence or Absence*	**P A**
Infested area*	Area: sq. ft. sq. meters sq. mi. acres ha
Canopy Cover*	Choose one: <1% 1-5% 5-25% 25-50% 50-75% 75-95% 95-100%
Appearance/phenology	Circle any: germ'g./early growth new growth flowering seeding senesc. dead
Distribution pattern	Circle any: clumpy scattered patchy scattered even linear
Photo documentation	(Use table on back to log photos)
Weed Location	
Geo Feature type*	Circle one: Point Polygon Line
Geographic location*	GPS waypoint or feature ID: Coords. (if point): X: Y:
Coordinate system*	UTM Zone: Lat/Long dec. degs Other (specify):
Datum*	WGS 84/NAD83 Other (specify):
Location offset	Distance: feet meters Bearing/direction:
Location data accuracy*	Choose one: <1m 1-5m 5-15m 15-100m 100m-1km 1km-10km >10km
Locality description	
Distance to water	Est'ed distance: Horiz or Vert? Units:

Photo Log					
Photo #	**GPS waypoint or feature #**	**X Coordinate**	**Y Coordinate**	**Bearing or Direction**	**Feature/Notes**

Notes

Attach this form to hand-drawn map and write the date, observer name, and the site and feature numbers on the map for easy cross-referencing.

SECTION 2: SHARED DATA STANDARDS

SECTION CONTENTS:

2.1 Background on shared data standards

Data standards are necessary when data is being collected that may potentially be shared with others or combined with data collected at other times. A common format allows data collected by different organizations to fit together with a minimum of effort. In addition, established data standards help new data collection projects avoid many common mistakes.

In the overall effort to control weeds, there are some very compelling reasons for sharing data, from the regional level to the global level.

We know that weeds do not recognize property lines or jurisdictional boundaries. For regional weed managers to work effectively with different property owners and neighboring jurisdictions, it is important to be able to share inventory and mapping data.

By definition, invasion by alien species is a global problem. Ideally, invasive plant control would be supported by constantly updated information on the big-picture status of invasions. In order to gain full perspective on the movement and density of invasive species, we need a large number of surveyors and a means for rapidly combining their observations into a common database. With enough data and the ability to share it quickly, valuable new information services can be created, such as early alert systems and predictive modeling. These will enable better-informed weed management decisions, and also present political decision makers with a more clear idea of the threat posed by invasive plants.

There is widespread recognition among land management agencies that sharing invasive species data is of the utmost importance for stemming

the tide of this environmental catastrophe. This consensus is evidenced by the recent proliferation of national and international declarations, groups, and efforts toward the goal of sharing and combining data. The Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW), the Global Invasive Species Programme (GISP), and the many regional Exotic Pest Plant Councils are just a few of the groups that have worked on standards and examples of data sharing.

Many of these programs have begun to develop online databases, and there is a concentrated effort to coordinate the rapid, open exchange of data on a global scale. Data standards are at the core of this work.

NAWMA, the North American Weed Management Association, has developed a weed mapping content standard called *The International Standards for Inventory, Monitoring, and Mapping of Invasive Plants*. The data standards presented in this section of the handbook for California weed mappers is based on the NAWMA standard with the addition of a data structure and the keywords and pick-lists that will be useful in California. The table in Section 4.2 ("A Comparison of the NAWMA and CDFA Data Standards") shows the two data standards side by side.

KINDS OF DATA STANDARDS

These standards help different organizations combine datasets and analyze them together meaningfully.

Content standards
These give consistency to the names and definitions of data fields and the attributes assigned to them. They make it possible for different data collectors to "speak the same language."

Sampling protocol
These give guidance for collecting field data. which helps multiple observers create consistent datasets.

Data structure
This standard specifies the way data is organized in a database. It makes it easier to combine data from different kinds of databases into one database.

Data format
This is a standard for actual file type, which makes combining data much easier. The "Shapefile" format is a common example for ArcView GIS users. "XML" is a more generic format that is not associated with a particular software package.

2.2 Core weed information to collect

The data for which we need a standard is straightforward and contains those elements everyone will want to collect: what weed was observed, how much of it there is, where it is, who owns the land, who saw it, when they saw it, and how accurately they mapped it. The role of a standard is to make this data collection consistent across observers and organizations.

The following describes the standard data content elements that we have developed for California weed managers. The first part of the list describes categories you will need to collect when in the field. The second part of the list describes categories that could be recorded in the office, whether before the field outing or upon returning. See also Section 4.3 "Summary of Minimum Requirements for Weed Mapping."

In the field

Collection Date: The full date on which the infestation was observed should be written on all paper forms in the format YYYYMMDD (or one you could convert to that format when it comes time to share the data). If you are using a GPS unit, the date will be automatically stored with each observation.

Observer: The full name of the person who observed the infestation should be written on all paper forms.

Site Name or ID, any site description information: Record a name for the site or an alphanumeric identifier and also put this on your hand-drawn map. Make any observations describing the site while there.

Genus/species: The scientific name for weeds should be used to avoid confusion. If you are using a mapping-grade GPS with a data dictionary, or digital form, you can create a menu to choose from. The Jepson manual, the CalFlora database (online at <www.calflora.org>), or the Integrated Taxonomic Information Systems (ITIS) can be used as sources of current scientific names. If you use a common name in the field you will need to translate it when you are back in the office.

Presence/Absence: This is implied as "presence" when there is information describing an infestation (such as cover class), but a simple absence report can be made for an area as well by stating the species and indicating the location, and saying it is "absent."

Gross Area and Infested Area: "Gross area" is an estimate of the size of the general region where the weeds occur and may be used when precision is either unnecessary or impractical (see further discussion of this in the Yellow starthistle case study, Section 4.8). An example of the use of gross area is the identification of a 40-acre property that has weeds in large patches, but also has un-infested areas. The fact that the observer put "40 acres" in the gross area field correctly conveys the fact that a detailed survey was not done. This associated with average cover density of the weed is a quick way to note the presence and severity of an infestation.

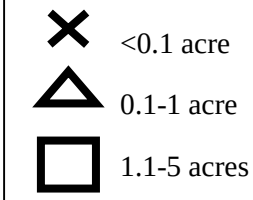
In contrast," infested area" is an estimate of the size of the *specific* region in which the weed occurs, mapped more carefully by thoroughly observing the site and estimating the area of the land covered by the weed (whether it's sparse or dense cover).

When hand mapping, we recommend the use of point symbols (shown at right) to mark infestations under five acres. For infestations five acres and larger, draw the areas onto the map (assuming you are using a map with 1:24,000 scale such as a USGS topo quad). Avoid drawing areas or lines if there are not clear reference features by which to judge location, as it may be misleading. If you use colors or abbreviations as codes (to indicate the type of weed, for example), be sure to write a key to the code on every document where the code is used.

If you are using a GPS unit to measure location, you should record the size of the infestation in acres.

Canopy Cover: Canopy cover is percent of the infested area covered by the weed being surveyed. One way to think of this is to visualize all of

HAND-MAPPING SYMBOLS



the weeds pushed together until their canopies touch, and then estimate this area and the portion of the overall infested area that this represents. Classify the cover into one of the categories listed at right.

National Ownership, Local Ownership: Record the national ownership code, as listed in the table on the following page. State ownership codes may also be developed in the future. Local ownership can be recorded as the name and contact information of the party who owns the property for future reference.

Geographic Location: If you are hand-mapping, indicate on your map with the desired symbol and give the feature an identifying alphanumeric identifier. Put this feature ID into the form that contains the descriptive information for that location. If you are writing down coordinates from a GPS unit, be careful of transcription errors as small numerical mistakes can translate into big geographic errors. It's helpful to stick with one coordinate system displayed in a consistent format, know what those numbers should look like, and always mind your decimals.

If you are storing points in your recreation-grade GPS unit, or points, lines, and polygons in your mapping-grade GPS unit, your location data is stored digitally. GPS data is automatically stored by the unit in the pre-chosen format, the default of which is usually latitude and longitude in WGS84. Once this is downloaded to your computer, you can convert the data into any projection you need. If you are creating polygons or line features with a GPS, the data is more complex and will be handled entirely in its digital form.

Coordinate System and Datum: Record the coordinate system in which you are recording data. This includes the projection and datum—for instance, UTM Zone 10 NAD83. It's best to set this up in advance, whether by choosing the coordinate system that is displayed by the GPS unit, or decided how coordinates will be taken from a map.

Location Accuracy: Location accuracy refers to the closeness of the coordinates recorded to the real-world location (which can also thought of as the "fuzziness" of the data). High accuracy in location reporting is not always necessary or desired- the important thing for future data interpretation is to record it, whether it is high or low! Location accuracy takes both the accuracy of the mapping method and the intended exactness of the location data into account for a number that indicates how much error or fuzziness should be considered part of the data. Note: "precision" and "accuracy" are different- precision essentially refers to the number of decimal places, so a very high-precision GPS instrument can give you a high-precision location number with 6 decimal places, but still be inaccurate as far as its closeness to the real-world location you're trying to record. See the paragraph on accuracy in the GPS section (3.2) for information about factors that effect accuracy.

COVER CLASSES

(BASED ON DAUBENMIRE)

Cover Class	Range of Coverage	Midpoint of Range
TRACE	<1%	--
1	1- 5%	2.5%
2	5- 25%	15.0%
3	25 - 50%	37.5%
4	50 - 75%	62.5%
5	75 - 95%	85.0%
6	95 - 100%	97.5%

NATIONAL OWNERSHIP CODES

Listed below are codes that are likely to be useful in California. For a full list, see Appendix C of the NAWMA guidelines at www.nawma.org. This webpage includes information on specific tribal codes for reservations.

