LEGISLATIVE ANALYST REPORT

From: Andrew Murray, Office of the Legislative Analyst
Date: July 2, 2007
Re: **Natural Areas Management Plans** (BOS File No. 061559) (OLA No. 096-06)

SUMMARY OF REQUESTED ACTION

The Board of Supervisors approved a motion introduced by Supervisor Elsbernd requesting that the Office of the Legislative Analyst (OLA) research natural areas plans comparable to San Francisco's that have been implemented in other jurisdictions. The motion also directed the OLA to explore existing studies that provide data that may assist in determining potential costs for San Francisco's draft Significant Natural Resource Areas Management Plan (SNRAMP).

EXECUTIVE SUMMARY

Natural areas programs are growing in popularity as jurisdictions recognize the value of remnant historic ecosystems and undeveloped parkland. Local programs exhibit great diversity in design and implementation. Regarding planning particularly, prominent local programs have followed many different pathways in establishing overall program goals, system-wide practices, and park-specific work plans. This is somewhat unusual - often local government programs (addressing various issues) evolve along similar paths across jurisdictions, based on federal or state requirements or the successes of pioneers.

The San Francisco Recreation and Park Department's (RPD) draft Significant Natural Resource Areas Management Plan (SNRAMP) is among the most comprehensive natural areas planning documents encountered in any jurisdiction during this research project. It inventories all natural areas and contains system-wide and site-specific recommendations, which provide valuable guidance for implementation. Other jurisdictions with prominent natural areas programs, such as Chicago and New York, are currently preparing overarching management plans modeled in part on San Francisco's effort.

San Francisco is developing annual work plans based on the recommendations of the SNRAMP, but does not have detailed, long-term, site-specific work plans. Such work plans would enable detailed budget forecasts. Without long-term work plans, it is challenging to estimate the cost of implementing the SNRAMP over its 20-year horizon with any accuracy. RPD's Natural Areas Program (NAP) has detailed site assessment information, provided by the consultant that helped to prepare the SNRAMP, which it could use to create long-term work plans and detailed cost estimates. The program has not, however, thoroughly processed this data, which would require a substantial effort.

Roughly estimated, the cost of implementing the SNRAMP over its 20-year horizon will likely be 20 years of fairly stable funding (currently approximately $1M per year), as well as additional expenditures

on capital projects (22 currently completed, in process, or planned). If the program is expanded to enable active management of all 1,100 acres, the annual budget would need to be increased to approximately $2.5M. Although the capital projects vary dramatically in nature, past projects have averaged approximately $260,000. The main capital activities include restoration, erosion control, trail creation, and tree removal. Large-scale tree removal will very likely elevate the cost of some future capital projects significantly above this average. One goal of the SNRAMP is to re-establish native community ecosystem function where it has been degraded. Ongoing maintenance requirements of successfully restored natural areas could be relatively low compared to developed parklands.

BACKGROUND

San Francisco Natural Areas Program

The Natural Areas Program (NAP) of the San Francisco Recreation and Park Department (RPD) is responsible for managing the City's natural areas, which are parklands that often contain relatively undisturbed remnants of San Francisco's original landscape or rare species. Local environmental nonprofit organizations originally encouraged the creation of the program, in part due to the presence in San Francisco of an unusual (in some cases unique), diverse assemblage of plants and animals. Policy 2.13 of the Open Space Element of the City's General Plan (as amended in 1991) noted the need to "Protect and Preserve Significant Natural Resource Areas." The Recreation and Parks Commission formally established the program in 1995.

The program's mission is twofold: to preserve, restore, and enhance natural areas, and to develop and support community-based site stewardship of these areas. The 31 natural areas occur mostly in the central and southern portions of the City, and include Sharp Park, which is located in Pacifica but owned by San Francisco. Natural areas range in size from less than one acre to almost 400 acres (Lake Merced), and together cover approximately 1,100 acres. (Appendix A contains a listing of the natural areas and their acreages.) The NAP currently has an annual budget of $1.07M and nine full-time staff, including one program manager, one volunteer coordinator, and seven gardeners. The program also engages a significant number of volunteers, who collectively contributed nearly 12,000 hours in FY 2005-06.

Significant Natural Resource Areas Management Plan

Policy 2.13 of the Open Space Element directed the City to identify significant natural resource areas using the following criteria:

- Relatively undisturbed remnants of San Francisco's original landscape that either support diverse and significant indigenous plant and wildlife habitats or contain rare geologic formations or riparian zones;
- Sites that contain rare, threatened, or endangered species or areas likely to support these species; and
- Areas that are adjacent to other protected natural resource areas.

It also encouraged the development of natural areas management plans, and a consistent set of system-wide management policies and practices, including policies governing access and recreational uses to ensure that natural resource values are not diminished by public use.

In 1995, RPD staff outlined a process for developing an overarching management plan through the Staff Report on the Significant Natural Resource Areas Management Plan (SNRAMP). In the report, RPD staff laid out plan objectives, guidelines for identifying significant areas, and guidelines for inventorying the areas. The report states that "An environmental consultant would be selected…to further refine the plan, inventory natural resources within selected park properties, and make the site-specific management program recommendations." The report also contained an initial prioritization of potential natural areas and proposed general management policies, which included items such as maintain/promote indigenous plant species, control/remove invasive species, and encourage community participation in a public stewardship program.

In 1998, RPD contracted with environmental consulting firm EIP Associates to prepare the SNRAMP. $430,000 was originally contracted for the work, which eventually grew to $645,000 as additional elements were added to the work scope. In 2002, a citizen task force draft was prepared, and a draft plan was made available for public review in 2005. EIP's contract with the City expired on September 1, 2005 and was not renewed. A final draft plan was completed by NAP staff and released in February 2006.

The draft SNRAMP is intended to guide management activities and site improvements for the next 20 years. It contains system-wide goals (Appendix B) and management recommendations, as well as site-specific conditions and recommendations. (Note that the recommendations attempt to appropriately balance the sometimes competing desires of various stakeholders and user groups.) Each of the 31 natural areas is treated in the same level of detail. It also defines and delineates management areas, which are site designations relating to sensitivity, species presence, and habitat complexity. The plan does not contain site-specific detailed work plans. Rather, it encourages the development of annual work plans that reflect site-specific objectives and resources, such as staffing, volunteer groups, grants, capital funds, or other resources, available for that year. Nor does the plan contain explicit discussion of program funding. EIP essentially prepared the plan from a technical perspective based on its sense of ecological needs, following industry standards. It purposely left implementation elements, such as work plans and budgets, to RPD, because implementation is dependent on annual capital and maintenance funding, the level of volunteerism, and other factors that would have been very difficult for EIP to predict while preparing the plan.

The final draft SNRAMP must undergo environmental review pursuant to the California Environmental Quality Act (CEQA) prior to its consideration for adoption by the Recreation and Parks Commission. The environmental review (either an Environmental Impact Report (EIR) or a Mitigated Negative Declaration) is anticipated to cost as much as $800,000 if an EIR is required.

NATURAL AREAS PROGRAMS IN OTHER JURISDICTIONS

The OLA conducted research in late 2002, on a separate but related project, and found that a number of cities, including Boston, Chicago, Denver, New York, Philadelphia, Seattle, and Tucson, had natural areas programs. Subsequent to that, in 2004, the city of Ann Arbor, MI undertook the most comprehensive survey of local natural areas programs to date. The purpose of the survey was to gather basic information about urban natural areas programs from around the U.S. and Canada that could be used as a foundation for networking and benchmarking. The Ann Arbor survey covered 54 of the most prominent programs at the time. Table 1, below, lists the largest cities among the 41 that responded to the survey.[1] The survey verified the OLA's earlier findings that many cities have created some form of natural areas program, although they are not ubiquitous.

Table 1. North American Cities with Natural Areas Programs

City	Population	Year Est'd	Program Name
New York, NY	8,000,000	Unknown	Natural Resources Group
Chicago, IL	3,000,000	2001	Nature Areas
Toronto, Ontario	3,000,000	1998	High Park Woodland Restoration Program
Miami Dade, FL	2,253,362	1990	Natural Resources Management
San Diego, CA	2,000,000	1989	Park Ranger Program
Philadelphia, PA	1,500,000	1997	Natural Lands, Restoration and Environmental Ed. Program
Phoenix, AZ	1,472,930	2000	Natural Resources Division
Calgary, Alberta	900,000	2000	Natural Area Management Section
San Francisco, CA	750,000	1997	Natural Areas Program and Presidio Natural Resources
Toledo, OH	750,000	2000	Metropolitan Park District Land Management Division
Indianapolis, IN	700,000	1991	Land Stewardship
Albuquerque, NM	598,000	1984	Open Space Management
Washington, DC	572,000	1978	Natural Resource Management/Non-native Plants
Nashville, TN	570,000	2004	Natural Areas Program
Portland, OR	520,000	1988	Natural Areas Program
Boston, MA	500,000	2001	Urban Wilds Program

Source: City of Ann Arbor, MI, 2004

In addition to local programs, a number of states have natural areas programs. The Natural Areas Association conducted a survey in 2001, and found that 22 states have comprehensive natural areas programs. In addition, 18 have some more limited form of program.

