

5. SYSTEM-WIDE MANAGEMENT ACTIONS AND PRACTICES

5.1 INTRODUCTION

Although Natural Areas encompass a variety of habitats and micro-climatic variations, some management issues commonly occur throughout them. This section first presents these common issues and management recommendations. System-wide issues and recommendations are referenced where appropriate in discussions of specific Natural Areas, along with site-specific issues and recommendations (Section 6). This chapter also describes standard Best Management Practices (BMPs) that can be used to address issues such as excessive erosion and pathogen control during vegetation management.

5.2 SYSTEM-WIDE ISSUES AND MANAGEMENT ACTIONS

VEGETATION

Issue GR-1 Invasive Plant Control and Revegetation: San Francisco's natural heritage is housed in Natural Areas. These Natural Areas are threatened by invasive plant species (e.g., annual grasses, blue gum eucalyptus (*Eucalyptus globulus*), and French broom (*Genista monspessulana*)), which are responsible for historic and present-day loss of biodiversity. Invasive plant species are capable of spreading rapidly and displacing native plants primarily because they are adapted to similar climatic conditions, lack predators or pests, and/or have other autoecological characteristics that make them thrive. Invasive plants change ecosystem functions and displace native species (Bossard et al. 2000, Westman 1990). In fact, over 50 percent of the plant species recorded in 1958 have already become extinct (Howell et al. 1958). This phenomena is wide-spread in the United States. In California yellow star thistle (*Centaurea solstitialis*) now dominates approximately 8 million acres of what was once productive grassland (Pimentel et al. 2004). Cape ivy (*Delairea odorata*) infestation has become the top priority in the Golden Gate National Recreation Area, where it is overgrowing coastal and riparian vegetation and displacing endangered species (Balciunas et al. 2004). Invasive species that are threats to diversity within the Natural Areas thrive in the San Francisco climate, grow rapidly and out-compete native species, produce huge numbers of seeds that remain viable for several years, and often sprout from cuttings or root fragments making control challenging. If left unmanaged, some Natural Areas would contain only a handful of invasive weeds and some of the animals that rely on the diversity of native plants might become extinct locally. Removal of invasive vegetation results in opportunities for revegetation and augmentation of native species that are declining or have disappeared in the City. Recently restored areas may also be subject to higher rates of invasion than established habitats due to soil disturbance and, therefore, follow-up weed control of restoration areas is critical.

Recommendation GR-1a: Reduce invasive plant populations (see specific sections in Chapter 6 for species and areas). Because MA-1 areas support the most critical landscapes for conservation, invasive weed control shall be focused in those areas first, followed by MA-2 and MA-3 areas. While this is a general guideline, priorities may shift toward MA-2 and MA-3 areas while additional resources, such as capital funds or stewardship groups, are made available. The general control strategy for MA-3 areas shall be to reduce and control the spread of invasive plants into neighboring MA-1 and MA-2 areas. Some invasive plant species known to support birds, butterflies, and other beneficial insects may be maintained in MA-3 areas.

Recommendation GR-1b: Where native plant seed banks do not exist or have diminished, revegetation with appropriate native species may occur. In most cases, native species shall be planted to approximate the diversity, cover, and density of adjacent habitats or reference sites in similar habitats (Appendix B). In some cases, for example at park entryways and transition zones with adjacent parkland landscapes, planting palettes may be modified to favor showy native plants over other species.

Recommendation GR-1c: Restoration activities shall be conducted during the appropriate time of year and at an appropriate scale to avoid impacts to wildlife and minimize erosion (see GR-4b and Section 5.3). In general, at any one time, the area of vegetation removal shall be relatively small to minimize the potential for erosion. If necessary, the BMPs discussed in Section 5.3 shall be implemented to minimize erosion. Any temporary flagging or pin-flags used to locate plants shall be replaced at sufficient intervals so that they do not break down and litter the Natural Area.

Recommendation GR-1d: In areas where it may not be feasible to reduce large infestations of invasive vegetation immediately, containment actions along the interface between the native and non-native habitats shall occur. Given the existing resources of the NAP, this strategy is the most realistic approach to invasive weed control in MA-3 areas.

Recommendation GR-1e: Management Areas, restoration areas, and other sensitive habitats shall be routinely monitored (ideally each year) for invasion of undesired plant species (Section 7).

Issue GR-2 Sensitive Plant Species: The richness of San Francisco's flora has declined by almost half since 1958. The Natural Areas contain several vegetation series and many individual species of limited distribution and significant local importance. For example, red fescue (*Festuca rubra*) prairie (considered a rare vegetation type by some biologists) is found within four Natural Areas and amounts to a total of only 1.1 acres. There are many other vegetation series of limited distribution within the system (Table 3-3). In addition, 67 species of special-status plants occur in limited numbers through the Natural Areas (Table 3-4). For example, San Francisco spineflower (*Chorizanthe cuspidata* var. *cuspidata*) was discovered recently during restoration

activities near Impound Lake (Lake Merced; Section 6.1); the only population of yellow-eyed grass (*Sisyrinchium californicum*) known in San Francisco can be found in Glen Canyon Park (Section 6.3).