ARS	Agricultural Research Svc.
ALOT	Native American Allotments
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Mgmt.
CGOV	County-owned lands
DOD	Department of Defense
NPS	National Park Service
NRCS	Natural Resources Conservation Svc.
PVLA	Privately-owned lands
STAT	State-owned lands
TNC	The Nature Conservancy
TRIB	Tribal lands
UNIV	University lands
USFS	US Forest Service
USFW	US Fish & Wildlife Service
USGS	US Geological Survey
USOT	US Government - Other

Location Offset: Location offset is the direction and distance to the target location. Sometimes you can't stand right on the clump of weeds, but you'd like to record which way and how far to look when you get to that waypoint.

Weed Description Information: The parts of the form that describe the weed infestation, appearance/phenology and distribution pattern, along with documenting photos, should of course be filled out while in the field. Use the pick-lists for descriptors as presented in the sample field form.

Examples of error estimates

1) Joe Weedman observed some *Arundo donax* while driving to work. In the office, he made a report, assigning an approximate location for the infestation by taking coordinates from a quad map shown in TOPO! software. Joe decides to assign an error of a few hundred meters to the observation.

2) Joe returns to the infestation a week later with his Trimble Pro-XRS mapping-grade GPS receiver. He maps the single clump of plants by standing right in the clump. The GPS point is meant to indicate the exact location, and under perfect conditions this instrument can provide sub-meter accuracy, but Joe couldn't stay long to get the recommended 180 readings, and his PDOP was high. He decides that an error of about 10 meters is appropriate.

ERROR ESTIMATES

Use these broad classes:

- <1m
- 1-5meters
- 5-15 meters
- 15-100 meters
- 100 meters-1 km
- 1 km-10 km
- >10 km

The accuracy ranges from 1 km to more than 10 km are useful for indicating that a data point represents the center of a large area in which the weed is known to be present.

In the office

Make sure to record the following information. It is not critical to record this information in the field—it can be done in the office (promptly) after the field work.

Observer Contact Information: This may be the same as the organization contact information, and so you won't probably need to write it on every form. The purpose of this information is to allow for contacting the observer should there be questions about the data later on. Keep contact information up to date.

Source of Data: Record the full name of the agency or organization responsible for collecting the data. If the agency has a national ownership code, that may be used. Again important mostly when you decide to send the data to someone outside the organization.

County: Record the county name, or the state code, or the six-digit FIPS (Federal Information Processing Standards) code for your county. A table listing these two systems of codes along with the county names can be found in Section 4.6.

HUC Code (for aquatic weeds only): Look up and record the Hydrologic Unit Code for the watershed in which the aquatic weed occurs. See the USGS HUC website at <http://water.usgs.gov/GIS/huc.html>.

2.3 Forms for data collection

As mentioned above, we've included with this handbook a model form for collecting data in the field (found in Section 4.2). The form is designed for recording all of the above information. The form can be used "as-is" to collect this data together with hand-drawn maps or GPS data (or both). The form can also be used as a template for designing your own custom paper form, GPS data dictionary, or electronic form on a PDA.

2.4 Storing data in spreadsheets, databases, and filing cabinets

Storing the data from the field forms

Even if you are doing your mapping entirely on paper, it is suggested that you enter your weed observation data into a simple spreadsheet, and when you do that to create the metadata that is so important for keeping track of it all. Taking this step *as soon after collecting the data as* possible is a good data management habit that will serve you well. On the disk at the back of the handbook, we've included an Excel workbook file containing a group of simple spreadsheets with the basic fields for recording data from the paper field forms. The fields match the standard as discussed above. Doing this will not only help you know what data you have, it will enable you to share your information with others.

The sheets in the Excel workbook are called: Observer Contact Information, Metadata and Site Description, Weed Observation, and Photo Log. All of these are sections in the standard, and could have been put into a single spreadsheet. The reason for creating separate sheets is to avoid having to enter data many times when it can be entered once and used multiple times by referencing its ID number- the basis for a relational database. Until a database application is developed with forms for data entry, it is up to you to use the keywords recommended in the model form. The workbook and its spreadsheets could form the template for such a database in software such as MS Access. ArcView can be set up to communicate with the Access database tables, allowing for the descriptive records to integrate with the geographic information display and analysis abilities of a GIS. Digital forms would help with mistake-free data entry (and auto-generation of the all-important IDs). These developments are likely to be done in the near future for all to use.

Mail to:
California Natural Diversity Database
Department of Fish and Game
1807 13th Street, Suite 202
Sacramento, CA 95814
Fax: (916) 324-0475 email: WHDAB@dfg.ca.gov

For Office Use Only
Source Code _____ Quad Code _____
Elm Code _____ Occ. No. _____
EO Index No. _____ Map Index No. _____

***Date of Field Work** mm/dd/yyyy:* _____

Reset

California Native Species Field Survey Form

Send Form

Scientific Name:

Common Name:

Species Found? ☐ Yes ☐ No _____ If not, why?

Total No. Individuals _____ Subsequent Visit? ☐ yes ☐ no
Is this an existing NDDB occurrence? _____ ☐ no ☐ unk.
Yes, Occ. #

Collection? If yes: _____ Number _____ Museum / Herbarium

Reporter: _____
Address: _____
_____
E-mail Address: _____
Phone: _____

Plant Information

Phenology: _____ % vegetative _____ % flowering _____ % fruiting

Animal Information

_____ # adults _____ # juveniles _____ # larvae _____ # egg masses _____ # unknown

☐ breeding ☐ wintering ☐ burrow site ☐ rookery ☐ nesting ☐ other

Location Description ***(please attach map AND/OR fill out your choice of coordinates, below)***

County: _____ Landowner / Mgr.: _____
Quad Name: _____ Elevation: _____
T____ R __ Sec ____ , ____ ¼ of _____ ¼, Meridian: **H**☐ **M**☐ **S**☐ Source of Coordinates (GPS, topo. map & type): _____
T____ R __ Sec ____ , ____ ¼ of _____ ¼, Meridian: **H**☐ **M**☐ **S**☐ GPS Make & Model _____
Datum: NAD27☐ NAD83☐ WGS84 ☐ Horizontal Accuracy _____ meters/feet
Coordinate System: UTM Zone 10 ☐ UTM Zone 11 ☐ *OR* Geographic (Latitude & Longitude) ☐
Coordinates: Easting/Longitude _____ Northing/Latitude _____

Habitat Description *(plant communities, dominants, associates, substrates/soils, aspects/slope):*

Other rare taxa seen at THIS site on THIS date:

Site Information Overall site quality: ☐ Excellent ☐ Good ☐ Fair ☐ Poor

Current / surrounding land use:

Visible disturbances:

Threats:

Comments:

Determination: *(check one or more, and fill in blanks)*
☐ Keyed (cite reference): _____
☐ Compared with specimen housed at: _____
☐ Compared with photo / drawing in: _____
☐ By another person (name): _____
☐ Other: _____

Photographs: *(check one or more)*

	Slide	Print	Digital
Plant / animal	☐	☐	☐
Habitat	☐	☐	☐
Diagnostic feature	☐	☐	☐

May we obtain duplicates at our expense? ☐ yes ☐ no

California Natural Community Field Survey Form

Mail to:
Natural Diversity Database
California Dept. of Fish and Game
1416 Ninth Street
Sacramento, CA 95914
(916) 324-6857

For office use only
Source Code_____ Quad Code_____
Community Code _____ Occ #_____
Map Index #_____ Update Y _____ N _____

Please provide as much of the following information as you can. Please attach a map (if possible, based on the USGS 7.5 minute series) showing the site's location and boundaries. Use the back if needed.

Community name:_____
Reporter:_____E-mail Address:_____ Phone _____
Affiliation and Address_____
Date of field work:_____ County:_____
Location (**Please attach/submit map**):

Quad name: _____T_____R _____ _____ ¼ of____ ¼ sec_____ Meridian_____
UTM Zone __ __ Northing __ __ __ __ __ __ __Easting __ __ __ __ __ __
Landowner/Manager: _____Photographs: Slide☐ Print☐
Elevation: _____Aspect: _____ Slope (indicate % or °)_____ Drainage:_____
Site acreage: _____
Evidence of disturbance or threats:

Current land use:
Substrate/Soils:

General description of community:

Any Special Plants or Animals present:

Successional status/Evidence of regeneration of dominant taxa:

Overall site quality: Excellent☐ Good☐ Fair☐ Poor☐ Comments (below):

Basis for report: Remote image☐ Binocular/Telescopic survey☐ Windshield survey☐ Brief walk-thru☐
Detailed survey☐ Other☐ _____
Relevé: In the space below, indicate each species cover % within the following growth form categories:

Trees	Shrubs	Herbs/Graminoids

Continue on back if needed. Thank you for your contribution.

Trees	Shrubs	Herbs/Graminoids

General Instructions for Filling Out California Natural Diversity Database Field Survey Forms

The California Natural Diversity Database (CNDDB) is the largest, most comprehensive database of its type in the world. It presently contains almost 40,000 site specific records on California's rarest plants, animals, and natural communities. The majority of the data collection effort for this has been provided by an exceptional assemblage of biologists throughout the state and the west. The backbone of this effort is the field survey form.