Activities common to natural areas programs include removal of nonnative/invasive vegetation; planting native vegetation; thinning/removing nonnative trees; creating trails; and engaging in geomorphic projects such as erosion control. They might also include the installation of site amenities such as interpretative signs and benches. Note that these activities can generally be classified as either initial/one-time or ongoing.

[1] Note that two of the respondents were still establishing their programs, and therefore could not provide pertinent data.

NATURAL AREAS MANAGEMENT PLANS IN OTHER JURISDICTIONS

The request directed the OLA to research comparable natural areas plans that have been developed in other jurisdictions. The Ann Arbor survey compiled the most comprehensive data yet collected on local natural areas programs. Unfortunately, it did not collect any information on the programs' planning efforts. Based on OLA research, it appears that although a number of North American cities have natural areas programs, a small number have overarching natural areas management plans comparable to that being developed in San Francisco. (For the purposes of this report, an overarching management plan is defined as one that generally contains a system-wide inventory, system-wide management policies, and site-specific recommendations.) Indeed, in talking with contacts from other jurisdictions about plans, they often cited San Francisco as having among the most comprehensive in both breadth (covering all 31 natural areas and containing general management policies) and depth (dealing with all natural areas at the same level of detail and containing site-specific inventories and recommendations).

The small number of overarching plans is likely due to many factors. Many of the programs are relatively young (two-thirds of the programs that responded to the Ann Arbor survey were started in 1990 or later). As such, they are progressing through natural stages of program development, which usually include creating organizational infrastructure, beginning to inventory and designate natural areas, beginning to develop site-specific work plans; and undertaking modest maintenance and restoration projects. Many have not yet reached a point where an overarching management plan is appropriate or desirable.

In addition, the survey noted that many of the programs have very modest budgets, which cannot support the development of complex plans, particularly in the absence of prospects for significantly expanded future funding. Even if planning resources existed, it might not be sensible to develop ambitious plans that have little prospect of securing funding for implementation.

One other factor is that many of the existing natural areas programs are integrated with other park or open space programs. The Boulder, CO program, with the second greatest acreage under management (43,000) among those in the Ann Arbor survey, is one such program. In these cases, natural areas management issues are often addressed as part of broader open space or park management plans (e.g., Boulder Open Space Department Long Range Management Policies).

Even within jurisdictions that have distinct natural areas programs, management plans for prominent parks/natural areas (opposed to all parks/natural areas) or issue-specific plans (invasive plants or wetlands, for example) are more common than comprehensive, overarching plans. One example is the Midpeninsula Regional Open Space District Invasive Plant Management Plan. Strategic plans, such as that developed for Philadelphia's Fairmount Park and under development for Boston's Urban Wilds, are also somewhat common. These generally address a broad range of high-level strategic issues, including program governance, funding, and administration, and do not address resource management issues in detail.

Ultimately, in order to undertake restoration and maintenance, all that is needed is a site-specific work plan.[2] An overarching management plan that prioritizes work on different sites and establishes system-wide management policies might be desirable for a multi-site system, but it is not required to begin undertaking projects. Therefore, programs might have any number of planning documents to guide their activities, or none at all. New York City, notably, has restored over 2,000 acres of salt marsh, grassland, wetland, and forest without having an overarching management plan. The Boulder Open Space Department Long Range Management Policies illustrates the variety of complementary management documents that a single program might create: long range management policies; resource-specific (plant or animal) management plans; area-specific management plans; and project implementation plans.

Appendix C contains a description of the planning efforts of municipalities with prominent natural areas programs. The discussion illustrates the great variety in how prominent systems plan for and manage their natural areas programs. A number of programs identified through the Ann Arbor survey do not appear to have any significant high-level planning efforts in place. Given the variety, an apples-to-apples comparison of planning efforts across jurisdictions is difficult to make. Table 2, below, summarizes the existence of planning and management guidance documents prepared by the programs referred to above.

Table 2. Natural Areas Program Planning Documents

Jurisdiction	High Level Strategic Plan	Detailed Resource Inventory	General Mgmt Policies	Park-Specific Mgmt Policies	Park-Specific Detailed Work Plan	Fiscal Feasibility in Plan	Cost Estimate
Boston	In process	In process	In process	No	No	In process	No
Calgary	Yes	Yes	Yes	Yes	No	No	No
Chicago	Yes	Yes	Yes	No	No	No	No
Denver	Yes	In process	No	In process	In process	No	No
King County	No	No	Yes	Yes	Yes	No	No
New York	In process	No	No	No	No	No	No
Philadelphia	Yes	Yes	Yes	Yes	Yes	No	No
Portland	No	No	No	No	No	No	No
San Francisco	No	Yes	Yes	Yes	Yes*	No	No

[2] Note that the preeminent ecological restoration organization, the Society for Ecological Restoration, notes in its *Primer on Ecological Restoration* that according to its standards restoration project plans should include, at a minimum, the following components:

- A clear rationale as to why restoration is needed;
- An ecological description of the site designated for restoration;
- A statement of the goals and objectives of the restoration project;
- A designation and description of the reference;
- An explanation of how the proposed restoration will integrate with the landscape and its flows of organisms and materials;
- Explicit plans, schedules and budgets for site preparation, installation and post-installation activities, including a strategy for making prompt mid-course corrections;
- Well-developed and explicitly stated performance standards, with monitoring protocols by which the project can be evaluated; and
- Strategies for long-term protection and maintenance of the restored ecosystem.

* The NAP prepares annual work plans for each natural area, based on the recommendations of the SNRAMP. Some other programs have created longer-term detailed work plans for all of their sites.

NATURAL AREAS MANAGEMENT AND RESTORATION COST CASE STUDIES

The request directed the OLA to gather existing data that may assist in determining potential costs of San Francisco's management plan. Although a comprehensive set of detailed long-term work plans (which NAP lacks) are required to develop accurate cost estimates, it is still possible to develop a general sense of what costs might be incurred by examining the experience of other agencies. The OLA chose from among many case studies to include those that bore greatest resemblance to projects that will likely be pursued under San Francisco's management plan.

As background, there are generally three tiers of cost estimates in construction/restoration projects. The first (least specific) is a high-level estimate referred to as the "planning" level cost estimate. This is developed by the funding organization in the planning stages of a project to provide a general sense of what project implementation might cost. The next tier is the "construction" cost estimate, which is developed once many of the project details (total linear feet of new trail, approximate number of trees to be removed, etc.) are known. This cost estimate is refined as a more detailed, site-specific work plan is developed and as construction documents are created. Contractors bidding to undertake the work proposed provide final construction or "bid" cost estimates.

A few general observations regarding program costs bear mention. Generally, there can be significant economies of scale and scope in restoration. That said, many projects could be scaled to effectively make use of a wide range of budgets. Many jurisdictions focus efforts on their most prominent parks or most pressing ecological issues (invasive species, for example). The fact that many of San Francisco's natural areas are small and isolated will likely result in higher average cost for projects. On the other hand, the fact that they are fragmented also suggests that it would be possible to effectively make use of budgets of many sizes, because success at an individual site does not necessarily rely on success at other sites. And, small areas might be better able to attract the interest of neighborhoods, and therefore secure private resources and volunteers.

Note that although land acquisition is a major activity (and therefore a major cost) of many natural areas programs (Portland, for example), it is not an activity addressed in San Francisco's management plan. Rather, it is addressed on a department-wide basis in the Recreation and Park Acquisition Policy. Therefore, case study information regarding acquisition of natural areas by other programs is excluded from the discussion below.

Ann Arbor Survey Results

Various natural areas programs throughout North America

As discussed above, in 2004 the city of Ann Arbor surveyed 54 natural areas programs, including the most prominent local programs at the time. The survey captured a variety of information from respondents, including annual budgets, which ranged from $5.6M (Phoenix) to less than $50,000 (numerous programs). The annual budget per acre under management ranged from $4,500 (Chicago) to

less than $100 (numerous programs). The difference in spending suggests two things: 1) per acre management requirements vary widely and 2) program budgets are set based on available funding resources and competing spending priorities, not just ecological objectives.

Center for Natural Lands Management
Various Arizona, California, and Oregon locations

The Center for Natural Lands Management (CNLM) is a nonprofit organization that protects sensitive biological resources through professional, science-based stewardship of mitigation and conservation lands. On behalf of the U.S. Environmental Protection Agency, in 2004 CNLM completed 28 case studies of the cost of managing natural lands (owned by public agencies, private non-profits or private parties) in Arizona, California, and Oregon.

The study areas ranged in size from 13 acres to more than 100,000 acres. The variation between preserves was striking not only in the total management cost but also in the kinds of activities necessary to manage them. Annual management costs averaged $51 per acre (the median was $122) for all 28 projects. The range of annual cost per acre was $6 to more than $2,100. The study noted that economies of scale are dramatic.

Unlike the Ann Arbor survey, budget information in the CNLM study is accompanied by detailed site information. However, it is still difficult to relate the CNLM information to the SNRAMP. The habitat types in the CNLM study are dissimilar to those found in San Francisco's natural areas, and most of the lands under study are not in urban areas, and therefore have been less disturbed and experience different use patterns than those in San Francisco. Nonetheless, the variation in the CNLM budgets usefully illustrates the challenges of making general cost assumptions.