Recommendation GR-2a: Invasive weed reduction and management in areas supporting sensitive species and/or vegetation series shall be prioritized over other activities (see Recommendation GR-1a).

Recommendation GR-2b: Sensitive species shall be given priority in revegetation and reintroduction activities throughout Natural Areas. Augmenting existing populations and (re)establishing or (re)introducing additional populations where they once occurred (or were likely to have occurred) will help to ensure their continued survival in the City. Sensitive plant species reintroduction to a site should not occur until appropriate habitat is made available. Invasive weed populations must be contained such that survival of sensitive plants will not be threatened. The evaluation of historic occurrences provided in Appendix E, shall guide reintroduction activities. These species shall be directly seeded or propagated and then planted in appropriate habitats and in Natural Areas where long-term survival will be most likely (see Section 2.3). Plants shall be installed at densities and in composition that corresponds to their natural distribution, and in a manner that takes into account the species' life history and population biology.

Recommendation GR-2c: Efforts shall be made to protect the areas containing sensitive species and vegetation series of limited distribution from human disturbances.

Recommendation GR-2d: Plant populations and vegetation series of limited distribution shall be closely monitored (Section 7). If the monitoring data indicate that populations are declining, adaptive management shall be applied, including increasing the population size by planting or changing the management regime (see Recommendation GR-2b).

Recommendation GR-2e: Knowledge of sensitive plant species life histories and ecological requirements is, at best, incomplete. Continue to work with the scientific community to better understand key biological factors affecting sensitive species survival and reproduction and to inform adaptive management decision making.

Issue GR-3 Native Grasslands: Grasslands in Natural Areas are a focal point for restoration. Non-native grasslands represent a relatively large area within Natural Areas and manual weed control (including spraying, manual removal, or mechanical removal) at that scale may not be feasible (Huntsinger and Bartolome 2005). Furthermore, the interruption of natural process such as fire and native herbivore grazing has resulted in conditions favorable to non-native invasive species. Native grasslands within many Natural Areas may be at risk of being invaded by non-native species because conditions may not be optimal for supporting native ones.

Recommendation GR-3a: SFRPD shall monitor, annually if feasible, native grasslands and control invasive species (see Recommendation GR-1a through 1e).

Recommendation GR-3b: SFRPD shall explore non-manual methods of grassland management for large grassland expanses. Prescribed fires may help native species germinate and control invasive plants. Similarly, control by domestic livestock grazing could reduce the populations of undesirable species and improve conditions for native grasses. Any prescribed burns recommended by this Final Draft only will be implemented if approval from the San Francisco Fire Marshal and the Bay Area Air Quality Management District is received. No burns will be initiated by SFRPD without first protecting adjacent homes (GR-13b). As part of the approval process, a site-specific burn plan would be developed that would specify the scope and timing of the prescribed fire. Goat grazing has been implemented with some success and is likely a more viable alternative to fire. When using goats to control grassland weeds, SFRPD shall consider herd size and the potential negative effects that large goat herds can have on erosion and soil stability. Early season grazing is likely to have the greatest positive influence on non-native grassland management.

Another method of manually controlling invasive grasses and yet allowing desirable plant species to survive would be to use power mowers or weed wackers. SFRPD should experiment with the use of weed wackers in areas where it may be feasible to use this technique to suppress invasive grass species while allowing broad-leafed plants to survive (Huntsinger and Bartolome, 2005).

WILDLIFE

Birds

Issue GR-4 Breeding Bird Habitat: Nesting birds (resident species, neotropical migrants, and other species of concern) are sensitive to direct human disturbance and human-generated changes to the environment. These species could be affected by human activities including vegetation management, recreational use, and off-leash dog use. In addition, brown-headed cowbirds (*Molothrus ater*) are common throughout the City and likely parasitize the nests of most species of songbirds in the area (Murphy 1999). The combination of nest parasitism and human-related disturbances could place significant pressure on native passerine (songbird) species. When coupled with relatively low-functioning nesting habitat within many Natural Areas, it is not surprising that local bird populations continue to decline. However, restoration activities also make it possible to improve substantially the quality of available habitat and can help offset some of these pressures.

Recommendation GR-4a: If resources are available, conduct annual breeding bird surveys using standardized point count or transect methodology to develop a list of species nesting, or suspected of nesting, in Natural Areas. Surveys should be conducted following a variation of standard Breeding Bird Survey methodology (Section 7) (Ralph et al. 1993). The information gathered from the surveys would allow for more effective

and better informed planning and coordination between management activities, (e.g., tree pruning) to enhance native habitats used by breeding birds.