Although the future lies in the digitally submissible field form and map, this system is not yet in place. Enclosed are copies of CNDDB paper field survey forms for species and natural communities. The CNDDB would appreciate your field observations on rare, threatened, endangered, or sensitive species and natural communities (elements) submitted to us on these forms.

To determine what species and natural communities are of concern to us, refer to our free publications for lists of which elements these include: *Special Vascular Plants, Bryophytes, and Lichens List*, *Special Animals List*, and *Natural Communities List*. Reports on multiple visits to sites that already exist in the CNDDB are as important as new site information as is it helps us track trends in population/stand size and condition. Naturally, new site information is also welcomed.

Enclosed is an example of a field survey form that includes the information we like to see. Note that you may either submit a copied portion of a USGS topographic quad map with the population/stand outlined or marked (see back of enclosed example), or provide a set of coordinates (GPS coordinates, TRS information, or other). You do not have to submit all of this information; just one will suffice, and generally the best choice is to submit a map. Furthermore, you do not have to fill out every box on the form; just fill out what seems relevant to your site visit. Remember that your name and telephone number and/or email are very important in case we have any questions about the form.

If you are concerned about the sensitivity of the site, remember that the CNDDB can label your element occurrence "Sensitive" in the database, thus restricting access to that information.

The CNDDB is only as good as the information in it, and we depend on people like you as the source of that information. Thank you for your help in improving the CNDDB.

Please see also, **Instructions for Collecting Information with Global Positioning Systems for the California Natural Diversity Database**.

Mail to:
California Natural Diversity Database
Department of Fish and Game
1807 13th Street, Suite 202
Sacramento, CA 95814
Fax: (916) 324-0475

For Office Use Only
Source Code _____ Quad Code _____
Elm Code _____ Occ. No. _____
EO Index No. _____ Map Index No. _____

Date of Field Work: 8 - 10 - 2000

Reset

California Native Species Field Survey Form

Send Form

Scientific Name: *Lupinus padre-crowleyi*

Common Name: Father Crowley's lupine

Species Found? ☑ Yes ☐ No _____ If not, why?

Total No. Individuals *10 Subsequent Visit? ☐ yes ☑ no
Is this an existing NDDB occurrence? 8 Yes, Occ. # ☐ no ☐ unk.

Collection? If yes: _____ Number _____ Museum / Herbarium

Reporter: Your Name Here
Address: Your Organization and Address Here
Your Town, State Zipcode Here
E-mail Address: youremail@here
Phone: (000) 000-0000

Plant Information

Phenology: _____ % vegetative 100 % flowering _____ % fruiting

Animal Information

_____ # adults _____ # juveniles _____ # larvae _____ # egg masses _____ # unknown

☐ breeding ☐ wintering ☐ burrow site ☐ rookery ☐ nesting ☐ other

Location Description ***(please attach map AND/OR fill out your choice of coordinates, below)***

Along Shepherd Pass trail, between the first and second saddles above the main switchbacks from Symmes Creek to the top of the ridge, as the trail levels out and begins to drop down towards Shepherd Creek drainage. **See Comments, below.

County: Inyo Landowner / Mgr.: USDA, Inyo National Forest
Quad Name: Mount Williamson, CA Elevation: 9081 ft.
T 14S R 34E Sec 20 , NW ¼ of NE ¼, Meridian: H☐ M☑ S☐ Source of Coordinates (GPS, topo. map & type): GPS
T____ R ___ Sec ____ , ____ ¼ of _____ ¼, Meridian: H☐ M☐ S☐ GPS Make & Model Garmin 12
Datum: NAD27☑ NAD83☐ WGS84 ☐ Horizontal Accuracy 3-5 meters meters/feet
Coordinate System: UTM Zone 10 ☐ UTM Zone 11 ☑ *OR* Geographic (Latitude & Longitude) ☐
Coordinates: Easting/Longitude E383883.83 Northing/Latitude N4063216.65

Habitat Description *(plant communities, dominants, associates, substrates/soils, aspects/slope):*

Moderately steep, east facing slope; sandy granitic soil; sagebrush scrub: Artenisia tridentata, Eriogonum umbellatum, Arctostaphylos patula, Symphoricarpos sp., Angelica lineariloba

Other rare species? None seen.

Site Information Overall site quality: ☑ Excellent ☐ Good ☐ Fair ☐ Poor

Current / surrounding land use: Wilderness; hiker trail passes adjacent to population

Visible disturbances: Trail work could potentially impact population; however, Inyo NF standards call for surveys prior to any ground disturbing activities.

Threats:

Comments: *Population was located late in the day; no count was conducted, but <10 plants were visible from the trail, Further survey work needed.
**Going up the trail towards the pass, the plants are located above the trail, just before the 2 big Jeffrey pines below the trail

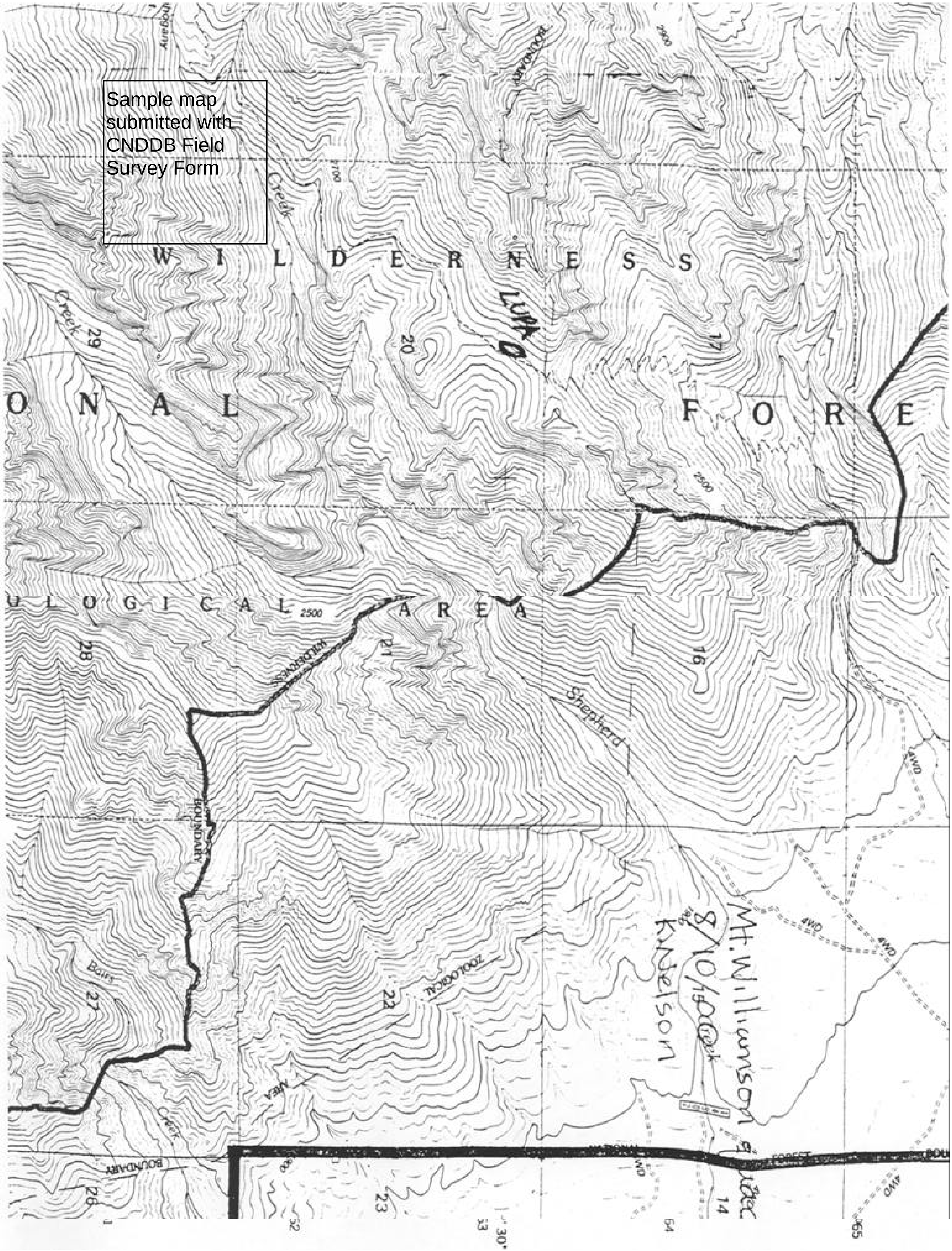
Determination: *(check one or more, and fill in blanks)*

☐ Keyed (cite reference): _____
☑ Compared with specimen housed at: UC herbarium
☐ Compared with photo / drawing in: _____
☐ By another person (name): _____
☐ Other: _____

Photographs: *(check one or more)*

	Slide	Print	Digital
Plant / animal	☐	☐	☑
Habitat	☑	☐	☐
Diagnostic feature	☐	☑	☐

May we obtain duplicates at our expense? ☑ yes ☐ no


Sample map submitted with CNDDB Field Survey Form
W I L D E R N E S S
O N A L
F O R E
U L O G I C A L
A R E A
Creek
Shepherd
Bairs
Creek
BOUNDARY
WILDERNESS
ZOOLOGICAL
AREA
4WD
2500
2700
2900
29
20
17
28
21
16
27
22
26
23
14
Mt. Williamson
8/10/00
K. Nelson
Lupo
30'

Appendix C: Information Handouts and Brochures

Appendix C. Information Handouts and Brochures

Due to file size and distribution restrictions, information handouts and brochures have not been included in this online electronic version of the document.