Ellwood-Devereux Coast Open Space and Habitat Management Plan
Santa Barbara, CA

In March 2004, the City of Goleta, County of Santa Barbara, and the University of California, Santa Barbara created the Ellwood-Devereux Coast Open Space and Habitat Management Plan.
The plan addresses a 652-acre contiguous area along the coast that includes open space and natural reserves managed for public access and natural resource protection. The establishment of the Open Space Plan Area and associated public access and habitat improvements are dependent upon approval of certain development projects on other sites.

For planning purposes, the agencies estimated the costs of undertaking a number of improvement projects. Table 3, below, illustrates some of the costs, although they do not include engineering design, permitting, environmental review, construction management, or ongoing maintenance.

Table 3. Restoration and Enhancement Cost Estimates	
Activity	**Cost/Acre**
Riparian scrub restoration	$50,000
Vernal pool enhancement	$60,000
Native grassland restoration	$40,000
Dune scrub restoration	$40,000

Source: Ellwood-Devereux Coast Open Space and Habitat Management Plan, 2004

Golden Gate National Recreation Area/Golden Gate National Parks Conservancy

Various projects in San Francisco, CA

The Golden Gate National Parks Conservancy (GGNPC) is a nonprofit membership organization working in partnership with the National Park Service and Presidio Trust to preserve the Golden Gate National Parks. GGNPC has undertaken a number of high-profile restoration projects, including that of Crissy Field, a $34.5M effort that involved the creation of a 20-acre tidal marsh, a 29-acre open space grassy meadow, a 1.5-mile promenade and the Crissy Field Center.

GGNPC provided cost information for three projects that bear resemblance to those likely to be undertaken relative to the SNRAMP. These projects include Presidio Bluffs, Mori Point, and the Coastal Trail enhancement. Table 4, below, presents cost estimates for a number of restoration activities at Mori Point, a 105-acre park located on a bluff above the Pacific Ocean near the city of Pacifica.

Table 4. Cost Estimates for Mori Point Restoration Activities		
Activity	**Cost/Acre**	**Notes**
Invasive Plant Treatments		
Cape ivy	$9,000	Easy removal
Cape ivy	$14,600	Hard removal (cliffs, coastal scrub)
Cape ivy retreatment	$1,000	Herbicide X 3
Habitat Restoration - Plants and Installation		
Northern Coastal Scrub	$64,063	Plants and installation
Coastal Scrub, Serpentine bluff scrub	$52,434	Plants and installation
Dune	$63,122	Plants and installation
Riparian	$65,359	Plants and installation
Coastal Grassland	$12,106	Mix of plant and installation, and direct seeding
Unique floral assemblage	$11,253	Plants and installation
Native forest understory	$27,926	Plants and installation
Native forest overstory	$24,448	Plants and installation
Maintenance	$10,000	Per year X 5 years
Erosion Control		
Small jobs	$2,000	
Big jobs	$5,000-10,000	

Source: Golden Gate National Park Conservancy, 2007

The table below presents information from the Coastal Trail at Presidio Bluffs Resource Enhancement, Habitat Restoration and Non-designated Trail Management and Maintenance Strategy. It illustrates

planting costs for various habitat types common to the bluffs. The cost differences relative to Table 4 above are noteworthy. For example, relative to specific sites at Mori Point, northern coastal scrub plantings were estimated to cost $64,063 per acre, whereas they are estimated to cost $30,941 at sites at Presidio Bluffs.

Table 5. Planting Densities and Total Costs (Plants and Installation) by Habitat Type		
Habitat Type	**Estimated Cost/Acre**	**Number of Plants/Acre**
Northern Coastal Bluff Scrub	$30,941	5,846
Coastal Scrub/Serpentine Bluff Scrub	$29,264	5,863
Unique Floral Assemblage	$10,029	1,783
Coastal Prairie	$10,860	1,456
Arroyo Willow Riparian Forest	$15,396	3,035
Arroyo Willow Riparian Scrub	$14,677	2,915
Freshwater Seep/Freshwater Marsh	$18,994	5,445

Source: Golden Gate National Park Conservancy, 2007

Appendix D contains fairly detailed information regarding Coastal Trail Enhancement Projects.

University of California, San Francisco

San Francisco, CA

The University of California, San Francisco (UCSF) owns the Mount Sutro Open Space Management Reserve, approximately 61 acres of mostly undeveloped area on Mount Sutro, in San Francisco. As a result of community feedback received while updating the campus' Long Range Development Plan in 1997, the university created in 2001 a reserve management plan. The plan was prepared by an environmental design, planning and science firm, EDAW, Inc. Enhancing wildlife habitat values and protecting and expanding native plants are two of seven plan goals. One of the main features of the site is the presence of a large number of invasive eucalyptus trees, also an issue at NAP sites. Cost estimates are presented in the table below.

Table 6. Planning Level Cost Estimates from Mount Sutro Open Space Reserve Management Plan			
Activity	**Description**	**Cost/Unit**	**Unit**
Hazardous tree removal (contract labor)	Chainsaw and chip trees, grind stumps, herbicides, remove vines	$3,000	per tree
Hazardous tree removal (contract labor)	Maintenance of hazardous tree removal areas	$120	per year per tree
Eucalyptus thinning (contract labor)	Protect healthy trees, clear others and invasives, grind stump, herbicides, signs	$25,000	per acre
Eucalyptus thinning (contract labor)	Maintenance of thinned eucalyptus areas	$2,500	per year per acre
Conversion planting and irrigation (contract labor)	Protect natives, clear most vegetation, plant, install drip irrigation, signs	$30,000	per acre
Conversion planting and irrigation (contract labor)	Maintenance	$2,500	per year per acre
Native plant enhancement	Remove invasives, restore natives	$30,000	per acre
Native plant enhancement	Maintenance	$2,500	per year per acre
Trail Construction	New trails	$12	per linear foot of trail
Contractor overhead and profit		25%	
Oversight		30%	
Contingency		15%	
Annual cost inflation		3%	

Source: Mount Sutro Open Space Reserve Management Plan, September 2001

The plan covers ten years, envisioned as the first phase of a multi-phase process of managing the reserve. The plan incorporates some management activities in small demonstration areas to determine their effectiveness and desirability before implementing them throughout the reserve. Therefore, the first phase is a pilot phase. The estimated annual management and maintenance costs are approximately $400,000 - $700,000 (and total estimated cost $5.7M). Future phases might seek to more fully implement some of the pilot measures.

In addition to the plan discussed above, UCSF recently submitted a grant application to the Federal Emergency Management Agency (FEMA) to undertake a number of activities in the reserve. The table below contains cost estimates related to these activities.

Table 7. Planning Level Cost Estimates from FEMA Restoration Project		
Activity	**Cost/Unit**	**Unit**
Treatment of stumps and understory	$3,300	Per acre
Planting and staking native trees	$5,450	Per acre
Vegetation removal operations	$12,500	Per acre

Source: University of California, San Francisco, 2007

Note: Estimates do not include any design or survey work, only implementation

EXPENDITURES OF SAN FRANCISCO'S NATURAL AREAS PROGRAM

As noted above, the NAP currently has an annual budget of $1.07M and nine full-time staff, a small share of RPD's overall FY 2006-07 budget of $151M and over 1,100 full-time employees. NAP staff is primarily engaged in routine maintenance and small-scale restoration activities, as well as recruiting volunteers to do the same. In addition, the department has undertaken some capital projects on natural areas sites. Information presented below provides an overview of NAP expenditures. Note that natural areas have significant deferred maintenance relative to other RPD parklands that have been getting routine maintenance attention for many years. In this sense, NAP will experience some start up costs that are not necessarily reflective of ongoing costs.

Routine Maintenance and Small-Scale Restoration

Seven of the nine NAP staff members are gardeners. As such, NAP staff spends the bulk of its time on restoration and ongoing maintenance activities. Recent historical budget and staffing levels of NAP are illustrated below in Table 8. With the current budget, the program actively manages roughly 400 acres (all approximately 193 acres of MA1 areas and half of the approximately 430 acres of MA2 areas) of the 1,100 total acres within the NAP.

Table 8. Historic Staffing and Budget Levels of the Natural Areas Program

Fiscal Year	Budget (Current $)	Staffing (FTE)
2000-01	$567,723	6
2001-02	$453,647	6
2002-03	$592,083	6
2003-04	$763,033	10
2004-05	$800,489	10
2005-06	$975,182	10
2006-07	$1,073,885	10

Source: Recreation and Park Department, 2007

Natural Areas Acquisition

Acquisition is not addressed in the SNRAMP. Rather, it is addressed on a department-wide basis in the Recreation and Park Acquisition Policy. There are no acquisitions planned for the NAP at this point.

Recreation and Parks Capital Projects

Subsequent to the passage of Proposition A (the Neighborhood Park Bond, a $110 Million General Obligation Bond) and Proposition C (a continuation of the Open Space Fund) in March 2000, RPD undertook its first comprehensive capital planning effort. As a result, RPD developed a Capital Improvement Plan (CIP), which identified 440 capital projects to be undertaken over ten years beginning in FY 2000-01. (Note that in 2006 the timeline for implementation of the CIP, and completion of associated projects, was modified from 10 years (2001 - 2010) to 20 years (2001 - 2020).) Projects were sorted as belonging to one of four types: Short-term capital improvements (must be complete within 3 years of full funding), Long-term capital improvements (must be complete within 5

years of full funding), Reforestation, and Natural area restoration. Projects were also prioritized as being Phase I, Phase II, or Phase III, and further prioritized within each phase. The total program budget, based on 1999 assessments, was projected to be $400M. Funding sources included the following: $110M (Neighborhood Park Bond); $120M (Open Space Funding); $100M (State and Federal Grants); $30M (Revenue Bonds); and $40M (Philanthropic Gifts).

