

2. MANAGEMENT APPROACH

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.¹
- 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.

¹ The term “special-status species” (or sensitive species) refers to species that are: 1) federally listed as endangered, threatened, candidate, or food plants for those species; 2) state-listed as endangered, rare, threatened, California fully protected, species of special concern, or food plants for these species; 3) listed on the California Native Plant Society *Inventory of Rare and Endangered Vascular Plants of California* (CNPS 2001); 4) on the National Audubon Society’s Watch List; or 5) under threat of local extirpation as determined by the Yerba Buena chapter of the California Native Plant Society, or the Golden Gate chapter of the National Audubon Society.

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.

2.2 ECOSYSTEM FUNCTIONS AND MANAGEMENT CONCERNS

ECOSYSTEM FUNCTIONS

The Natural Areas have conservation values that include:

- refugia for native plant and animal species within a major city;

- a diversity of native plant communities and habitats including lake and pond, open sand, rock outcrop, grassland, freshwater and salt marsh, coastal scrub, riparian, and oak woodland;
- special-status and unusual species of plants and animals;
- major movement corridors for birds and other animals;
- refugia for pollinators and natural predators;
- hydrologic processes such as groundwater recharge and flood control; and
- atmospheric or climatological processes such as oxygenation and cooling.

MANAGEMENT CONCERNS

The primary management concerns relate to restoring and enhancing the remaining natural communities that have been impacted adversely by human activities. Human-generated impacts to natural areas include the loss of nature habitat, the fragmentation of natural landscape, the introduction of non-native plants and animals, and the increase in pressures from human use.

Management issues include:

- loss of special-status or unusual native species or habitats;
- loss of diversity and components of a healthy ecological system;
- effect of non-native invasive species on the local native flora and fauna;
- erosion of natural areas from inappropriately located or constructed trails and access roads;
- effect of human uses (active recreation, poor trail location or too many trails, and a general increase in use) that conflict with conservation values; and
- effects of feral animals and domestic pets on native flora and fauna.

2.3 RESTORATION AND MANAGEMENT STRATEGIES AND METHODS

Urban wildland management is a young but rapidly expanding field. A recent survey of urban natural areas found 35 cities from around the U.S. and Canada engaged in actively managing urban wildlands (Borneman and Hostetler 2004). Management included invasive species control, trail maintenance, and erosion control, and almost universally relied on volunteers (34 of 35 respondents).

The Natural Areas Program (NAP) has, and will continue to, communicate with these sister agencies in an effort to learn techniques, solutions, and other methods that will further restoration and management goals in San Francisco.

The following sections describe the best and most applicable restoration methods and practices.

ADAPTIVE MANAGEMENT

The strategy for managing Natural Areas is based on adaptive management concepts. Adaptive management is a flexible, learning-based approach to managing complex ecosystems. This approach recognizes that some uncertainty exists about the nature of ecosystems and the organisms and processes that define them. Adaptive management, as applied to natural systems, involves a continuous cycle of systematically monitoring biodiversity and other ecosystem goals, and reassessing the plans, strategies/goals, methods, and questions that underlie the management approach. Land managers then use this information to evaluate success and failures, and to refine techniques and approaches. In this management approach, adaptive management will be executed in three phases. First, site-specific issues and recommendations are developed (Section 5 and 6). Second, a plan based on these recommendations and on priorities assigned by the NAP will be implemented. Third, a monitoring program will be implemented to evaluate the plan's site-specific success (Section 7) and, based on the information gathered, modify implementation strategies, priorities, and methods as necessary.

RESTORATION STRATEGIES

According to the Society of Ecological Restoration (SER) International Science and Policy Working Group, ecological restoration is the process of repairing damage caused by humans to the diversity and dynamics of indigenous ecosystems (SER 2004). Restoration ecology is considered an applied science based on the science of ecology. Restoration ecologists integrate the best of science and practice into the activities of weed management, plant propagation, monitoring, etc. Science and understanding underlie and inform decisions that are made in restoration. For example, predictions about how plants will respond to environmental change or which species comprise a particular plant community are informed by science. Practical considerations also are taken into account because management resources often are limited and in urban settings, Natural Areas are subject to a variety of human impacts.