The following information is available online:

1. **Tool Selection:** available online at http://tncweeds.ucdavis.edu/tools.html

2. **Handling herbicides:** available online at: :http://tncweeds.ucdavis.edu/products/library/herbsafe.pdf

3. **Planting Guidelines:** available online at: http://www.lasposita s.com/planting.htm

4. **Guidelines for Developing and Managing Ecological Restoration Projects:** at http://www.ser.org/content/guidelines_ecological_restoration.asp

5. **Fire Management:** Use of Fire as a Tool for Controlling Invasive Weeds available online at: http://www.weedcenter.org/management/burning_weeds.pdf

6. **Hazard Tree Recognition:** available online at http://www.na.fs.fed.us/spfo/pubs/howtos/ht_haz/ht_haz.htm

7. **Pitch Canker Identification and Treatment - Pest Notes, UC Agriculture and Natural Resources Publication N0 74107** available online at: forestry.berkeley.edu/comp_proj/pnpitchcanker.pdf

8. **Diagnosis and Monitoring of Sudden Oak Death** available online at http://cemarin.ucdavis.edu/symptoms.html

9. **Eucalyptus** available online at tncweeds.ucdavis.edu/esadocs/documnts/eucaglo.html

10. **California Guidelines for Assessing Grazing Residual Dry Matter** available online at www.casrm.org/ANR%20Publication%208092.pdf

Appendix D: Helpful Resources for Vegetation Management

Appendix D. Helpful Resources for Vegetation Management

1. GENERAL REFERENCES ON VEGETATION MANAGEMENT

Websites

- **National Park Service - Restoration Projects around the Bay Area**
  http://www.nps.gov/goga/parklabs/restoration/index.htm
- **East Bay Regional Parks Wildlands Management Plan**
  www.ebparks.org/resources/pdf/hr/job_desc/WILDLAND_VEG_PROG_MNGR.pdf
- **Western Watershed Program** http://www.westernwatersheds.org/

2. INVASIVE PLANT RESOURCES

Books

- **Weed Worker's Handbook: A Guide to Techniques for Removing Bay Area Invasive Plants.** The Watershed Project and California Invasive Plant Council. 2004. Available online at: http://www.cal-ipc.org/ww_handbook/
- **San Mateo County Weed Guide**
  http://www.cdfa.ca.gov/phpps/ipc/weedmgtareas/SanMateo/smwma_brochure.pdf
- **Invasive Plants of California Wildlands.** 2000. Carla Bossard, John M. Randall, and Mark C. Hoshovsky. University of California Press, Berkeley and Los Angeles, CA. Available online at:
  http://groups.ucanr.org/ceppc/Invasive_Plants_of_California's_Wildlands

Websites

- **The Nature Conservancy Invasive Plant Resources website**
  http://tncweeds.ucdavis.edu/handbook.html
- **California Invasive Plant Council (Cal-IPC) website**
  http://www.cal-ipc.org/
- **San Mateo Agriculture Commissioner**
  http://www.co.sanmateo.ca.us/agriculture/agriculture.html
- **San Mateo Weed Management Area**
  http://www.cdfa.ca.gov/phpps/ipc/weedmgtareas/wma_index_hp.htm

Contacts

- **San Mateo Weed Management Area**
  San Mateo County
  Contact: Ronald Pummer
  (650) 363-4700
  rpummer@co.sanmateo.ca.us
  sanmateoag@co.sanmateo.ca.us

- **San Mateo County Agricultural Commissioners Office**
  728 Heller Street
  Redwood City, CA 94064
  Contact: Gail Raabe
  (650) 363-4700
  smateoag@co.sanmateo.ca.us
  www.co.sanmateo.ca.us

- **California Native Plant Society Invasive Exotics Chairs, Santa Clara Valley Chapter**
  Ken Himes, North County (650) 591-8560
  Don Thomas, South County (408) 867-1515

3. SENSITIVE SPECIES INFORMATION

Websites

- **Department of Fish and Game website**
  http://www.dfg.ca.gov/hcpb/species/species.shtml
- **U.S. Fish and Wildlife Service**
  http://ecos.fws.gov/ecos/index.do
- **California Native Plant Society**
  www.cnps.org/
- **Audubon Society of California**
  http://www.audubon-ca.org/california_birding.htm

4. SPECIES IDENTIFICATION GUIDEBOOKS

Books

- **Peterson's Field Guide: Pacific States Wildflowers.** Niehaus and Ripper. 1976. Houghton Mifflin Company.
- **Jepson Manual:** Higher Plants of California. Larry Hickman, Editor. 1993. University of California Press.
- **Pacific Coast Trees.** McMinn and Maino. 1951. University of California Press.
- **Birds of North America.** National Geographic.
- **Peterson Field Guides: Western Birds.** Roger T. Peterson. 1990. Houghton Mifflin Company.
- **Peterson Field Guides: Insects.** Christopher Leahy. 1987.
- Houghton Mifflin.
- **California Insects.** Jerry A. Powell. 1981. University of California Press.
- **Peterson Field Guides: Western Amphibians and Reptiles.** Robert C. Stebbins. 2003. Houghton Mifflin Company.
- **Bugs of Northern California.** John Acorn. 2002. Lone Pine.

Websites

- **Calflora website** (pictorial index to most plants and animals in California)
  http://www.calflora.org/species/index.html
- **Jepson Manual Online**
  http://ucjeps.berkeley.edu/interchange.html (plants)
- **National Park Service Online Identification Guide** (common plants and animals in local National Parks) http://www.nps.gov/goga/parklabs/library/wildlifeguide/
- **San Mateo County Weed Guide** (weeds)
  http://www.cdfa.ca.gov/phpps/ipc/weedmgtareas/SanMateo/smwma_brochure.pdf

5. PLANT DISEASES AND PESTS

Websites

- **California Oak Mortality Task Force**
  www.suddenoakdeath.org
- **California Department of Food and Agriculture**
  http://www.cdfa.ca.gov/phpps/pe/sod_survey/
- **Pitch Canker Task Force**
  http://frap.cdf.ca.gov/pitch_canker/
- **UC IPM Pitch Canker management Guidelines**
  http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn74107.html
- **UC Cooperative Extension Tree Root Rot Fungus Detection and Control.**
- http://danr.ucop.edu/ihrmp/oak16.htm

6. FORESTRY AND FIRE PROTECTION

Websites

- **California Department of Forestry**
  http://frap.cdf.ca.gov/
- **UC Berkeley Forestry Dept**
  http://forestry.berkeley.edu/lectures/wmmain3.html
- **UC Berkeley Fire Management Plan**
  http://oep.berkeley.edu/programs/fire_mitigation/
- **US Forest Service**
  http://www.fs.fed.us/psw/
- **San Mateo County FIRESAFE program**
  http://www.smcfiresafe.org/members.htm

Fuel Load Modeling Software:

- http://www.fire.org and at the following website under "software":
  http://farsite.org/index.php?option=content&task=section&id=2&Itemid=25.

Information on Fire Resistant Landscaping

- **East Bay Municipal Utilities,** Document entitled "Firescape: Landscaping to Reduce Fire Hazard order from web site at:
  http://www.ebmud.com/conserving_&_recycling/conservation_publications/default.htm

7. LIVESTOCK GRAZING IN WILDLANDS

Websites

- **RangeNet website** http://www.westernwatersheds.org/rangenet/rangenet.html
- **Range Biome**
  http://www.rangebiome.org/
- **Society for Range Management**
  http://www.rangelands.org/srm.shtml
- **California Cattlemen's Association**
  http://www.calcattlemen.org/
- **California Native Grassland Association**
  http://www.cnga.org/index.php
- **Use of Goats for Management of Unwanted Vegetation**
  http://www.cals.ncsu.edu/an_sci/extension/animal/meatgoat/MGVeget.htm
- **Prescription Grazing for Vegetation Management**
  http://www.cnr.uidaho.edu/rx-grazing/prescriptions.htm

Knowledgeable Individuals

- **Goats R Us**
  P.O. Box 37
  Orinda, CA 94563

- **David Amme**
  Resource Restoration and Management
  1504 Beverly Place
  Albany, CA94706
  (510) 524-3637
  Doug Allshouse <dougsr@rcn.com> (415) 584-5114

8. VOLUNTEER ORGANIZATIONS (NEEDS VERIFICATION)

- **Audubon Society California**
  http://www.audubon-ca.org/california_birding.htm
- **California Native Plant Society**
  www.cnps.org/
- **Friends of Edgewood Park**
  P.O. Box 3422, Redwood City, CA 94064-3422
  (866) GO-EDGEWOOD
  http://www.friendsofedgewood.org/
- **Friends of San Bruno Mountain**
  Contact: Doug Allshouse
  dougsr@rcn.com
  (415) 584-5114
  http://www.supportparks.org/links.html#mountain
- **Friends of Fitzgerald Marine Reserve**
  PO Box 451
  Moss Beach, California 94038
  (650) 728-3584
  http://www.fitzgeraldreserve.org/
- **Friends of Huddart and Wunderlich**
  2961 Woodside Rd.,
  PO Box 620767
  Woodside, CA 94062
  650-851-2660
  friends@parksupport.org
  http://www.parksupport.org/
- **NOAA, LIMPETS program**
  http://limpets.noaa.gov/
- **San Bruno Mountain Watch,**
  44 Visitacion Avenue
  Brisbane, CA 94005
  (415) 467-6631
  http://www.mountainwatch.org/
- **San Bruno Heart of the Mountain,**
  Joe Cannon
  San Bruno Mountain Stewardship Project
  650.355.6635
  restore_ecology@earthlink.net.
  http://www.heartofthemountain.com/
- **Volunteer Horse Patrol**
  Contact: Rob Krensky
  rob@krensky.com
  650-368-8200

9. INTEGRATED PEST MANAGEMENT

- **U.C. Davis Integrated Pest Management**
  http://www.ipm.ucdavis.edu/
- **U.S. Environmental Protection Agency**
  http://www.epa.gov/pesticides/ipm/
- **National Integrated Pest Management Center**
  http://www.ippc.orst.edu/DIR/

10. VEGETATION BIOMASS DISPOSAL AND PROCESSING

- **Organic Materials Management Strategies** 1999. United States Environmental Protection Agency Publication No. EPA530-R-99-016. Washington D.C. July 1999.