The CIP is updated annually, during which projects are added and removed based on evolving resources, needs, and priorities.

Natural Areas Capital Projects

For the purposes of the RPD capital program, a natural areas capital project is defined as a project involving physical changes to the landscape (such as retaining walls, large scale plant and tree removal and re-vegetation, large scale erosion control, trail development or rehabilitation, etc.) that is valued at over $50,000. Such projects have a life cycle greater than 3 years, and the value of the asset property shall be enhanced through the improvement.

The CIP originally identified 31 natural areas capital projects. RPD updated its proposed natural areas capital projects in the 2005 CIP annual update (issued in March 2006) and the SNRAMP (issued in February 2006), removing the following that appeared in the original CIP.

Natural Areas Capital Projects from Original CIP Now Removed

Project Site/Name
15th Av. Steps
Brooks Park
Dorothy Erskine Mini Park
Golden Gate Heights Park
Hawk Hill Openspace
Kite Hill
Lakeview/Ashton Mini Park
Mountain Lake
Palou Phelps Open Space
Portola Park
Rock Outcropping @ 14 Ave. & Noriega
Tank Hill
Yerba Buena Island

The 2005 CIP annual update and SNRAMP listed the same projects except that the CIP listed two projects each for Parcel 4 (Balboa) and McLaren Park. Also, the CIP listed a capital project at Corona Heights (not included in SNRAMP, perhaps because it was already completed), and the SNRAMP listed a project in India Basin (not included in CIP). The 2006 CIP annual report, issued in March 2007, noted that there are 404 total capital projects planned, 23 of which are natural area capital projects (9 Phase I, 10 Phase II, and 4 Phase III). (Note however that this was an error – there are

actually just 22 total projects (8 Phase I), correctly listed in the update's appendix (Phased Implementation Plan).) (Appendix E illustrates the evolution of planned natural area capital projects.) Evolving record keeping practices, naming conventions, and the fact that projects can be added and removed from the list of planned capital projects makes comparing lists over time challenging.

Current List of Natural Areas Capital Projects

Phase I
Balboa Natural Area/Parcel 4 - Natural Areas and Signage
Corona Heights
Glen Park - Canyon - NA (Phase I)
India Basin Phase III (wetland restoration) - NA
Lake Merced (Phase I)
McLaren Park
McLaren Park - Yosemite Marsh Renovation
Pine Lake Park

Phase II
Bayview Park
Bernal Heights Park
Buena Vista Park Oak Woodland Rest.
Edgehill Mountain Improvements
Glen Park - Phase II
Grandview Park
Lake Merced - Phase II
Mt Davidson Park
Sharp Park
Twin Peaks

Phase III
Billy Goat Hill
Golden Gate Park - Oakwoodlands
Interior Greenbelt
McLaren Park - Phase II

Capital Project Expenditures

As noted above, NAP has Phase I capital projects at the following locations: Balboa Natural Area/Parcel 4; Corona Heights; Glen Canyon Park; India Basin; Lake Merced; McLaren Park; and Pine Lake Park. The information in Table 9 below, provided by RPD, briefly describes the projects. It is important to point out that natural areas capital projects are sometimes a part of larger capital efforts within parks. Therefore, identifying the natural area component of a larger capital project can be challenging. The capital projects undertaken have involved restoration, erosion control, trail creation,

tree removal, and other activities. The capital projects can involve relatively high public input, construction management, and other administrative costs compared to small-scale improvements.

While preparing this report, the OLA observed some lack in information sharing and coordination between the NAP and the capital program. The NAP program manager did not have access to complete information regarding capital projects in natural areas or financial information regarding the program. This created significant challenges for the OLA in acquiring information. It also raises questions regarding the programs' integration, coordination, alignment, and information management. As a result of challenges obtaining data, the information below contains some holes.

Table 9. Natural Areas Capital Project Expenditures			
Natural Area	**Project Description**	**Status**	**Estimated Budget**
Balboa Natural Area	Development of a dune habitat from a construction site. Included the importation of soil, planting, temporary fencing, installation of an elevated boardwalk and signs.	Complete	$305,000 (all natural areas related)
Corona Heights	Weed abatement; 500 linear feet of trail and stair construction; bench installation; retaining wall; and erosion control.	Complete	$16,000 (all natural areas related)
Glen Canyon	Trail plan; installation of 240 new stairs; 500 linear feet of new earthen trail; creek erosion assessment report; installation of erosion blankets and seeding (400 sq. ft.); straw wattles (300 sq. ft.); planting; 4 new drainage ditches; creek restoration; Cape Ivy removal; tree removal; Cape Ivy control throughout watershed (approximately 4 acres); and interpretive signs.	Complete	$1,538,500 ($447,689 for natural areas component)
India Basin Phase III	Wetland restoration including development of a dune habitat from a construction site. Included the importation of soil, planting, temporary fencing, installation of an elevated boardwalk and signs.	Complete	$159,200 (all natural areas related)
Lake Merced	Weed abatement in approximately 10 acres; tree removal; native habitat restoration at various locations; construction of 600 linear feet of trail; construction of overlook; and installation of benches and signage.	Construction	$481,777 (Construction budget of $120,000 for natural areas work, $150,000 for trail, and $110,000 for overlook)
Lake Merced - Mesa	Project restored approximately four acres of dune scrub.	Complete	$30,000 (all natural areas related)
McLaren Park - Yosemite Marsh	Erosion control; bank stabilization; marsh dredging; benches; trail improvements; picnic tables; and planting.	Design	$306,000 (mostly natural areas related, with the exception of the relatively minor paving, picnic tables, and benches)
Pine Lake	A six-phase $36,000,000 master plan for Stern Grove and Pine Lake Park included renovation of Pine Lake and the adjacent meadow and the recently completed renovation of Stern Grove Concert Meadow. Natural area activities include removal of invasive plants within Pine Lake, re-vegetation of the lake bank, and minor erosion control.	Construction (to be completed by December 2007)	$5,104,000 (natural area component is 13.3%, $680,000)

Source: Recreation and Park Department, 2007

COST OF IMPLEMENTING SAN FRANCISCO'S PLAN

A few points raised above in the discussion of case studies bear repeating here as they inform estimation of the cost of implementing the SNRAMP. A comprehensive set of detailed long-term work plans (which NAP lacks) are required to develop accurate cost estimates. In lieu of these, less accurate estimates of habitat restoration costs could be created using information on how many acres of a given habitat need to be restored from condition A to condition B, or how many acres are in need of intensive restoration vs. management and monitoring. This could be ascertained from the extensive inventorying and assessment conducted by RPD and its contractor while producing the SNRAMP.[3] However, the contract was not renewed, and RPD has not yet processed the information into a form that can be used for this purpose, and therefore does not know how many acres (by habitat type) are in need of intensive restoration. Information on the topography of the site, which is not in the SNRAMP, is also a determinant of project cost.

Without long-term work plans or other fine-grain information, it is difficult to estimate total costs. Indeed, in preparing the SNRAMP, RPD solicited the comments of the public, most recently on its Public Draft (June 2005). Regarding cost, in the Response to Comments, Master Responses by Theme, the department stated, "Due to the complexity of the Final Draft, it is not feasible to conduct a detailed cost analysis of the Final Draft."[4]

However, it is still possible to get a general sense of what costs might be incurred by examining the experience of other agencies and the past experience of NAP. One caution on the experience of other jurisdictions is that San Francisco's high density, urban character results in relatively high pressure on natural areas. Also, the cost of doing business, and construction costs specifically, are higher in San Francisco that many other locations.

The plan notes that adaptive management will be applied, which means adapting techniques midstream by incorporating lessons learned from past successes and failures. The use of adaptive management acknowledges uncertainty about implementation, which implies uncertainty about costs. However, it also implies that average costs might decrease over time, as better methods are developed, which is quite likely given that restoration ecology is a relatively young field of study.

[3] The plan contains the acreage of each management area classification within each natural area. As well, the plan contains an inventory of the acreage of each vegetative type (i.e., annual grassland, perennial grassland, wetland, coastal scrub, etc.) within each natural area, and measures of species richness, percentage native cover, and frequency of native plants within each natural area. Combining these various sets of data to determine the condition and restoration needs of sites by management area and vegetative type would greatly help estimation of project costs.

[4] Note that the City's Fiscal Feasibility Ordinance (San Francisco Administrative Code Chapter 29) subjects certain City projects to a fiscal feasibility review at the Board of Supervisors before the City Planning Department begins California Environmental Quality Act (CEQA) review. The ordinance covers projects for which the implementation and construction cost exceeds $25M and the project sponsor estimates that a portion of the predevelopment, planning, or construction costs in excess of $1M will be paid from public monies (excluding the costs of City personnel). The Office of the City Attorney advises that the SNRAMP does not fall under the ordinance as the plan does not itself propose any specific projects, nor commit the City to any projects.

The San Francisco plan incorporates the Bradley Method of restoration, which is composed of three principles that guide cost-effective and efficacious restoration projects: (1) work from areas with native plants toward weed-infested areas; (2) create minimal disturbance; and (3) allow native plant regeneration to dictate the rate of weed removal. Use of the Bradley Method implicitly embeds costs considerations into project prioritization and ensures cost effectiveness to some degree.