Recommendation GR-4b: Vegetation management activities that are likely to affect breeding birds (pruning, tree removal, ground cover removal, etc.) shall not be conducted during the breeding season (April 1-September 1) unless 1) projects begun prior to the breeding season have already disturbed the area, or 2) a breeding bird survey is conducted first. If active nests (or large abandoned stick nests) of a sensitive species are discovered, a 150-foot radius avoidance buffer shall be centered on the nest site(s) to prevent disturbance of the nesting birds while using power tools. Hand weeding may occur to within 50 feet of the nest.

Recommendation GR-4c: If surveys indicate that parasitism by brown-headed cowbirds is a significant problem, SFRPD shall consult with the California Department of Fish and Game and the U.S. Fish and Wildlife Service to determine proper protocols to minimize the negative effects of this species on breeding birds.

Recommendation GR-4d: Trimmed brush and trees provide material that may be used to increase nesting or escape habitat for ground-dwelling birds, and to mitigate the potential temporary loss of habitat due to vegetation clearing. Brush piles can be created by staking cut brush and debris in an irregular, more or less compact, manner. Brush piles shall be located out of public sight wherever possible and without creating public safety hazards (e.g., fire hazards). Hedgerows created from cut material shall be placed so that they connect scrub habitats and provide movement corridors for ground-dwelling birds.

Recommendation GR-4e: Create corridors of shrub species such as coyote brush (*Baccharis pilularis*), California coffeeberry (*Rhamnus californica*), lizard tail (*Eriophyllum confertiflorum* var. *confertiflorum*), California wild rose (*Rosa californica*), and lupine (*Lupinus* sp.) between landscaped areas and Natural Areas to provide cover and transitional habitat for birds and other wildlife. Corridors could also help control off-trail use, minimize erosion, and could improve the aesthetics of a Natural Area. When possible, replace invasive fruit-bearing shrubs with native fruit-bearing shrubs to maintain food supplies for wildlife. Coordinate with other SFRPD divisions and other City agencies to connect isolated habitats and fragments through corridors, thereby increasing the overall function of the landscape for wildlife.

Issue GR-5 Avian Foraging Habitat: Grasslands within the Natural Areas provide important foraging habitat for resident and migratory raptors. This area is under continual successional pressure from adjacent forest and scrub communities. As shrubs and trees spread into the grasslands, the grasslands obscure the burrows and escape habits of the prey base. Some habitats may actually support a higher prey base, but because of the structure of the vegetation, access to that prey base is blocked. For example, the conversion of grassland to Himalayan blackberry (*Rubus discolor*) scrub may increase food for small mammals (mice, rats, voles, etc.) but the

blackberries will protect those same mammals from red-tailed hawks who cannot capture prey through the blackberry brambles.

Recommendation GR-5a: Implementation of GR-1a through 1e and GR-3b will help preserve grassland structure and ecosystem functions throughout the Natural Areas. In general, colonization by invasive trees and shrubs into existing grasslands should be prevented. If possible, the creation and enhancement of grassland/shrub mosaics should be emphasized. Such mosaic habitats on a landscape scale provide both cover and food resources for small mammals, but also provide foraging habitat for raptors.

Issue GR-6 Avian Cavity Nesting Habitat: Nesting habitat for bird species that require cavities (e.g., wood ducks, woodpeckers, owls, bluebirds, etc.) often is limited within the Natural Areas. Natural cavities are preferred over nest boxes, but both can help support cavity-nesting species.

Recommendation GR-6a: Because they provide important breeding habitat for cavity-nesting birds and perching sites for raptors, snags (standing dead trees) and dead branches on live trees shall be left in place unless they are a hazard to public safety or contain significant harmful insect or disease infestations.

Recommendation GR-6b: Where natural cavities are not available or are in limited supply, provide nest boxes for species such as western bluebirds (*Sialia mexicana*), western screech owls (*Otus kennicottii*), woodpeckers, tree swallows (*Tachycineta bicolor*), etc. These shall be located in habitats that are appropriate for these species (e.g., bluebird boxes in the scrub and grasslands, and woodpecker and owl boxes in the forest). Nest boxes shall be constructed as designed for specific species, installed, and maintained. Annual maintenance of nest boxes is necessary during the non-nesting season, typically September 1 through January 31. During maintenance, all boxes shall be inspected, repaired as necessary, and cleaned of old nesting materials.

Recommendation GR-6c: Provide nest boxes for wood ducks at Impound Lake (Lake Merced), Sharp Park, and Pine Lake. Nest boxes shall be constructed, monitored, and maintained according to the specifications provided by the California Waterfowl Association (CWA 1999). It may be possible to obtain assistance with this project from the California Wood Duck Program, sponsored by the CWA and local scout groups.