11. TRAIL CONSTRUCTION AND TRAIL MAINTENANCE

Knowledgeable Individuals

- Barth Campbell – Campbell Grading
  100-A Wickiup Drive
  Santa Rosa, CA 95403
  (707) 433-1183

VIII. PHONE DIRECTORY OF RESPONDERS IN AN EMERGENCY

San Mateo County Offices (650 Area Code)

Local Police or Fire Services.....9-1-1
County Communications Center.....363-4961
County Operator (24 Hours).....363-4000
County Sheriff's Office.....363-4000
County Office of Emergency Services.....363-4790
County Environmental Health Division/County Health Officer.....363-4305
County Risk Management.....363-4611
County Department of Public Works
A. Sewer Maintenance (During Working Hours).....363-4100
B. Sewer Maintenance (After Working Hours)
* On-Call Sewer Maintenance Staff.....363-4000
County Utility Contacts
A. Utility Section Manager.....363-4100
B. Utility Section Analyst.....363-4100
C. Sewer Technician.....363-4100

State of California

California Office of Emergency Services.....(24 hours) 800-852-7550 or 916-262-1621
Regional Water Quality Control Board.....(During regular working hours only)
510-286-1255
(After regular hours call State OES) 800-852-7550
Department of Fish and Game.....800-952-5400
California Highway Patrol (Redwood City Office).....650-369-6261
(San Francisco City Office).....415-557-0305
Department of Transportation (CALTRANS) Regular Work Hours.....415-557-2614
After Work Hours.....415-464-0315
Department of Environmental Protection (CAL EPA).....916-445-3846
Toxic Substances Control **(Hotline)**.....800-698-6942

US Departments

Environmental Protection Agency (US EPA).....415-744-2000
Fish and Wildlife Services.....510-792-0222

Other Responders

Service Master Clean-up Service.....800-439-8833 (24-Hours)
Emergency Service Restoration, Inc.....800-540-5532 (24-Hours)
Olympic Restoration.....800-606-4110 (24-Hours)

Appendix E: Extended Bibliography

	Expanded Bibliography and Source Reference List - San Mateo Parks VMP																														
	REFERENCE			**PARK**																	**RESOURCE**										
Doc #	Document Name	Author	Date	All	Coyote Pt	Crystal Springs	Edgewood	Fitzgerald	Flood Park	Huddart	Junipers Serra	Memorial	Pescadero	Sam McDonald	San Pedro	San Bruno Mtn	Wunderlich	OTHER	Erosion Control	Fire/Fuel Load Mgt	Forest Health	Grazing	Green Waste Mgt	Integrated Pest Mgt	Hydrology	NonPoint Source Pollution Control	Pest and Plant Disease	Trails				
1	Edgewood County Park Golf Course site Constraints Analysis	Thomas Reid Associates	Jul-93				X												24												
2	Vegetation Management Program; Handbook & Field Guide	California Department of Forestry and Fire Protection	Jun-01															X		X											
3	Notice of Preparation for the Vegetation Management Program; Draft Environmental Impact Report	California Department of Forestry and Fire Protection	Early 2005?															X		X											
4	San Bruno Mountain Community Wildfire Protection and Fire Use Plan	Department of Forestry and Fire Protection	Apr-05													X				X											
5	Fitzgerald Marine Preserve Master Plan; Final Environmental Impact Report	Thomas Reid Associates	Jun-04					X																							
6	Fitzgerald Marine Preserve Master Plan; Draft Environmental Impact Report	Thomas Reid Associates	Nov-03					X											IV-B-4												
7	San Pedro Valley County Park Master Plan	EDAW Inc.	Feb-75												X																
8	San Pedro Valley Natural Resources Management Plan	Staff of San Mateo County, Division of Parks and Recreation, Department of Environmental Management	Jul-79												X																
9	Memorandum of Understanding; San Mateo County Weed Management Area	?	?	X			X																								

	REFERENCE			PARK																RESOURCE										
Doc #	Document Name	Author	Date	All	Coyote Pt	Crystal Springs	Edgewood	Fitzgerald	Flood Park	Huddart	Junipers Serra	Memorial	Pescadero	Sam McDonald	San Pedro	San Bruno Mtn	Wunderlich	OTHER	Erosion Control	Fire/Fuel Load Mgt	Forest Health	Grazing	Green Waste Mgt	Integrated Pest Mgt	Hydrology	NonPoint Source Pollution Control	Pest and Plant Disease	Trails
10	County of San Mateo, Watershed Management Program; Volume 1, Maintenance Standards	County of San Mateo, Department of Public Works	Apr-04	X															12-15, 53-55, 80-81,	19, 57-9			73-5, 88					
11	Local Coastal Program: Policies	Environmental Services Agency	Jun-98															X										
12	Fire and Fire Suppression Policy Report; Southeast Ridge Unplanned Burn	Thomas Reid Associates	Sep-05													X				X								
13	Notes from Grazing and Burning for Vegetation and Habitat Management Public Workshop	Eben Polk, Thomas Reid Associates	Jun-02													X		X		X		X						
14	Senate Bill 1369	Senator Kuehl	Feb-04	X																								
15	Preparing a Community Wildfire Protection Plan: A Handbook for Wildland-Urban Interface Communities		Mar-04	X																X								
16	Flood Channel Maintenance Activities Proposed in the Pescadero Creek Watershed Under a Clean Water Act Section 319 Pilot Program	California Coastal Commission	Jul-96										X						X				X					
17	San Bruno Mountain Area Habitat Conservation Plan Administration ; Monterey pine	Roman Gankin, Senior Planner, County of San Mateo	Sep-98													X												
18	Excerpts from the San Mateo County Local Coastal Program Riparian Corridor Policies	San Mateo County Planning and Building Division	Jan-98	X																								

	REFERENCE			PARK																RESOURCE										
Doc #	Document Name	Author	Date	All	Coyote Pt	Crystal Springs	Edgewood	Fitzgerald	Flood Park	Huddart	Junipers Serra	Memorial	Pescadero	Sam McDonald	San Pedro	San Bruno Mtn	Wunderlich	OTHER	Erosion Control	Fire/Fuel Load Mgt	Forest Health	Grazing	Green Waste Mgt	Integrated Pest Mgt	Hydrology	NonPoint Source Pollution Control	Pest and Plant Disease	Trails
19	Streamside Planting Guide for San Mateo and Santa Clara Streams	San Francisquito Creek Watershed, Coordinated Resource Management and Planning Process	?	X																								
20	San Mateo County 2001 Trails Plan	MHA Environmental Consulting, Inc.	Jun-01	X																								X
21	San Bruno Mountain Habitat Conservation plan: Year 2003 Activities Report for Endangered Species Permit PRT-2-9818	County of San Mateo, Department of Public Works	Jan-04													X				31-2		31						
22	Innovations in Park and Open Space Stewardship; Case examples in Urban Park and Open Space Management	The Trust for Public Land	Jun-05		64		74	64		74			74															
23	Fire History in Coast Redwood Stands in the Northeastern Santa Cruz Mountains, CA (in review at Fire Ecology)	Stephens, Fry UC Berkeley	?															X		X								
24	Huddart Natural Resources Management Plan	County, Division of Parks and Recreation, Department of Environmental	Aug-79							X																		
25	Coyote Point Park: Final Environmental Impact Report	San Mateo County, Department of Parks and Recreation	Jul-73		X																							
26	Edgewood Natural Preserve Master Plan	Environmental Services Agency	May-97				X												A-9									
27	General Plan: Policies	Department of Environmental Management	Nov-86	X																								

	REFERENCE			PARK																RESOURCE										
Doc #	Document Name	Author	Date	All	Coyote Pt	Crystal Springs	Edgewood	Fitzgerald	Flood Park	Huddart	Junipers Serra	Memorial	Pescadero	Sam McDonald	San Pedro	San Bruno Mtn	Wunderlich	OTHER	Erosion Control	Fire/Fuel Load Mgt	Forest Health	Grazing	Green Waste Mgt	Integrated Pest Mgt	Hydrology	NonPoint Source Pollution Control	Pest and Plant Disease	Trails
28	Coyote Point Landscape Manual	Garden Staff, Coyote point	Jan-99		X																			16				
29	Sanchez Adobe Historical Site Draft Master Plan	Architectural Resources Group	Apr-05															X										
30	The Master Plan for Coyote Point Park	San Mateo County Parks and Recreation Commission	1971		X																							
31	Coyote Point Natural Resources Management Plan	County, Division of Parks and Recreation, Department of Environmental	Aug-79		X																							
32	Recovery Plan for the Santa Cruz Cypress	U.S. Fish and Wildlife Service	Sep-98										10, 40-1					X		19-20								
33	Wunderlich Natural Resources Management Plan	County, Division of Parks and Recreation, Department of Environmental	Apr-79														X											
34	Junipero Serra Natural Resources Management Plan	County, Division of Parks and Recreation, Department of Environmental	Apr-79								X																	
35	Junipero Serra County Recreation Area: Master Plan	EDAW, Inc.	Nov-81								X																	23-8
36	Natural Resources Management Plan: San Mateo County Parks System	Force, Department of Environmental Management, Parks and Recreation Division	Mar-83	X															15									