One goals of the SNRAMP is to re-establish native community ecosystem function where it has been degraded. Ongoing maintenance requirements of successfully re-established communities could be relatively low compared to developed parklands. The department is responsible for approximately 5,400 acres of land spread over 230 sites.[5] The 2006-07 Annual Salary Ordinance authorized 298.5 FTE gardeners department wide. Although approximately 27% of the system's parkland falls under NAP, its gardening staff comprises just 2% of the system's total gardening staff.[6] The NAP estimates that it actively manages roughly 400 acres (all approximately 193 acres of MA1 areas and half of the approximately 430 acres of MA2 areas) with its current staff and volunteers.

New capital projects involving restoration, particularly those that will require intensive follow-up maintenance prior to achieving stability or self-sufficiency, will increase the routine maintenance burden. To what degree NAP should create new maintenance burden, given the challenges it already faces simply keeping up with the existing ecologically healthy sites, is a significant policy question that should be addressed, particularly given the SNRAMP's commitment to the Bradley Method.[7]

Work undertaken pursuant to the management plan can be scaled. The plan establishes a set of policies, but does not itself authorize or require any particular projects. Therefore, staff implementing the plan has enormous latitude in determining what activities to undertake. As such, implementation activities could be scaled to a wide range of budgets.

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[5] 5,400 acres includes the Furhman Bequest Property, 1,432 acres in Kern County that is currently leased for paintball games and ranching, and 329 acres at Camp Mather, which is used seasonally.

[6] Natural areas comprise approximately 1,100 of 4,000 total parkland acres (excluding the approximately 1,400 acre Furhman Bequest Property).

[7] The Coastal Trail at Presidio Bluffs, Resource Enhancement, Habitat Restoration and Non-designated Trail Management and Maintenance Strategy identifies the following likely ongoing maintenance requirements.

In most cases, volunteer stewardship actions will need to continue for a minimum of 5-10 years following the initial restoration activities. A general rule of thumb is:

• 5 years maintenance for plantings of grasses, forbs, and shrubs (monitoring plant die-off, replacing plants, maintaining planting sites) in areas where weed infestation pressures are limited;
• 5-10 years maintenance for riparian plantings and native forest conversion plantings (monitoring plant die-off, replacing plants, maintaining planting sites;
• 3-5 years monitoring and maintenance for small infestations of invasive nonnative plants and for invasive plants that are known to respond well to control treatment (e.g., most small trees and shrubs, fennel, poison hemlock, iceplant, mattress wire weed);
• 5-10 years, or possibly longer for large invasive nonnative plant infestations, that reproduce prolifically, have a long-lived seed bank, are early colonizers, and for invasive plants that do not respond well to control treatments (e.g., Himalayan blackberry, perennial grasses, Cape ivy, English and Algerian ivy, cotoneaster, French broom).

Note that the following discussion of costs related to the SNRAMP's implementation does not address some classes of costs, such as attaining the management plan's education and research goals.

Routine Maintenance and Small-Scale Restoration

The NAP is currently implementing the SNRAMP through annual site-specific work plans. Although long-term work plans that address all of the SNRAMP's recommendations would provide a better means of estimating future costs, in the absence of such, the best indicator of future routine restoration and maintenance costs is the program's current budget. The NAP already has a significant budget (approximately $1M per year) and workforce (including volunteers), and therefore can accomplish a number of projects with current resources. Therefore, it is reasonable to estimate a routine maintenance and restoration cost of $20M (nominal dollars) over the 20-year life of the SNRAMP. Recall that one lesson of the Ann Arbor survey is that programs are often funded based on available resources and prioritization among competing needs (not ecological considerations alone), which are often stable over time. The current budget only allows active management of approximately 36% of NAP's total acreage (400 of 1,100 acres). Program staff estimates that it would require approximately $2.5M annually to actively manage all 1,100 acres. If the budget were immediately expanded as such, the 20-year cost for routine maintenance and restoration would be $50M (nominal dollars).

Although restoration projects can be very labor intensive, NAP is well positioned to maintain relatively low costs while accomplishing significant work by continuing to engage substantial volunteer effort, a practice common to many natural areas programs throughout the country. However, given the scale of restoration desirable within NAP and competition for volunteer resources by other environmental efforts in the city, it is unclear to what degree the volunteer contribution can be increased. According to NAP, to date more volunteers have wanted to work in habitat restoration than NAP has been able to accommodate due to full-time staff oversight constraints. Note that the activities of volunteers are limited by RPD policies to work that does not involve the use of power tools, application of herbicides, or the removal of trees.

Capital Projects

Of the 22 natural areas capital projects cited in the most recent department-wide listing (the 2006 CIP annual report, issued in March 2007), NAP has implemented or forecasted the budgets of eight. All 22 have been judged to cost at least $50,000, as that is one criterion of inclusion on the capital project list.

The natural areas-related costs of the eight projects that are underway or have been completed total $2.06M, averaging approximately $260,000 each. Therefore, the 22 projects together could be estimated to cost $5.68M. For context, the RPD average for all capital projects stood at approximately $900,000 per the original CIP ($400M (1999 dollars) for 440 projects). A cost estimate floor could of course be established by assuming that all of the 14 remaining projects will cost at least $50,000 ($700,000), totaling $2.76M when including the completed and in process projects. Because the remaining capital projects have not yet been fully specified, it is unclear to what degree past projects will be similar to future projects. Given the different character of the projects (e.g., the significant number of trees to be removed at Sharp Park), these estimates must be recognized as very general.

Erosion Control Projects

A number of NAP's capital projects involve erosion control work, the budgets for which can vary dramatically. Currently, erosion control work is performed either on a small-scale basis by existing staff and volunteers or through the capital program for larger projects. As such, the estimated future cost of erosion control projects is already accounted for to some degree in the estimated future routine and capital costs above. It is known that NAP will have to undertake at least one significant erosion project, at Bayview Hill. Depending on the solution chosen, consultants Treadwell & Rolo, Inc. estimate that it could cost as much as $1M. RPD will likely need to undertake some erosion control projects within natural areas to address neighbors' or environmental concerns (stormwater pollution, safety, etc.) whether or not the SNRAMP is adopted.

Trees

The management plan recommends the removal of a number of nonnative trees from 15 natural area sites. The inventory revealed 64,000 invasive trees, 3,400 (5%) of which the SNRAMP proposes to remove. Sharp Park contains an additional 54,000 invasive trees, of which the SNRAMP proposes to remove 28%, or approximately 15,000. Therefore, approximately 18,400 trees are planned for removal.

Some tree removal activity will be undertaken through ongoing maintenance and the capital projects discussed above. (Existing gardening staff is permitted by RPD policy to remove trees up to 6 inches in diameter at breast height.) Therefore, the estimated future cost of tree removal projects is already accounted for to some degree in the estimated future routine and capital costs above.

Cost estimates from the Mount Sutro plan indicate that tree removal can cost up to $3,000 per hazardous tree, or as little as $25,000 per acre for thinning of small trees. Other cost estimates, from GGNPC's Coastal Trail, include $8,000 per acre for small tree removal and $500 per tree for cutting scattered mature trees that would be left onsite. It is difficult to extrapolate Mount Sutro, Coastal Trail, or other estimates given differences in the type and size of trees and topography. It is also difficult to generalize about trees in the NAP given heterogeneity. As noted in the SNRAMP, a survey estimated that one area of McLaren Park had 62 trees per acre, mostly over 18 inches in diameter at breast height, whereas one area of Glen Canyon had over 1,400 trees per acre, most less than 6 inches in diameter at breast height.

For the sake of illustration, a range can be created. Assuming that each of the 18,400 trees is mature and must be removed at a cost of $3,000, total tree removal would cost $55.2M. Assuming rather that each of the trees must be removed at a cost of $500, total removal would cost $9.2M. Small trees that can be addressed by thinning and left onsite would be significantly less expensive to remove. Assuming that each of the trees is small and could be removed by thinning, the cost could be as low as $100 per tree of less. (The Mount Sutro plan estimates 740 trees per acre, including very small trees. Assuming 33% removal for thinning, $25,000/acre * 1 acre/244 trees = approximately $100 per tree.) Similar to

some erosion control projects, described above, RPD will likely need to remove some hazardous trees from natural areas for safety reasons whether or not the SNRAMP is adopted.

Trails

Recommendations of the SNRAMP largely focus on improving existing trails rather than developing new ones, and call for closure or relocation of social trails that appear particularly redundant or destructive. The SNRAMP inventoried 40 miles of existing trails in the natural areas. Trails to remain were categorized into three groups: improved, unimproved, and proposed new trails, as detailed below in Table 10.

Table 10. Trails Addressed in the SNRAMP

Existing trails to retain	
- Improved/maintained'	17.5 miles
- Unimproved'	12.5 miles
Social trails to close/reroute	10.3 miles
Total Trails within Natural Areas	40.3 miles
New trails to be developed/maintained	1.1 miles

Source: Recreation and Park Department, 2007

Like other projects in the natural areas, trail projects can vary greatly in cost, depending on the type of trail and the terrain it traverses. As noted above regarding the NAP's capital project at Lake Merced, the program expended $150,000 to construct 600 linear feet (0.11 miles) of new concrete trail (to maximize access, not a typical trail), $250 per linear foot. The Mount Sutro plan estimated just $12 per linear foot for new trail construction. Therefore, creating 1.1 miles of new trail per the SNRAMP could be estimated to range in cost from approximately $70,000 to $1.45M. No estimate of the cost of maintaining existing trails or closing social trails was available for incorporation.