Restoration Planning and Reference Sites

The SER *Primer on Ecological Restoration* (SER 2004) includes theoretical and practical considerations for the practice of restoration. When successful, the restored ecosystem: contains a characteristic species assemblage with high levels of native species, is self-sustaining at the individual and community levels, functions normally, is integrated into a larger scale landscape, threats have been reduced, and the community is resilient enough to survive normal stressors (SER 2004).

Restoration projects have two components: planning and implementation. It is important to have good planning, including a clear reason that justifies the restoration project, a discussion of the project in relation to the reference site and the surrounding ecosystem, and clearly articulated goals, objectives, and performance criteria (SER 2004). Implementation requires detailed plans, schedules, and procedures for dealing with potential problems, explicit performance criteria, and

a long-term monitoring strategy (SER 2004). Ecosystem goals, objectives and supporting policies are described in Sections 1 and 2 of this Final Draft. Sections 3 and 6 provide the regional and site-specific information necessary to discuss how the proposed restoration project fits into the overall landscape. Site-specific plans are not included within this document, but are developed in the form of annual work plans by NAP. This Final Draft includes a detailed monitoring protocol that will allow for evaluation of restoration performance (Section 7).

Reference sites areas used in restoration ecology when planning and evaluating projects. Because plant communities vary through space and time, evaluating restoration success or determining target plant communities for a particular site can be difficult. Consequently, restoration ecologists use the concept of reference systems to determine the natural range of plant species composition (Pickett and Parker 1994, SER 2004). In reference sampling, ecologists attempt to capture the range of diversity within a given habitat or, as described by SER (2004), a “constellation of potential states and the historic range of variation.” Restored systems are then compared to reference systems to evaluate over time whether the restoration has been successful and how to modify management practices in the future.

As part of this document, reference sites were sampled in grasslands, dunes, scrub, woodland, and wetlands throughout the Franciscan landscape. The reference sampling methodology is provided in Section 3. Reference sampling data, which informs the development of restoration planting plans and can be used to evaluate success, is provided in Appendix B. While the species lists provided in Appendix B guide the restoration of natural plant communities, the choice of species to be installed may be modified in order to accommodate a variety of ecological and sociological goals. For example, in an erosion-prone area, plants with a greater potential to hold the soil likely would be favored over others. In other cases, species choice and arrangement may be modified in order to be more aesthetically consistent with neighboring park landscapes or to beautify roadway frontages and park entrances.

The Bradley Method

The Bradley Method of restoration is a widely practiced method of plant community restoration, because it provides a realistic framework for restoration in resource-limited situations (Bradley 1997). Developed in the 1960s, the Bradley Method works on three general principles: (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. These principles prioritize the protection of intact areas, remove the pressure that invasive plants place on native plants, and encourage the natural recruitment and spread of plants into degraded areas by means of seeds and spores.

The NAP and the management recommendations described in this Final Draft are based on the principles of the Bradley Method. A prioritization of restoration work in the most intact management areas first (MA-1 and MA-2) is consistent with the Bradley Method.

SENSITIVE PLANT SPECIES REINTRODUCTION METHODOLOGY

One important component of conservation and restoration is preservation of sensitive species. San Francisco has lost much of its endemic and native flora and fauna. For example, approximately 50 percent of the plants recorded in the 1958 Flora of San Francisco California (Howell et al. 1958), have gone extinct from San Francisco (see Appendix E). Some of the species that remain occur in three or fewer population and are at risk of local extinction (CNPS 2005). In order to prevent the further extirpation of local populations of sensitive species and to reverse the extinction trend, reintroduction, re-establishment, and augmentation of at-risk or extinct populations is important. The following are the list of criteria and typical questions developed for this document to determine the location of potential plant re-introductions:

- Evidence of historic presence (based on Howell et al. 1958). Historic locations for plant species are provided in Table E-1.
- Park size. Is the park large enough to support a viable population over the life of this plan? Most small parks may not be large enough to support viable populations.
- Habitat area. Is there sufficient suitable habitat (soil of the proper condition, appropriate moisture requirements, exposure) to support a viable population?
- Competition. Is there enough undisturbed habitat that is relatively weed-free to support the species? If areas are excessively weedy, maintenance of plant populations would require a large amount of human resources to be viable.
- Park use. How much human use is experienced in the sensitive species' habitat and could this use jeopardize a reintroduction?