	REFERENCE			PARK																RESOURCE										
Doc #	Document Name	Author	Date	All	Coyote Pt	Crystal Springs	Edgewood	Fitzgerald	Flood Park	Huddart	Junipers Serra	Memorial	Pescadero	Sam McDonald	San Pedro	San Bruno Mtn	Wunderlich	OTHER	Erosion Control	Fire/Fuel Load Mgt	Forest Health	Grazing	Green Waste Mgt	Integrated Pest Mgt	Hydrology	NonPoint Source Pollution Control	Pest and Plant Disease	Trails
37	Final Report: Sediment Assessment of Roads and Trails within the Pescadero /Memorial /Sam Macdonald County Park Complex, Pescadero Creek Watershed	Pacific Watershed Associates	Feb-03									X	X	X					X									23-30
38	Pescadero Creek Park: Master Plan	Sasaki, Walker, Roberts, Inc.	Jul-75										X															
39	Fremontia	Various	Apr-97															X			X						X	
40	Forest Resources Study Committee	Forest Resources Study Committee, San Mateo County Planning Department	Mar-71																	61-66	X							
41	Pescadero Creek Park: Final Environmental Impact Report	JARA	Jul-75										X															
42	Natural Resources Management Program, Implementation Concept Plan: Pescadero Creek County Park	John E. Kenney	Oct-95										X						7, Fig. 4	7								
43	Sam McDonald County Park: Concept Plan	County of San Mateo, Department of Parks & Recreation	Sep-74											X														
44	Sam McDonald County Park: Additions, Final Environmental Impact Report	Department of Parks and Recreation, San Mateo County	Nov-75											X														
45	Sam McDonald County Park: Draft, Additions, Environmental Impact Report	Department of Parks and Recreation, San Mateo County	Jun-75											X														

	REFERENCE			PARK																RESOURCE										
Doc #	Document Name	Author	Date	All	Coyote Pt	Crystal Springs	Edgewood	Fitzgerald	Flood Park	Huddart	Junipers Serra	Memorial	Pescadero	Sam McDonald	San Pedro	San Bruno Mtn	Wunderlich	OTHER	Erosion Control	Fire/Fuel Load Mgt	Forest Health	Grazing	Green Waste Mgt	Integrated Pest Mgt	Hydrology	NonPoint Source Pollution Control	Pest and Plant Disease	Trails
46	Stage II, Final Supplement to the EIR for Edgewood County Park Master Plan	Environmental management, Planning and Development Division	Aug-84				X																					
47	The Flora of Edgewood Park	Toni Corelli, for the Santa Clara Valley Chapter of the California Native Plant Society.	Apr-93				X																					
48	Stage I Final Environmental Impact Report: Edgewood County Park Master Plan	Torrey & Torrey, Inc.	Dec-82				X																					
49	Flood Park: Master Plan	Parks and Recreation Division, San Mateo County	1983						X																			
50	Fitzgerald Marine Reserve Master Plan	Brady/LSA	May-02					X											150-2							129-142		
51	Wildland Management Policies and Guidelines	East Bay Regional Park District	Aug-92															X		6; 8;10-1		13-19		13				
52	San Mateo County Parks Vegetation Resources	Rana Creek Habitat Restoration	Mar-02	X	p. 3-20	21-50	51-82	83-108	109-116	117-128	129-144		145-168	169-192	193-121	213-226												
53	San Pedro Creek Watershed Assessment and Enhancement Plan	San Pedro Creek Watershed Coalition	Mar-02												X			X								28; 43; 48		
54	A Supplement to Soil Survey, San Mateo County Area, CA	Department of Agriculture, Soil Conservation Science and San Mateo County	Jan-69	X																								

	REFERENCE			PARK																RESOURCE										
Doc #	Document Name	Author	Date	All	Coyote Pt	Crystal Springs	Edgewood	Fitzgerald	Flood Park	Huddart	Junipers Serra	Memorial	Pescadero	Sam McDonald	San Pedro	San Bruno Mtn	Wunderlich	OTHER	Erosion Control	Fire/Fuel Load Mgt	Forest Health	Grazing	Green Waste Mgt	Integrated Pest Mgt	Hydrology	NonPoint Source Pollution Control	Pest and Plant Disease	Trails
55	Natural Resources management Program for Pescadero Creek County Park	Western Ecological Services Company	Jun-83										X								p. 2-38							
56	Natural Hazards: Background & Issues	?	?	X																15.17; 15.41; 15.74								
57	Parks and Recreation Resources: Background & Issues	?	?	X																								
58	Vegetable, Water, Fish, and Wildlife Resources	?	?	X																								
59	Park Brochures for each park	?	?	X																								
60	More brochures	?	?	X																								
61	Selected Invasive Plants of San Mateo County	San Mateo County Weed Management Area																										
62	Maps report	?	Jun-05	X																								
63	AB 242, Forest Fire Prevention Exemption Emergency Rule		Jan-05	X																X								

	REFERENCE			PARK																RESOURCE										
Doc #	Document Name	Author	Date	All	Coyote Pt	Crystal Springs	Edgewood	Fitzgerald	Flood Park	Huddart	Junipers Serra	Memorial	Pescadero	Sam McDonald	San Pedro	San Bruno Mtn	Wunderlich	OTHER	Erosion Control	Fire/Fuel Load Mgt	Forest Health	Grazing	Green Waste Mgt	Integrated Pest Mgt	Hydrology	NonPoint Source Pollution Control	Pest and Plant Disease	Trails
64	Fire, fuels, and land use planning in the wildland/urban interface	Gary Gilbert	January/ Februar y 2004															X		X									
65	Riverside County multiple species plan: A blueprint for innovative and success	Kristi Lovelady	?															X											
66	Section 12000, San Mateo County Ordinance; Regulation of Removal of Significant Trees	County of San Mateo Planning and Building Division	?	X																	X								
67	Section 11000, San Mateo County Ordinance: Regulation of Removal of Heritage Trees	County of San Mateo Planning and Building Division	Apr-77	X																	X								
68	Habitat Restoration projects on San Bruno Mountain 2005- Map	Thomas Reid Associates	May-05													X													
69	CA Salmonid Stream Habitat Restoration Manual	Downie, James Hopelain, Michael Bird, Robert Coey, and Barry Collins	Feb-98															X	II-12										
70	Bay Checkerspot Butterfly Federal Listing Studies	Environmental Services Agency	1994															X											
71	Weed Management/ Monitoring Guidelines	Ricardo Trejo	?	X																									
72	Colma Creek Headwaters Restoration Project, San Bruno Mountain	Joe Cannon and Mark Heath	Mar-05													X			6										

	REFERENCE			PARK																RESOURCE										
Doc #	Document Name	Author	Date	All	Coyote Pt	Crystal Springs	Edgewood	Fitzgerald	Flood Park	Huddart	Junipers Serra	Memorial	Pescadero	Sam McDonald	San Pedro	San Bruno Mtn	Wunderlich	OTHER	Erosion Control	Fire/Fuel Load Mgt	Forest Health	Grazing	Green Waste Mgt	Integrated Pest Mgt	Hydrology	NonPoint Source Pollution Control	Pest and Plant Disease	Trails
73	James V. Fitzgerald Marine Preserve Resource Assessment	Tenera Environmental	Nov-04					X																		p. 4-7		
74	Coyote Point Recreation Area Master Plan	?	Summer 2002		X																			III-12		III-10		III-115; IV-4
75	Draft Negative Declaration-Edgewood	County of San Mateo, Parks and recreation Division	Jul-04				X																					
76	Huddart and Wunderlich parks: Draft Master Plan	Harris Design	May-05							X							X		81-90	117-134								56; 59-74
77	Final Report on NFWS grant for Habitat Restoration at Edgewood Natural Preserve	Stuart B. Weiss	Oct-02				X																					
78	San Bruno Mountain Master Plan	?	?													X				Section 6.4						Section 4.14		3-3; 3-11
79	Sediment Assessment for Pescadero Park complex	Pacific Watershed Associates	Feb-03										X						X									23-9
80	Water Supply Alternatives, Fish Passage and Use, and Streambed Conditions at Memorial County Park	Balance Hydrologics, Inc.	Sep-03									X													X			
81	Post-Burn Restoration Plan for Wax Myrtle Ravine	Thomas Reid Associates	Mar-04													X			p. 8-9	X								

	REFERENCE			PARK																RESOURCE										
Doc #	Document Name	Author	Date	All	Coyote Pt	Crystal Springs	Edgewood	Fitzgerald	Flood Park	Huddart	Junipers Serra	Memorial	Pescadero	Sam McDonald	San Pedro	San Bruno Mtn	Wunderlich	OTHER	Erosion Control	Fire/Fuel Load Mgt	Forest Health	Grazing	Green Waste Mgt	Integrated Pest Mgt	Hydrology	NonPoint Source Pollution Control	Pest and Plant Disease	Trails
82	Sanchez Adobe Draft Master Plan	Architectural Resources Group	Apr-05															X										
83	Conceptual Plan for Interpretation at Fitzgerald Marine Reserve	The Acorn Group, Inc.	Dec-04					X																				
84	Werder Pier Restoration Feasibility Study	Concept Marine Associates	Mar-04																30									
85	Coastal Access Plan	Callander Associates Landscape Architecture, Inc.	Oct-02															X										
86	Conceptual Plan for Edgewood Park Interpretive Center	The Acorn Group, Inc.	Nov-02				X																					33-9
87	Mirada Surf Coastal Trail	Harris Design	Sep-04															X										X