Mammals

Issue GR-7 Predators: Feral and free-roaming cats (*Felis catus*), raccoons (*Procyon lotor*), striped skunks (*Mephitis mephitis*), black rats (*Rattus rattus*), and Virginia opossums (*Didelphis virginiana*) are among the terrestrial predators found within Natural Areas. Introduced amphibians such as bullfrogs (*Rana catesbeiana*) and African clawed frogs (*Xenopus laevis*) are also predaceous. These introduced or subsidized predators can have significant negative effects on native animals, contributing to their local extinction. Within San Francisco the effects of predation may be exacerbated by the fact that the Natural Areas are relatively few, many of them

are quite small, and most are separated by very dense urban development. In the scientific review conducted in preparation for the June 2005 Public Draft of this document, the need for cat control was described as “urgent” because cats have been shown to prey on birds, reptiles, amphibians, and small mammals (Huntsinger and Bartolome 2005). For purposes of this Final Draft, “feral cat control” refers to managing feral cats such that the location of feral cats and cat colonies minimizes the risk of cat predation on wildlife. It does not refer to “trap and kill.”

Recommendation GR-7a: The SFRPD shall implement the policy toward feral cat control as adopted from the Quail Recovery Plan and approved by the Commission on the Environment on January 14, 2004. The Quail Recovery Plan reads “Removal and relocation of predators may result in the death and other unintended negative consequences. Therefore, any proposed removal or relocation of predators of any kind must be submitted in writing to the San Francisco Recreation and Park Department for review and recommendation. In each proposed case, the Department will consult with the San Francisco SPCA to determine whether the relocation or removal is feasible and, if so, how best it can be done. If the relocation or removal is approved by SFRPD, the Department will utilize the pro bono services of SF/SPCA to accomplish the task unless SF/SPCA declines to participate.” If the SF/SPCA is unwilling or unavailable to consult on matters related to feral cats, then SFRPD shall consult with other knowledgeable feral cat advocate groups in this process.

Relocation of feral cats and feral cat colonies can be difficult, time-consuming and problematic (Alley Cat Allies and fixourferals.org). Therefore, relocation of cats or cat colonies shall only be undertaken when there is a high potential to impact native wildlife and other options are exhausted. Gradually moving feeding stations away from wildlife habitat areas is a more straightforward solution to the problem (Alley Cat Allies). Currently there are only a few feeding stations within or adjacent to Natural Areas at Lake Merced and in the Golden Gate Park Oak Woodlands. The SFRPD shall work with the SF/SPCA to gradually move or relocate these colonies if necessary to protect wildlife. The establishment of new feral cat colonies shall be discouraged in Natural Areas where colonies could threaten wildlife (AVMA 2005).

Recommendation GR-7b: Ultimately, the feral cat issue is one that is generated and perpetuated by humans. The only long-term solution to this problem is to eliminate the release of animals into the wild. While the entire effort is outside the scope of this Final Draft, the SFRPD can help in this goal. The SFRPD shall develop outreach materials to educate neighbors and users of Natural Areas about feral cats, including adoption, spay/neuter and the San Francisco Society for the Prevention of Cruelty to Animals’ (SF/SPCA) Cat Assistance programs (SF/SPCA, no date). Information regarding other programs such as the Cats Indoors, which is sponsored nationally by the American Bird Conservancy¹ and locally by the Golden Gate Audubon Chapter, as well as by the

¹ Available online at <http://www.abcbirds.org/cats>.

SF/SPCA² shall be made available to residents. The Cats Indoors program has educational material available for purchase or download. Information regarding the feral fix program is available on the SF/SPCA's website³. Other resources for dealing with free-roaming cats can be found at Stray Pet Advocacy⁴ and Alley Cat Allies⁵. In addition, literature that focuses on preventing "dumping" of unwanted cats into the streets and on public land should also be distributed when possible.

Recommendation GR-7c: The control of other predators (raccoons, skunks, opossum, rats, bullfrogs, clawed frogs, etc.) should be undertaken only in situations where the predators are concentrated in such a manner that they are having a substantial effect on native wildlife populations. Any control program should be developed in conjunction with San Francisco Animal Care and Control, CDFG, and other resource agencies and community organizations as appropriate. To the extent possible, all predator control shall be performed in a humane manner, such that harm and suffering to the animals is minimal.

Issue GR-8 Dog Use: Dog walking is a very popular recreational activity in Natural Areas. Approximately 80 percent of the SFRPD off-leash acreage is located within Natural Areas (see Table 5-1). The effect of dogs on Natural Areas is extremely variable and can depend on owners' actions and responsibility, the dogs' behaviors, and site-specific conditions.