Proposition C - Park Standards

A November 2003 ballot measure (Proposition C) created the City Services Auditor (CSA) within the Controller's Office. In part, Proposition C directed the CSA to work with departments to develop standards by which to evaluate City parks and streets. Although CSA and RPD have developed standards for most parklands, standards for natural areas have not been established. In its July 7, 2006 annual report on parks and streets maintenance, CSA noted that RPD "needs to follow through on a prior commitment to develop standards for parkland managed under the Natural Areas Program." Once standards are developed, staff and volunteers might need to be reallocated from traditional NAP activities to focus specifically on addressing the standards. If so, the effort directed towards other routine maintenance and restoration would be diminished.

CONCLUSION

Natural areas programs are growing in popularity as jurisdictions recognize the value of remnant historic ecosystems and undeveloped parkland. San Francisco's draft SNRAMP is among the most comprehensive natural areas planning documents encountered in any jurisdiction during this research project.

NAP is developing annual work plans, but does not yet have detailed, long-term, site-specific work plans, which would enable detailed budget forecasts. In lieu of detailed forecasts, the cost of implementing the SNRAMP can be estimated based on the past experience of the NAP and other natural areas programs.

The cost of implementing the SNRAMP over its 20-year horizon will likely be 20 years of fairly stable funding (currently approximately $1M per year) and the completion of the majority of the planned capital projects (22 currently completed, in process, or planned). If the program is expanded to enable active management of all 1,100 acres, the annual budget would need to be increased to approximately $2.5M, resulting in considerably higher total costs over 20 years. Past capital project costs have averaged approximately $260,000, and have included major restoration, erosion control, trail creation, and tree removal. Large-scale tree removal will very likely elevate the cost of some future capital projects significantly above this average.

One goal of the SNRAMP is to re-establish native community ecosystem function where it has been degraded. Ongoing maintenance requirements of successfully restored natural areas could be relatively low compared to developed parklands. Also, the San Francisco plan incorporates the Bradley Method of restoration, which is composed of three principles that guide cost-effective and efficacious restoration projects, thereby embedding cost-effectiveness considerations to some degree.

NAP's current budget of $1.07M and nine full-time staff are a relatively small part of RPD's FY 2006-07 budget of $151M and over 1,100 full-time employees. Although approximately 27% of the system's parkland falls under NAP, its gardening staff comprises just 2% of the system's total gardening staff. At approximately $1,000 per acre per year, its budget is also considerably below spending by other some natural areas programs, including Chicago's $4,500 per acre and Pittsburgh's $1,765 per acre (as reported in the Ann Arbor survey).

While preparing this report, the OLA observed some lack in information sharing and coordination between the NAP and the RPD capital program. The NAP program manager did not have access to complete information regarding capital projects in natural areas. This created significant challenges for the OLA in acquiring information. It also raises questions regarding the programs' alignment, coordination, and information management.

Appendix A - Acreage of Significant Natural Areas and Total Park Acreages

Significant Natural Area	MA-1	MA-2	MA-3	Total Natural Areas Acreage	Total Park Acreage
15th Avenue Steps	0.0	0.2	0.0	0.2	0.3
Balboa Natural Area	1.1	0.7	0.0	1.8	1.8
Bayview Park	8.2	15.8	19.7	43.7	43.9
Bernal Hill	7.6	5.8	10.7	23.3	24.3
Billy Goat Hill	0.6	1.1	1.6	3.4	3.5
Brooks Park	0.8	0.9	0.3	2.0	3.5
Buena Vista Park	0.0	6.1	0.0	6.1	36.1
Corona Heights	2.9	2.5	4.2	9.6	12.6
Dorothy Erskine Park	0.2	0.3	1.0	1.5	1.5
Duncan/Castro	0.3	0.1	0.1	0.5	0.5
Edgehill Mountain	0.0	0.9	1.4	2.3	2.3
Fairmount Park	0.0	0.0	0.7	0.7	0.7
Glen Canyon Park	7.4	30.1	22.4	59.9	68.8
Golden Gate Heights	0.2	0.5	0.1	0.8	6.0
Golden Gate Park (Oak woodland, Strawberry Hill, and Whiskey Hill)	0.7	25.5	0.0	26.2	1021.0
Grandview Park	0.9	2.4	0.7	4.0	4.0
Hawk Hill	1.4	3.0	0.0	4.4	4.5
India Basin Shoreline Park	3.2	2.8	0.0	6.0	11.8
Interior Green Belt	0.0	1.8	14.7	16.5	19.4
Kite Hill	0.4	0.5	1.6	2.5	2.5
Lake Merced	60.8	101.8	231.5	394.1	614.0
Lakeview/Ashton Mini Park	0.1	0.2	0.2	0.5	0.5
McLaren Park	34.9	68.3	61.4	164.6	312.6
Mt. Davidson	8.8	11.0	20.1	39.9	40.2
O'Shaughnessy Hollow	0.7	2.9	0.0	3.6	3.8
Palou/Phelps	0.8	0.4	0.8	2.0	2.5
Pine Lake	1.0	3.8	3.6	8.4	30.3
Rock Outcrop	0.8	0.7	0.0	1.6	1.6
Sharp Park	35.0	125.1	76.5	236.6	411.0
Tank Hill	1.5	0.6	0.7	2.8	2.9
Twin Peaks	12.6	14.3	3.8	30.7	34.1
Total	**192.8**	**430.2**	**478.0**	**1080.4**	**2,722.5**

Appendix B - San Francisco Natural Areas Program Goals
(From the Significant Natural Resource Areas Management Plan, Final Draft, February 2006)

2.1 GOALS

The goals and objectives for the Natural Areas were defined by the 1995 Significant Natural Resource Areas Management Plan (SNRAMP). These goals, described in Section 1, have been further refined and incorporated into the overall aims of this document. The goals of this Management Plan are listed below.

CONSERVATION AND RESTORATION GOALS

- To identify existing natural resources.
- To maintain viable populations of all special-status species.
- To maintain and enhance native plant and animal communities.
- To maintain and enhance local biodiversity.
- To re-establish native community diversity, structure, and ecosystem function where degraded.
- To improve natural area connectivity.
- To decrease the extent of invasive exotic species cover.

EDUCATION GOALS

- To provide services that will enable all age groups to better understand the values of the Natural Areas, including ecosystem functions and socioeconomic values.
- To provide opportunities for service learning to students in the San Francisco Unified School District.
- To provide diverse outdoor classroom opportunities.

RESEARCH GOALS

- To provide a research framework and research opportunities to schools and universities that will lead to an enhanced understanding of the natural systems and an informed adaptive management approach.
- To contribute to the scientific understanding of local natural systems.
- To contribute to the field of restoration ecology and other applied sciences.

STEWARDSHIP GOALS

- To develop and support opportunities for public stewardship of Natural Areas.
- To foster neighborhood stewardship and volunteer groups.
- To provide diverse opportunities for participation by stewardship groups.

RECREATION GOALS

- To provide opportunities for passive recreational uses (e.g., hiking, nature observation) compatible with conservation and restoration goals.
- To improve and develop a recreational trail system that provides the greatest amount of accessibility while still protecting natural resources.

MONITORING GOALS

To establish a long-term monitoring program to:

- Identify the species on which monitoring should focus.
- Detect increases and declines in abundance, distribution, or health of special-status species.
- Detect significant changes in acreage of native communities, wildlife habitats, and invasive species.
- Detect significant increases and declines in native species richness.
- Assess success of restoration activities in achieving conservation and restoration goals.
- Provide an adaptive management framework for evaluating changes (e.g., conceptual model).

DESIGN AND AESTHETIC GOALS

- Where possible, to develop aesthetically pleasing landscapes that are consistent with surrounding landscapes and that create natural transitions, especially where adjacent parklands and traditionally landscaped areas abut natural areas.
- To maintain and develop viewpoints and viewsheds to enhance park experiences.
- Where possible, to design and maintain landscapes to discourage the accumulation of trash and illegal encampments.

SAFETY AND GOALS

- To design and maintain landscapes that promote public safety.

Appendix C - Planning Efforts of Municipalities with Prominent Natural Areas Programs

City of Boston, Urban Wilds Initiative

The Urban Wilds Initiative (UWI) is a program run through the Boston Parks and Recreation Department that manages the 40 city-owned natural areas, containing over 250 acres. The city is currently developing an Urban Wilds and Natural Areas Management Plan, which will be a comprehensive master plan for natural area site management, program development, and administration. The draft plan, which is now in the final stages of preparation, is already serving as an interim guide to activities. Note that prior to the forthcoming plan, the city prioritized restoration projects that involved reclaiming brownfields, in part because it was under obligation to the state to address these sites, and because other resources were available to brownfield projects that could be leveraged for natural area restoration.