	Expanded Bibliography and Source Reference List - San Mateo Parks VM										
	REFERENCE										
Doc #	Document Name	Author	Date	Sensitive Habitats	Sensitive Species	Weed Control/Invasive Plant Detection and Control	Volunteer Involvement Opportunities	Public Health and Safety	Facilities Maintenance	Recreational Activities	Historic / Cultural Resources
1	Edgewood County Park Golf Course site Constraints Analysis	Thomas Reid Associates	Jul-93	44 -5	32 -44						51
2	Vegetation Management Program; Handbook & Field Guide	California Department of Forestry and Fire Protection	Jun-01								
3	Notice of Preparation for the Vegetation Management Program; Draft Environmental Impact Report	California Department of Forestry and Fire Protection	Early 2005?								
4	San Bruno Mountain Community Wildfire Protection and Fire Use Plan	Department of Forestry and Fire Protection	Apr-05								
5	Fitzgerald Marine Preserve Master Plan; Final Environmental Impact Report	Thomas Reid Associates	Jun-04							III-22- 29	
6	Fitzgerald Marine Preserve Master Plan; Draft Environmental Impact Report	Thomas Reid Associates	Nov-03	IV-A-11	IV-A-5	IV-A-13				II-31, IV-D-1-3	II-26
7	San Pedro Valley County Park Master Plan	EDAW Inc.	Feb-75	43							
8	San Pedro Valley Natural Resources Management Plan	Staff of San Mateo County, Division of Parks and Recreation, Department of Environmental Management	Jul-79							9	
9	Memorandum of Understanding; San Mateo County Weed Management Area	?	?			2nd part					

	REFERENCE										
Doc #	Document Name	Author	Date	Sensitive Habitats	Sensitive Species	Weed Control/Invasive Plant Detection and Control	Volunteer Involvement Opportunities	Public Health and Safety	Facilities Maintenance	Recreational Activities	Historic / Cultural Resources
10	County of San Mateo, Watershed Management Program; Volume 1, Maintenance Standards	County of San Mateo, Department of Public Works	Apr-04		57-9						
11	Local Coastal Program: Policies	Environmental Services Agency	Jun-98	7.1-10	7.10-13	7.13-7.14					
12	Fire and Fire Suppression Policy Report; Southeast Ridge Unplanned Burn	Thomas Reid Associates	Sep-05								
13	Notes from Grazing and Burning for Vegetation and Habitat Management Public Workshop	Eben Polk, Thomas Reid Associates	Jun-02			X					
14	Senate Bill 1369	Senator Kuehl	Feb-04								
15	Preparing a Community Wildfire Protection Plan: A Handbook for Wildland-Urban Interface Communities		Mar-04								
16	Flood Channel Maintenance Activities Proposed in the Pescadero Creek Watershed Under a Clean Water Act Section 319 Pilot Program	California Coastal Commission	Jul-96			X					
17	San Bruno Mountain Area Habitat Conservation Plan Administration ; Monterey pine	Roman Gankin, Senior Planner, County of San Mateo	Sep-98								
18	Excerpts from the San Mateo County Local Coastal Program Riparian Corridor Policies	San Mateo County Planning and Building Division	Jan-98	X							

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Doc #	Document Name	Author	Date	Sensitive Habitats	Sensitive Species	Weed Control/Invasive Plant Detection and Control	Volunteer Involvement Opportunities	Public Health and Safety	Facilities Maintenance	Recreational Activities	Historic / Cultural Resources
19	Streamside Planting Guide for San Mateo and Santa Clara Streams	San Francisquito Creek Watershed, Coordinated Resource Management and Planning Process	?	X							
20	San Mateo County 2001 Trails Plan	MHA Environmental Consulting, Inc.	Jun-01							X	
21	San Bruno Mountain Habitat Conservation plan: Year 2003 Activities Report for Endangered Species Permit PRT-2-9818	County of San Mateo, Department of Public Works	Jan-04		4-23	24-7	30-1				
22	Innovations in Park and Open Space Stewardship; Case examples in Urban Park and Open Space Management	The Trust for Public Land	Jun-05				X		X	X	
23	Fire History in Coast Redwood Stands in the Northeastern Santa Cruz Mountains, CA (in review at Fire Ecology)	Stephens, Fry UC Berkeley	?								
24	Huddart Natural Resources Management Plan	County, Division of Parks and Recreation, Department of Environmental	Aug-79							8	
25	Coyote Point Park: Final Environmental Impact Report	San Mateo County, Department of Parks and Recreation	Jul-73								
26	Edgewood Natural Preserve Master Plan	Environmental Services Agency	May-97	12, 14; A-19-28;	A-30-37	A-28; A-58			13; A45-59	13	A-41
27	General Plan: Policies	Department of Environmental Management	Nov-86		1.1			10.1-16.1		6.1	5.1

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Doc #	Document Name	Author	Date	Sensitive Habitats	Sensitive Species	Weed Control/Invasive Plant Detection and Control	Volunteer Involvement Opportunities	Public Health and Safety	Facilities Maintenance	Recreational Activities	Historic / Cultural Resources
28	Coyote Point Landscape Manual	Garden Staff, Coyote point	Jan-99								
29	Sanchez Adobe Historical Site Draft Master Plan	Architectural Resources Group	Apr-05							X	X
30	The Master Plan for Coyote Point Park	San Mateo County Parks and Recreation Commission	1971								
31	Coyote Point Natural Resources Management Plan	County, Division of Parks and Recreation, Department of Environmental	Aug-79	3					5	6	
32	Recovery Plan for the Santa Cruz Cypress	U.S. Fish and Wildlife Service	Sep-98			23					
33	Wunderlich Natural Resources Management Plan	County, Division of Parks and Recreation, Department of Environmental	Apr-79	Pg. 1-5					6	7	
34	Junipero Serra Natural Resources Management Plan	County, Division of Parks and Recreation, Department of Environmental	Apr-79	Pg. 1-4		5			6	7	
35	Junipero Serra County Recreation Area: Master Plan	EDAW, Inc.	Nov-81						14-23, 28	23	
36	Natural Resources Management Plan: San Mateo County Parks System	Force, Department of Environmental Management, Parks and Recreation Division	Mar-83								

	REFERENCE										
Doc #	Document Name	Author	Date	Sensitive Habitats	Sensitive Species	Weed Control/Invasive Plant Detection and Control	Volunteer Involvement Opportunities	Public Health and Safety	Facilities Maintenance	Recreational Activities	Historic / Cultural Resources
37	Final Report: Sediment Assessment of Roads and Trails within the Pescadero /Memorial /Sam Macdonald County Park Complex, Pescadero Creek Watershed	Pacific Watershed Associates	Feb-03								
38	Pescadero Creek Park: Master Plan	Sasaki, Walker, Roberts, Inc.	Jul-75	18					15-6; 36-40	15;18, 31-4	10, 12, 15
39	Fremontia	Various	Apr-97		X						
40	Forest Resources Study Committee	Forest Resources Study Committee, San Mateo County Planning Department	Mar-71							112-8	
41	Pescadero Creek Park: Final Environmental Impact Report	JARA	Jul-75						69-70, 129-132, 149, 160	64-8, 124-129, 149, 162	58-62, 119-120, 148, 162
42	Natural Resources Management Program, Implementation Concept Plan: Pescadero Creek County Park	John E. Kenney	Oct-95				12		12		
43	Sam McDonald County Park: Concept Plan	County of San Mateo, Department of Parks & Recreation	Sep-74						9-10, 14-7		
44	Sam McDonald County Park: Additions, Final Environmental Impact Report	Department of Parks and Recreation, San Mateo County	Nov-75								
45	Sam McDonald County Park: Draft, Additions, Environmental Impact Report	Department of Parks and Recreation, San Mateo County	Jun-75	58	58					p. 9-10	59-60

	REFERENCE										
Doc #	Document Name	Author	Date	Sensitive Habitats	Sensitive Species	Weed Control/Invasive Plant Detection and Control	Volunteer Involvement Opportunities	Public Health and Safety	Facilities Maintenance	Recreational Activities	Historic / Cultural Resources
46	Stage II, Final Supplement to the EIR for Edgewood County Park Master Plan	Environmental management, Planning and Development Division	Aug-84								
47	The Flora of Edgewood Park	Toni Corelli, for the Santa Clara Valley Chapter of the California Native Plant Society.	Apr-93		111-28;153-240						
48	Stage I Final Environmental Impact Report: Edgewood County Park Master Plan	Torrey & Torrey, Inc.	Dec-82								
49	Flood Park: Master Plan	Parks and Recreation Division, San Mateo County	1983			21				15-8	p. 12-13
50	Fitzgerald Marine Reserve Master Plan	Brady/LSA	May-02	41-6; 83-90; 91; 102-6; 118-128	102-6; 118-128	107-112			55-65; 79;81	47-54; 77-80; 91	153-6
51	Wildland Management Policies and Guidelines	East Bay Regional Park District	Aug-92	3-6;	12-3;	6-7;					
52	San Mateo County Parks Vegetation Resources	Rana Creek Habitat Restoration	Mar-02	7; 27-8; 59-61; 85-8; 111; 120; 134; 151-2176-7; 198-200; 216-7	7-8; 27-9; 59-62; 85-91; 111; 121-2; 134-5; 151-3; 176-8; 198-201; 216-8	9;30-1; 63; 92; 111-2; 122; 136; 154; 179; 202; 219					
53	San Pedro Creek Watershed Assessment and Enhancement Plan	San Pedro Creek Watershed Coalition	Mar-02		29						
54	A Supplement to Soil Survey, San Mateo County Area, CA	Department of Agriculture, Soil Conservation Science and San Mateo County	Jan-69								