- **Owner Action and Responsibility** – Owner behavior plays an important role in the type of impact dogs may or may not have on natural resources. For example, a person walking with a dog on trail has less of an impact than a person throwing a ball up a hill for the dog to chase. If dogs are allowed or encouraged by owners to dig, run, or chase wildlife in Natural Areas, soil, plant, and animal resources will be negatively affected.
- **Dog Behavior** – Dogs that remain on paths present little or no disruption to wildlife because the compaction or trampling by dogs walking on trails does not differ significantly from human use of trails. However, when dogs run off-leash, especially up and down steep slopes, native plant community and slope integrity can be degraded. In addition, some on- and off-leash activities such as dog digging and dog waste can disturb soil and plant resources and compromise the long-term health of ecosystems.
- **Site-Specific Conditions** – How and to what degree such activities will have an impact will be influenced by site-specific conditions such as slope (steepness), soil type (sand versus clay) and the type of native plant habitat (grasslands and dunes tend to be less resilient than urban forest and coastal scrub).

Potential negative impacts associated with dog use of parks can include:

- disruption of wildlife feeding and nesting (Huntsinger and Bartolome 2005);
- soil erosion and disturbance and promotion of weed growth associated with digging and running on slopes;

² Available online at http://www.sfspca.org/behavior/cat_library/index.shtml.

³ The SF/SPCA can be found online at <http://www.sfspca.org/feral/index.shtml>.

⁴ Stray Pet Advocacy can be found online at <http://www.straypetadvocacy.org>.

⁵ Alley Cat Allies can be found online at <http://www.alleycat.org>.

- direct native plant and animal loss resulting from hunting or capturing, urinating, and digging; and
- increases in nitrogen from dog waste that promote the growth of invasive weeds.

Approximately 118 acres of land in SFRPD parks citywide are currently designated for off-leash dog activities. The Dog Policy adopted by the Recreation and Park Commission in 2002 allows for three types of dog access on SFRPD land: off-leash, on-leash, and no access.

- *Off-Leash Access* - According to SFRPD's Dog Policy, off-leash dog activities are allowed only in designated Dog Play Areas (DPAs). Of the 25 DPAs currently operating on SFRPD land, 10 exist in parks with Natural Areas. New DPAs can be created through a community process coordinated through the Dog Advisory Committee (DAC) and described in the Dog Policy.
- *On-Leash Access* - Dogs are allowed on-leash in all other City park lands not designated as a DPA or specified as a no-dog area. Given the need to manage dog impacts on Natural Areas, the rarity with which on-leash regulations in Natural Areas have been enforced creates management issues and conflicts among park uses.
- *No Dog Access* - Some areas, including athletic fields, courts, children's play areas, and sensitive habitat areas, may be off-limits to dogs and thus exempt from consideration as DPAs. (See Section 3.0 of the Dog Policy).

According to Section 2.0 of the Dog Policy, Sensitive Habitat Areas include:

- sensitive wildlife areas such as breeding habitat for birds;
- sensitive remnant native plant communities such as wetlands;
- sensitive plant populations such as locally rare wildflower species;
- high erosion prone areas; and
- active restoration areas (temporary exclusion only).

“These areas support or are likely to support locally important, rare threatened or endangered species (examples include red-tailed hawk nesting sites, heron rookeries, cormorant nesting colonies, red-legged frog habitat, western pond turtle habitat, wetlands, quail habitat areas). Sensitive Habitat Areas are areas within designated Natural Areas that would be off-limits to dogs.”

At the time of its adoption, the Dog Policy stated: “Of approximately 500 acres of Natural Areas available for recreational use, approximately 20 percent would be considered Sensitive Habitat Areas. The remainder of the Natural Areas (approximately 400 acres) would be potentially available for off-leash, on-leash or on-trail DPAs.” This Final Draft provides updated acreage data; a total of 865 acres of Natural Areas occur in San Francisco County with approximately 615 of those acres on land (excluding water area of Lake Merced).

Recommendation GR-8a: Retain the boundaries and locations of eight existing DPAs in Natural Areas. No changes are recommended for the DPAs at Corona Heights, Golden Gate Park Southeast, Pine Lake Park, McLaren Park Geneva or McLaren Park Crocker

Amazon (see Sections 6.11, 6.15, 6.7 and 6.19 respectively). The Corona Heights DPA is a fenced area at the base of the Natural Area. The Pine Lake Park DPA includes the grassy meadow east of Pine Lake. The Golden Gate Park Southeast DPA is located across from Big Rec ballfield in a wooded area between Lincoln Avenue and Martin Luther King, Jr. Drive. The McLaren Park Crocker Amazon DPA is in an open space northeast of the Crocker Amazon ballfields. All of these DPAs are spatially separated from the Natural Area. The Geneva DPA is within the Natural Area but the specific area is not particularly sensitive.