The plan will contain: detailed site descriptions and assessments; prioritization guidance on maintenance and management activities; a strategy for further resource development, increased site protection, and enhanced levels of stewardship; and general recommendations for overall natural areas management. For example, the draft section on Maintenance and Management of Urban Wilds states that each city-owned urban wild should receive, at a minimum:

- Basic litter pick-up, four times per year;
- Overall site clean-up, once per year;
- Tree/shrub inspection and pruning, once per year;
- Fence inspection and repair, once per year;
- Mowing, as needed on a site-by-site basis, but at least once per year;
- Trail/path inspection and maintenance, once per year;
- Graffiti removal, twice per year;
- Sign inspection and repair, once per year; and
- Invasive plant removal and replanting with native species, on-going.

The plan will not contain detailed implementation/work plans for each of the natural areas. Rather, the plan calls for, subsequent to its adoption, the city to develop a Natural Areas Inspection Program and to develop management plans for the largest and most significant urban wilds. Of course, the city has already developed specific work plans for some of its areas.

The plan will address the issue of fiscal feasibility and resources in the section on Implementation Strategy. Restoration projects will be implemented based on their cost effectiveness; potential to provide habitat to native plants and animals; and ability to perform other ecological services. However, the plan will not contain cost estimates.

Note that the city has enjoyed a long-term partnership with EarthWorks, a local nonprofit organization that raises funds and organizes volunteers for restoration efforts in the natural areas. In 2003, EarthWorks began a five-year project to revisit its restoration project sites to assess the success of efforts.

A related effort, in 2002, the City of Boston developed a citywide Open Space Plan. The mayor has asked the Boston Parks and Recreation Department to update the citywide Open Space Plan for 2007 to 2011. Note that this will include a discussion of urban wilds.

City of Calgary, Natural Environment Parks

Calgary's Natural Environment Parks (NEP) are managed for both habitat protection and passive recreation. There are nearly 300 NEPs, which total over 9,500 acres of land. Calgary's NEPs are classified into three groups: Special Protection Natural Areas; Major Natural Environment Parks; and Other Parks ~ with Natural Environments. Special Protection Natural Areas are areas of the highest ecological significance, and have the strictest controls on active recreation. Major Natural Environment Parks are generally natural, but do not have the habitat quality or significance of a Special Protection Natural Area. Other Parks ~ with Natural Environments include large regional parks that contain significant amounts of natural environment within them, as well as developed recreational areas.

Calgary developed a Natural Areas Management Plan in 1994, one of the first of its kind. The plan established overall policy direction for protection, management, and acquisition, and provided guidelines under which NEPs are to be managed. The plan addressed restoration issues common to natural areas, including planting native vegetation, erosion control, weed control, animal control, wildlife encounters, encroachments, and vandalism.

As part of the development of the plan, a three-year natural environment inventory and assessment was conducted. Parks were classified into three categories, as described above. In addition, the plan also recommended a system of zones within parks, designating areas as either a Preservation Zone or an Active Recreation Zone. Three sets of system-wide management guidelines were articulated in the plan: guidelines that apply to all NEPs; guidelines that address specific issues (e.g., dog use, grazing, snags and deadfall, etc.); and guidelines that relate to specific habitat types. Note that the plan does not contain park-specific implementation plans. Rather, the plan recognizes the need for separate park specific master plans and management plans. The plan does not contain either planning level or park-specific cost estimates.

The city has more recently created an Open Space Plan, which addresses all parks and requires the preparation of park-specific Natural Area Management Plans, of which a number have been prepared. The management plans generally incorporate a biophysical inventory and resource analysis, policy statements and management guidelines for specific issues (e.g. off-leash dog walking, mountain biking, invasive species) and usually include a design-development plan (and capital cost estimate) for any proposed amenities, trail construction or restoration. A Wetland Conservation Plan, developed after the Open Space Plan, focussed on wetland protection and mitigation in development, and set some general direction regarding protection and management of wetlands that occur in the natural area park system.

City of Chicago Park District, Nature Areas

The Chicago Park District is currently drafting an overarching management plan for their 49 natural areas, which it hopes to complete by the end of 2007. The plan will be the culmination of a number of earlier efforts.

In 1999 the Chicago Region Biodiversity Council published the Chicago Wilderness Biodiversity Plan. One of the key recommendations of the document was that local municipalities develop policies to maintain biodiversity. As a result of that recommendation, in 2004 the Chicago Department of Planning and Development identified, through the "Chicago Habitat Inventory", 3,800 acres of natural prairies, savannas, dunes, woodlands, and wetlands within the city limits, and 920 additional acres suitable for habitat restoration. Note that Chicago's natural areas are part of a region-wide network including Cook County and other surrounding counties, collectively referred to as "Chicago Wilderness."

As the next step, in 2006 the Chicago Plan Commission, the Chicago Park District, and the Cook County Forest Preserve District adopted the Chicago Nature and Wildlife Plan. The plan is very high level and quite broad, and contains four goals: protect natural habitat; manage existing open spaces; monitor sites and compile research; and educate the public. The plan contains objectives associated with each of the goals. For example, one short-term objective is that existing management plans for habitat sites are implemented while priorities, goals and plans for other habitat locations are developed. However, the plan itself does not contain general natural area management policies, site-specific work plans, or any discussion of budgetary matters. The forthcoming management plan is the result of one of the Chicago Nature and Wildlife Plan recommendations and will contain all of the following elements: detailed resource inventory/assessment; general management policies; park-specific management policies; park-specific detailed work plans; and discussion of fiscal feasibility and implementation cost estimate.

City of Denver, Natural Areas Program

The Denver Department of Parks and Recreation oversees the Natural Areas Program, which contains approximately 4,000 acres of undeveloped land. The program's goals are to protect and restore natural ecosystems that still exist or to create and nurture natural ecological processes in open space areas with the potential of becoming naturalized landscapes.

In 1999, the program developed a high-level strategic plan. The plan established a number of goals and strategies addressing planning and designation; protection, restoration, and management; noxious and problem weed management; wildlife protection and management; and education and outreach. The plan also identified a process for implementing the program, including inventorying, developing site-specific work plans, monitoring and evaluation. Developing the plan itself did not involve undertaking these activities.

Note that in 2002 OLA staff, for a separate project, interviewed program staff from Denver and found that they were evaluating a draft natural area management plan. However, the city has not yet prepared a plan. The program has developed a noxious weed management plan as well as management plans for

natural areas that have been officially designated (approximately 65 acres to date). All undeveloped space, including large rights-of-way, have recently been inventoried and mapped.

King County Natural Resource Lands Program

The King County Department of Natural Resources and Parks manages more than 25,000 acres of active (Parks) and passive (Natural Resource Lands) recreation areas. King County contains Seattle, although the 25,000 acres of County lands are primarily in unincorporated areas outside of cities. More than 8,000 acres are part of the Natural Resource Lands program, which includes both "natural areas" (also called "ecological lands") and "working resource lands." The Natural Resource Lands program also holds approximately 95,300 acres of conservation easements and working forest development rights. Natural areas are managed to protect valuable ecological systems, whereas working resource lands are farms and forests that are managed for the production of food and wood products.

Overarching policy guidance for management of Natural Resource Lands is contained in a number of related documents: the King County Ecological Lands Handbook; the Programmatic Plan for Management of King County-owned Ecological Lands; and the Programmatic Plan for Management of King County-owned Working Forest Properties.

In 2004, the county updated the King County Open Space System plan, which contains policies for Parks and Natural Resource Lands. It addresses numerous high-level issues, such as standards; planning, acquisition and development; stewardship and maintenance; public outreach; and funding. Specifically regarding natural areas, the plan contains the following findings:

- Individual Site Management Plans will be developed for each natural site.
- Site Management Plans (typically called "Site Management Guidelines") for natural areas and working resource lands will be guided by the King County Ecological Handbook for Natural Areas and the Programmatic Plans for Forestry and Agriculture for forests and farms.

Site management guidelines have been developed for most Natural Resource Lands sites. Annual site maintenance plans are written for each site to guide site maintenance actions and to implement recommendations from site management guidelines.

The King County Open Space System plan notes that general fund support steadily decreased over several years until reaching a near crisis situation in 2003. To address the general fund decrease, a four-year local levy was passed in 2003; another multi-year levy will be on the ballot in 2007. Annual funds generated from the 2003 levy began at $11.5 million in 2004 and are expected to increase to approximately $12.2 million in 2007. These levy funds will comprise roughly 56% of the total annual budget needed to operate and maintain the entire open space system (funding is primarily directed toward active parks; only a small percentage of the budget funds Natural Resource Lands management). The levy funding is not used for acquisition.

City of New York, Forever Wild Program

The Forever Wild Program is an initiative of the New York City Department of Parks and Recreation to protect and preserve the city's most ecologically valuable lands. The 48 Forever Wild Preserves include over 8,700 acres of forests, wetlands, and meadows. The program is in the process of developing a management plan that it expects to complete in October 2007. The plan will contain overarching policies relevant to all preserves and a discussion of known species of greatest conservation need found in the preserves. It will not contain a detailed inventory, nor site-specific plans or cost estimates. The department has a long history of natural area management and restoration programs, and has restored more than 2,000 acres of salt marsh, grassland, freshwater wetland, and forest.