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Doc #	Document Name	Author	Date	Sensitive Habitats	Sensitive Species	Weed Control/Invasive Plant Detection and Control	Volunteer Involvement Opportunities	Public Health and Safety	Facilities Maintenance	Recreational Activities	Historic / Cultural Resources
55	Natural Resources management Program for Pescadero Creek County Park	Western Ecological Services Company	Jun-83	p. 2-37	2-33; 2-53						
56	Natural Hazards: Background & Issues	?	?					X			
57	Parks and Recreation Resources: Background & Issues	?	?							x	
58	Vegetable, Water, Fish, and Wildlife Resources	?	?								
59	Park Brochures for each park	?	?								
60	More brochures	?	?								
61	Selected Invasive Plants of San Mateo County	San Mateo County Weed Management Area				X	(before table of contents)				
62	Maps report	?	Jun-05								
63	AB 242, Forest Fire Prevention Exemption Emergency Rule		Jan-05								

	REFERENCE										
Doc #	Document Name	Author	Date	Sensitive Habitats	Sensitive Species	Weed Control/Invasive Plant Detection and Control	Volunteer Involvement Opportunities	Public Health and Safety	Facilities Maintenance	Recreational Activities	Historic / Cultural Resources
64	Fire, fuels, and land use planning in the wildland/urban interface	Gary Gilbert	January/ Februar y 2004								
65	Riverside County multiple species plan: A blueprint for innovative and success	Kristi Lovelady	?	X	X						
66	Section 12000, San Mateo County Ordinance; Regulation of Removal of Significant Trees	County of San Mateo Planning and Building Division	?								
67	Section 11000, San Mateo County Ordinance: Regulation of Removal of Heritage Trees	County of San Mateo Planning and Building Division	Apr-77								
68	Habitat Restoration projects on San Bruno Mountain 2005- Map	Thomas Reid Associates	May-05			X					
69	CA Salmonid Stream Habitat Restoration Manual	Downie, James Hopelain, Michael Bird, Robert Coey, and Barry Collins	Feb-98	X	X		VI-5				
70	Bay Checkerspot Butterfly Federal Listing Studies	Environmental Services Agency	1994		X						
71	Weed Management/ Monitoring Guidelines	Ricardo Trejo	?			X					
72	Colma Creek Headwaters Restoration Project, San Bruno Mountain	Joe Cannon and Mark Heath	Mar-05	X		2	14				

	REFERENCE										
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73	James V. Fitzgerald Marine Preserve Resource Assessment	Tenera Environmental	Nov-04							Section 2-1	
74	Coyote Point Recreation Area Master Plan	?	Summer 2002	III-13; VIII-4				VII-7	III-1-9, 14-8; VII-1-7	IV,V, VI	
75	Draft Negative Declaration-Edgewood	County of San Mateo, Parks and recreation Division	Jul-04	2					X		
76	Huddart and Wunderlich parks: Draft Master Plan	Harris Design	May-05	103-116		58			15-58; 75-80; 91-102	13-25; 28;56; 59-74	
77	Final Report on NFWS grant for Habitat Restoration at Edgewood Natural Preserve	Stuart B. Weiss	Oct-02	X	X	X					
78	San Bruno Mountain Master Plan	?	?	1-6; 2-2; 2-4; 3-2; 3-4; 3-34; 6-3,4	Section 4 p. 3-8,9; 3-6	3-2; 3-11	6-5; 6-2	Section 6-5	2-3; 2-6; 3-p.28-34; 5 p. 1-6; 6 p.1-6	2-3; 2-5; 3-5; 3 p. 8-22; 4-17; 5-2;	3-5; 4-15
79	Sediment Assessment for Pescadero Park complex	Pacific Watershed Associates	Feb-03	X					p. 10-19		
80	Water Supply Alternatives, Fish Passage and Use, and Streambed Conditions at Memorial County Park	Balance Hydrologics, Inc.	Sep-03	23	X						
81	Post-Burn Restoration Plan for Wax Myrtle Ravine	Thomas Reid Associates	Mar-04	9	10	p. 4-8	11				

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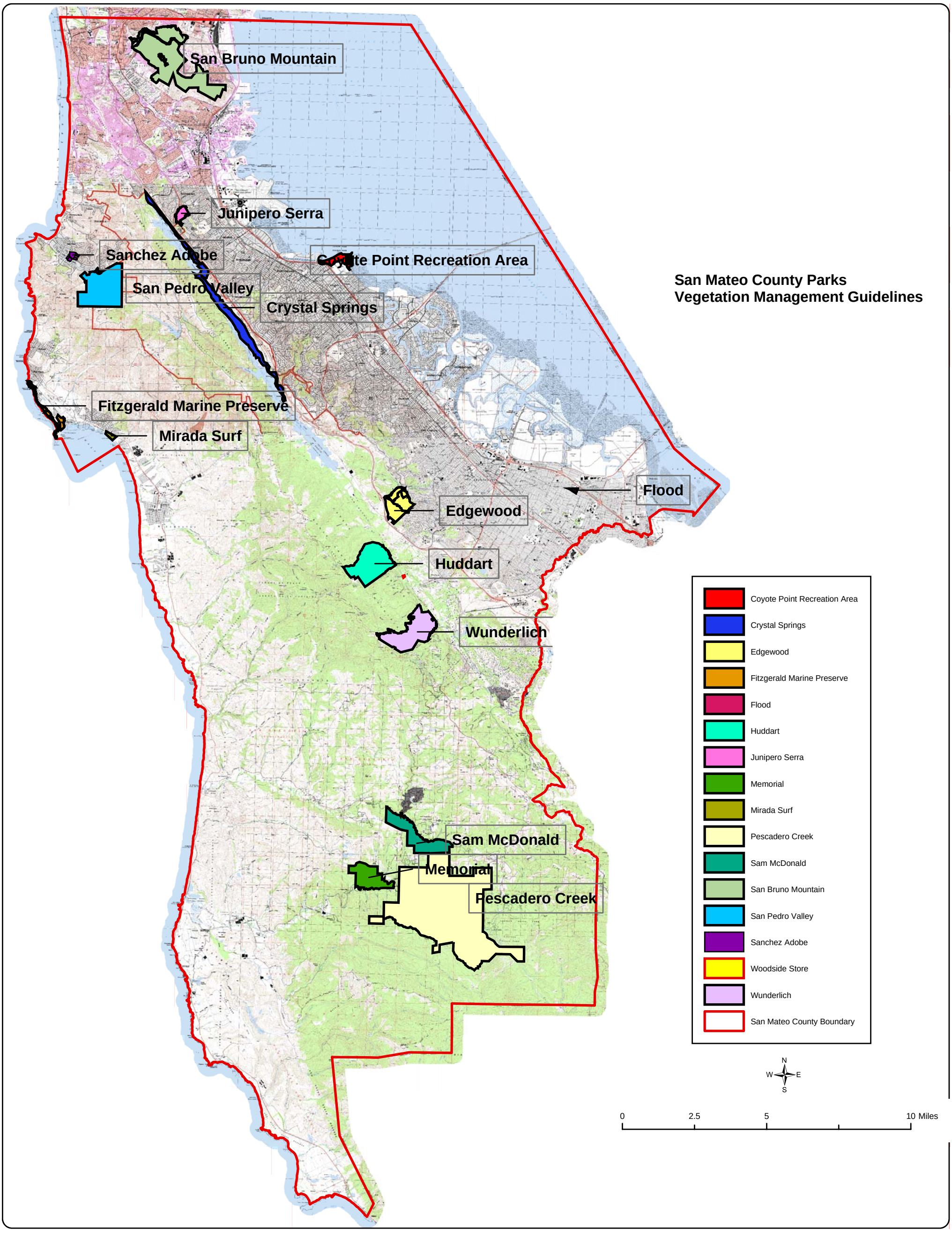
82	Sanchez Adobe Draft Master Plan	Architectural Resources Group	Apr-05						X		X
83	Conceptual Plan for Interpretation at Fitzgerald Marine Reserve	The Acorn Group, Inc.	Dec-04				X		X	X	
84	Werder Pier Restoration Feasibility Study	Concept Marine Associates	Mar-04						X		
85	Coastal Access Plan	Callander Associates Landscape Architecture, Inc.	Oct-02						X		
86	Conceptual Plan for Edgewood Park Interpretive Center	The Acorn Group, Inc.	Nov-02						X	X	
87	Mirada Surf Coastal Trail	Harris Design	Sep-04								

Appendix F: Maps


San Bruno Mountain
Junipero Serra
Sanchez Adobe
Coyote Point Recreation Area
San Pedro Valley
Crystal Springs
Fitzgerald Marine Preserve
Mirada Surf
Flood
Edgewood
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Pescadero Creek
Sam McDonald
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San Pedro Valley
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