The DPAs in Golden Gate Park Northeast, Buena Vista Park and Lake Merced do not currently have high use and therefore impacts are minimal. However, if use patterns change in these areas and impacts are detected through monitoring, then the DPA should be redesigned or relocated (see Sections 6.10, 6.15 and 6.1 respectively). Scientific review of the Draft Plan specifically urged the relocation of the DPA at Lake Merced (Huntsinger and Bartolome 2005).

Finally, the DPAs within the Shelley Drive Loop at McLaren Park and at Bernal Hill should be modified to protect sensitive habitat areas (see Sections 6.19 and 6.21, respectively). At McLaren Park, the creek area (Gray Fox Creek) should be made off-limits to dogs and the surrounding quail and wildlife habitat should be made available for on-leash use only. The modifications would result in a 0.6-acre reduction in human and dog access and a conversion of 7.7 acres to an on-leash area. If these recommendations are implemented, the 59-acre off-leash area at McLaren Shelley Loop would be reduced to 50.7 acres. Small areas of native grasslands and wild flower sites within the remaining off-leash area at McLaren Shelley Loop should be monitored for impacts associated with off-leash use.

The existing DPA at Bernal Hill is 21 acres. This off-leash area should be reduced by 6 acres. Of those 6 acres, approximately 2.5 acres are largely inaccessible, with slopes between 45 and 90 degrees. The 6-acre proposed on-leash area generally conforms to the areas delineated as MA-1a and MA1-b on the north side of the hill. The boundary of the proposed on-leash area has been adjusted to conform to existing trails and allows park users to have an on-leash circuit across the entire hill, even through MA-1 areas. In addition, there are 4.5 acres below Bernal Heights Boulevard that could be converted to off-leash to help off-set this reduction. Although portions of this area are steep, some areas could be developed with trails to accommodate public use and access.

It is very difficult to directly measure impacts of off-leash dogs on the landscape. It would require a highly controlled experiment designed to separate off-leash dog impacts from other impacts (human foot traffic, on-leash dogs, etc.), which is not considered feasible. However, the protocols for measuring the success of restoration and conservation projects as described in Section 7 could be modified to measure changes in vegetation in off-leash areas.

Recommendation GR-8b: When considering new DPAs within or adjacent to Natural Areas, on-leash and off-leash dog use should be matched with the sensitivity of the habitat. The highest impact dog use, off-leash recreation, should occur in the least sensitive habitat areas (MA-3 areas). In MA-1 and MA-2 areas dogs should be held on-leash. Currently, all MA-1 and MA-2 areas, excluding those in existing DPAs (Lake Merced, McLaren Park, Bernal Hill, and Buena Vista Park), are on-leash parks; however, many people use these on-leash areas for off-leash recreation. If dogs and people stayed on-leash and on trails in MA-1 and MA-2 areas, most impacts associated with dogs could be eliminated.

The MA-3 areas are the least sensitive habitat areas and are most appropriate for consideration by the DAC as off-leash areas. Most MA-3 areas lack steep slopes and could be considered as off-leash DPAs. Examples of appropriate off-leash areas in MA-3 areas include the tops of Billy Goat Hill and Kite Hill. If a proposed DPA is located next to an MA-1 or MA-2 area, the boundary between those activities may require fencing. For example, if an off-leash trail were established on the west side of Islais Creek in Glen Canyon, some sections of the creek might require fencing. For typical low rustic fence designs, see Appendix H.

Recommendation GR-8c: At this time, this plan proposes to restrict dogs from only three sensitive habitat areas. In McLaren Park (see GR-8a above and Section 6.19) access to a 0.6-acre creek area would be eliminated. In addition, at Sharp Park, access to habitat used by the federally endangered San Francisco garter snake (*Thamnophis sirtalis tetrataenia*) and federally threatened California red-legged frog (*Rana aurora draytonii*) should be restricted (see Section 6.4). This is a 33.3-acre area. Finally, access to the water at Pine Lake should be restricted. This is a small lake and wetland (1.7 acres) used by migratory and resident wildlife (see Section 6.7). Public access to the water's edge will continue at the beach access (soon to be renovated) on the eastern side of the lake. For logistical and aesthetic reasons, access to the water cannot be fenced at the east end beach. Therefore, at Pine Lake, signs stating that dog access to the water is restricted shall be posted at the east end access. These three proposed no-access areas total 35.6 acres, which include 2.3 acres in San Francisco and 33.3 acres in the City of Pacifica.