City of Philadelphia, Fairmount Park Environment, Stewardship and Education Division

The Fairmount Park Commission (FPC) manages the Fairmount Park system, which is comprised of 63 regional and neighborhood parks throughout Philadelphia, PA totaling 9,200 acres. The Environment, Stewardship and Education Division undertakes environmental restoration activities throughout the park system, primarily on the 5,600 acres of natural lands in the system's seven largest watershed and estuary parks. From 2000 through 2006, the city completed a number of contracted restoration projects at over 300 sites (316 acres total). These projects have included planting trees, shrubs and herbs (92,000 plants); stream channel restoration (6 sites, 1040 feet); erosion repair; meadow creation (45 acres); and invasive plant control (124 acres).

In 2001, Fairmount Park completed an inventory and assessment that resulted in the Natural Lands Restoration Master Plan. The plan contains recommended restoration activities for 452 high-priority sites in seven large parks. The park is currently implementing the recommendations through the use of park staff, contractors and volunteers. The series of projects is one of the largest programs of its kind in the United States.

The plan did not contain site-specific work plans, which require substantial additional detail. The agency has used consultants to prepare such plans, including expending $370,000 to develop restoration plans for two prominent parks. (Note that the design fee for a restoration project will typically comprise 10% of the project's total cost.)

In a related effort, in 2003 the city and the Fairmount Park Commission put a strategic planning process in motion to determine the future of parks and open space in Philadelphia. The result was the Fairmount Park Strategic Plan, which touches on a number of issues, including increasing sustainable revenue sources and strengthening the role of community partners. It also includes the goal of delivering a balanced and coordinated park system with natural and developed areas that maximizes the uses of park and recreation facilities. Objectives under this goal include expanding the implementation of resource management plans throughout the Fairmount Park System that conserves, restores, and preserves parks, watersheds, and urban ecosystems that maximize the value of the natural resources. It establishes a priority and timeline for strategies related to the plan, including developing a nonnative plant management program and establishing a wildlife management program.

The city is also now creating a comprehensive open space plan, GreenPlan Philadelphia, which will be completed by December 2007. GreenPlan Philadelphia will be a comprehensive plan for management of all existing and future open space in the city, including an inventory of the city's natural resources. The 15-year plan will address funding issues, and preliminary materials note that the city and its partners will actively pursue funding from public and private foundations as well as state and federal agencies.

Portland Metro, Natural Areas Program

The Portland (OR) region is recognized as having one of the most ambitious natural areas programs in the country. Metro is a regional government agency in the greater Portland area that has jurisdiction over three counties and the 25 cities in the Portland metropolitan area. The agency addresses regional issues such as land use planning, solid waste disposal, and regional facilities (Oregon Zoo, the Oregon Convention Center, etc.).

In November 2006, voters in the Metro area passed a $227.4 million bond measure devoted to acquiring and restoring natural areas throughout the region. The bond is expected to enable the acquisition of an additional 3,500 to 4,500 acres. The 2006 bond measure was modeled after a 1995 $135.6 million bond measure with a similar focus, which enabled government agencies to acquire approximately 8,000 acres and fund over 100 local projects. The agency now has approximately 10,000 acres, primarily undeveloped land outside of Portland, with roughly 3,000 in urban areas. Note that for both bonds, the majority of the funding has gone toward the acquisition of land (88% in 1995 and 74% in 2006).

Despite the magnitude of the natural areas program in the region, there is no overarching management plan, although natural resources management plans for individual natural areas have been developed. Because the program has primarily focused on the acquisition of fairly pristine natural areas, it has not devoted as much attention to restoration and management. The broader Metropolitan Greenspaces Master Plan, adopted in 1992, remains the guiding document through which natural areas protection priorities are established.

Appendix D

Prescribed Priority Activities - Coastal Trail Enhancement Projects							
Priority Actions	**Total Project Size (acres)**	**New Trail Construc-tion (meters)**	**Social Trails (feet)**	**Tree Removal (acres)**	**Invasive Plants (acres)**	**Restora-tion (acres)**	**Total Project Costs**
1-E. Coastal bluff habitat protection above Pirate's Cove - Invasive plant and tree control, trail tread improvements and erosion control	147	545	4,274	4 ind	13		$347,932.50
2-R. Incipient pampas and harding grass above Pirate's Cove	26.8	1678			4.1		$18,700.00
3-E. Pampas grass control west of Rodeo Valley	20				0.6		$12,900.00
7-E. Sediment and erosion reduction above Big Lagoon - trail improvements	5.6				0		$52,035.41
8-E. Wet meadow habitat enhancement and invasive non-native control in lower Tennessee Valley.	32.9			7 ind. + 1.2 acres	12.6		$55,650.00
15-E. Coastal prairie and scrub habitat protection through removing isolated non-native trees above Coastal drainages	105.4			125 ind + 4.9 acres	0		$58,400.00
17-E. Coastal bluff habitat and visitor access improvements - invasive plant and tree control, visitor use study, social trail removal and appropriate access route developed	70			21 ind + 0.6 acres	5.7		$129,074.00
19 A-E. Incipient harding grass control and improved maintenance practices along Wolf Ridge	13				0.5		$4,000.00
21-E. Pampas grass control west of Rodeo Valley	15.9			est. 10 trees	8.6		$39,130.00
22 A-R. Control incipient pampas grass populations at Point Bonita	128				2.4		$35,150.00
23-E. Mission blue butterfly habitat enhancement - targeted invasive plant and tree removal and social trail closure	116			103 ind + 0.2 acre	1.6		$87,470.00
24-E. Mission blue butterfly habitat enhancement - targeted invasive plant and tree removal and social trail closure	115			152 ind + 0.8 acre	up to 13.1		$362,883.00

Priority Actions	Total Project Size (acres)	New Trail Construc-tion (meters)	Social Trails (feet)	Tree Removal (acres)	Invasive Plants (acres)	Restora-tion (acres)	Total Project Costs
25-E. Mission blue butterfly habitat enhancement - targeted invasive plant and tree removal and social trail closure	52			0.3 acre + 10 ind	1		$30,120.00
26 A-E. Mission blue butterfly habitat enhancement - targeted thoroughwort control	32.9				2.4		$96,000.00
28 A-E. Mission blue butterfly habitat enhancement - targeted thoroughwort control	26.7				5.3		$103,750.00
29-E. Mission blue butterfly habitat enhancement - targeted thoroughwort control	12				3.5		$42,500.00
31-E. Mission blue butterfly habitat enhancement - targeted invasive plant and tree removal and social trail closure	67			25 ind + 0.2 acre	3.8		$79,310.00
35- E. Mission blue butterfly habitat enhancement along Julian Road, and trail erosion control	102	15,217		0.6 acre + 21 ind	7.6		$284,590.00
38-E. Cape Ivy Control and Habitat Improvements within Coastal bluff habitat (combined 38,39,40,41)	9.3			1.88	0		$197,656.00
39-E. Presidio bluffs visitor access control and habitat protection - social trail control and rehabilitation (combined 43,48, 49)	11.3	718	2,872		0.01	0.53	$599,412.31
65-E. Mori Point invasive non-native plant control and endangered species habitat improvements	12.4			up to 85 trees	up to 3		$76,700.00
Subtotal							**$2,713,363.22**
5% Inflation							**$135,668.16**
Total							**$2,849,031.38**

Source: Golden Gate National Park Conservancy, 2007

Appendix E - San Francisco Recreation and Park Department Natural Area Capital Projects

Listing from the Draft Natural Areas Management Plan (February 2006)

Phase I
Balboa Natural Area (Parcel 4)
Glen Canyon Park
India Basin
Lake Merced
McLaren Park,
Pine Lake

Phase II
Bayview Park
Bernal Hill
Buena Vista Oak Woodlands
Edgehill Mountain
Glen Canyon Park Phase II
Grandview Park
Lake Merced Phase II
McLaren Phase II
Mount Davidson
Sharp Park
Twin Peaks

Phase III
Billy Goat Hill
Interior Greenbelt
Oak Woodlands Golden Gate Park

Listing from the Capital Plan – 2005 Annual Update (March 2006)

Phase I
Corona Heights
Glen Canyon Phase I
Lake Merced Phase I
McLaren Park Phase I
McLaren Park Yosemite Marsh
Parcel 4 (also known as the Balboa Natural Area)
Parcel 4 Signage
Pine Lake Park

Phase II
Bayview Hill
Bernal Hill
Buena Vista Oak Woodlands
Edgehill Mountain
Glen Canyon Phase II
Grandview
Lake Merced Phase II
McLaren Phase II
Mt. Davidson
Outside Sharp Park
Twin Peaks

Phase III
Billy Goat Hill
Interior Greenbelt
Oak Woodlands in Golden Gate Park

Listing from the Capital Plan – 2006 Annual Update (March 2007)

Phase I
Balboa Natural Area/Parcel 4 - Natural Areas and Signage
Corona Heights
Glen Park PG - Canyon - NA (Phase I)
India Basin Phase III (wetland restoration) - NA
Lake Merced (Phase I)
McLaren Park
McLaren Park - Yosemite Marsh Renovation
Pine Lake Park

Phase II
Bayview Park
Bernal Heights Park
Buena Vista Park Oak Woodland Rest.
Edgehill Mountain Improvements
Glen Park - Phase II
Grandview Park
Lake Merced - Phase II
Mt Davidson Park
Sharp Park
Twin Peaks

Phase III

Billy Goat Hill
Golden Gate Park - Oakwoodlands
Interior Greenbelt
McLaren Park - Phase II