Additional sensitive habitats have been identified in Natural Areas but these areas are not proposed currently for any dog access restrictions. These areas include habitat for the endangered mission blue butterfly (*Icaricia icarioides missionensis*) at Twin Peaks (5.9 acres), Bayview Hill (1.3 acres), and McLaren Park (0.4 acres), as well as salt marsh wetlands at India Basin (2.3 acres), and the creek channel and wetlands at Glen Canyon (1.8 acres). A portion of these 12.3 acres are located adjacent to trails. If park users (and dogs) stay on trails, no further access restrictions or fencing would be required. However, if lack of enforcement and compliance with leash laws continues and/or damage to sensitive habitat areas is observed, SFRPD should consider restricting access to these sensitive habitat areas, as described in the Dog Policy, including physical barriers.

Permanent physical barriers are viewed as a last resort to be used only after signage and other soft solutions have been shown to be ineffective. If fences are installed, public access would still be allowed on designated trails; however, low trailside fencing would be installed to discourage people and dogs from drifting off-trail (see Appendix H for examples of low rustic fencing). If through monitoring these sites, it is determined that all 12.3 acres of sensitive habitat required trailside fencing, a maximum of 3,900 linear feet of trail, or less than 3 percent of all trails, would contain trailside fencing.

At this time 47.9 acres of sensitive habitat have been identified for monitoring or closure in San Francisco (14.6) and in the City of Pacifica (33.3). The Dog Policy allows restrictions in sensitive habitat in San Francisco. Any further restrictions in dog access in Natural Areas that include either installations of fences or other physical barriers or change in policy that are not covered in this plan should be presented to the DAC for review and the Recreation and Park Commission for approval prior to implementation. Thus the public will be informed and will have an opportunity to comment on any future changes to access prior to implementation. It is anticipated that any future restrictions would be located exclusively within MA-1 and MA-2 areas.

Issue GR-9 Small Mammal Habitat: Important elements within natural habitats for survival of small mammals, reptiles, and amphibians include underbrush, fallen logs, loose rocks, and rock outcrops. These elements are limited in their distribution and number.

Recommendation GR-9a: Brush, logs, rocks, and other natural elements that function as habitat for small mammals shall be preserved when feasible during vegetation management activities and in appropriate locations throughout Natural Areas (see the discussion of brush piles in Recommendation GR-4d).

Invertebrates

Issue GR-10 Invertebrate Habitat: Historically, native grassland habitats within the Natural Areas supported a wide array of butterflies and other insect species (e.g., native bees and beetles). However, species diversity has declined. This decline likely has been the result of native habitat loss due to development and increases in invasive plants. In some cases, some of the insect species that remain have adapted to using invasive plants such as sweet fennel (*Foeniculum vulgare*) and English plantain (*Plantago lanceolata*).

Recommendation GR-10a: As invasive plants are removed, install native plants or seeds that are beneficial to local insects. In revegetation efforts, favor native species that are suitable nectar and larval host plants for these species, such as those from the mallow (*Malvaceae*), carrot (*Apiaceae*), sunflower (*Asteraceae*), and legume (*Fabaceae*) families. Good native host plant species include lomatium (*Lomatium* spp.), aster (*Aster radulinus*), yarrow (*Achillea millefolium*), thistle, yampah (*Perideridia kelloggii*), and buckwheat. California lilac (*Ceanothus thyrsiflorus*) is an especially valuable nectar and

pollen source for maintaining bumble bee diversity (McFrederick 2004). Also consider reintroduction of host plant species that were historically present (Appendix E).

Recommendation GR-10b: In MA-3 grasslands, some invasive plant species that are host plants for local butterflies and other native insects may be maintained. These species will be prevented from spreading to MA-1 and MA-2 regions and threatening the native grassland community (GR-1a). In areas of recent disturbance, broadleaved invasive species that are host plants for butterfly species may be out competed by invasive species of grasses. In these areas, SFRPD should experiment with other techniques of vegetation management such as mowing or grazing that are not too labor intensive and would create a “patchy” structure that would be favorable to butterfly species (Huntsinger and Bartolome 2005).

SOILS, EROSION, AND PUBLIC USE

Most public use in Natural Areas is associated with trails (see Section 3). Public use of Natural Areas is not expected to decline, and management of the Natural Areas should consider that trail use will increase over the next 10 years. Significant numbers of homeless people use some of the parks, specifically the Oak Woodlands area of Golden Gate Park. This use has impacts that range from vegetation removal to creation of social trails to accumulations of trash and human waste. SFRPD, in concert with the San Francisco Police Department, has procedures to address homeless use of parks. Recommendations for solutions to this problem are beyond the scope of this document.

Issue GR-11 Trails and Views: Expanded and improved trail infrastructure, along with additional nature viewing experiences, has been identified as the most important and most needed park improvement to San Franciscans (see Section 3.4). Based on the current inventory, there are over 40 miles of trails within Natural Areas (Table 3-6). At most sites, trails in Natural Areas did not receive regular maintenance or improvements prior to the creation of the Natural Areas Program, and the trail system has suffered from this deferred maintenance. Also, many of the Natural Areas are covered with networks of social trails, which can and do create erosion problems. Social trails may include minor trails that short cut, yet lead to the same place as, major trails. Often these trails go directly up and down slopes with no steps, water bars, or other erosion control features. Social trails typically do not provide access to main points of interest in parks and are often associated with unauthorized activities. Well-planned formal trails are often subject to short-cutting of switchbacks, an action that tramples vegetation and exacerbates erosion. Erosion problems have been caused by excessive foot traffic that wears away the trails’ vegetation, in some areas creating wide swaths of exposed soils. In addition to the following recommendations, refer to erosion-specific BMPs in Section 5.3.

Recommendation GR-11a: Maintain and improve primary designated trails as identified in this plan (see Section 6). Approximately 17.2 miles of trails are proposed for improvement and maintenance (Table 3-6). Typical trail improvements will include wood

steps and trail contouring as shown in Appendix H, Figures H-1 to H-3. Another 12.5 miles of trails are considered unimproved designated trails that will remain. An additional 1.1 miles of new trails are proposed. Finally, this plan recommends re-routing or closing 10.3 miles of trail (approximately 26 percent of total existing trails).

Recommendation GR-11c: Public use in all Natural Areas, unless otherwise specified, should encourage on-trail use. To reduce the deleterious effects of trampling in unstable areas, formal use areas, including designated trails, shall be created at locations that are sufficiently stable to withstand the pressure of public use (see GR-11a). Additionally, interpretive and park signs should be installed or modified as appropriate to include “Please Stay on Trails” with information about why on-trail use is required. Temporary fencing may be required to allow for damaged areas to be restored. If off-trail use continues in a particularly sensitive habitat (e.g., wetlands), permanent fencing shall be considered as a last resort once all other options, including enforcement, have failed. Fencing to be used will be low and rustic, so as to not block views and to blend with the surrounding landscape (see Appendix H).

Recommendation GR-11d: Natural Areas shall be monitored on a routine basis for the development of new social trails. Those that impact sensitive species or sensitive habitats or that contribute to erosion problems shall be closed or re-routed (see GR-11b) with signs and brush barriers. Temporary fencing will be used as a last resort in these areas if less obtrusive measure (signs, brush barriers) are not effective. Install appropriate biotechnical erosion control measures (coir rolls or matting combined with native vegetation) and/or water bars to repair areas damaged by social trails and to prevent further erosion. Some of these measures are currently underway in several Natural Areas, but they need to be continued and expanded. Examples in Natural Areas where erosion control measures were well-designed and properly installed serve as an example to be followed for other locations:

- At Tank Hill, the designated trail from Belgrave Avenue is curved to conform to the contour of the hill and the risers are tied back into the face of the hill to prevent erosion around the ends. Treads are broad enough to allow some infiltration to occur, thereby reducing the flow of water along the stairway. The recently installed stairways at Twin Peaks and Glen Canyon Park also are good examples of proper stair construction.
- Dead branches culled from the Tank Hill Natural Area were used to construct brush barriers along the stairway to discourage park users from walking on the delicate and dangerously steep slopes of the hill.
- Similar brush barriers were placed along trails at Tank Hill and encouraged users to remain on the established paths.

- Signs on the brush barriers explain the program of native grass revegetation that has been undertaken in the Tank Hill Natural Area, and requests the users' assistance in maintaining and promoting the program.

These measures blend well with the park environment, are effective without intruding on the users' visual experience, and provide the public with a sense of participating in the rehabilitation process.

Recommendation GR-11d: In order to maintain and enhance public recreational experiences, viewsheds should be maintained. Key viewsheds can be blocked by planting trees and other large vegetation that block key public access points and views. Views from hilltops and across large Natural Areas are particularly important for the recreational trail user. Viewshed for park safety also shall be considered.

Recommendation GR-11e: Some formal trails lack amenities that may increase their use. Features such as overlooks or seating areas every few hundred yards along a trail should be considered when evaluating overall trail use. Creation of this type of feature would benefit habitat values by encouraging foot traffic to avoid more sensitive areas.

Issue GR-12 Erosion Control: Most of the Natural Areas occupy sites characterized by steep, erosion-prone slopes. Many of these locations exist as parks today because building homes or streets on such steep hillsides was considered infeasible. The soils in the steepest portions of these hillsides tend to be thin, sandy, and rocky, and support limited vegetative cover. This combination of factors (steep slopes, thin soils, sparse vegetation) makes the areas highly susceptible to erosion from wind, rain, and trampling. The effects of wind and rain are increased when trampling removes the sparse vegetation and disturbs the shallow soils. When other factors are equal, the severity of erosion is directly related to the level of uncontrolled public use, including the creation of social trails with little regard to slope, substrate, or vegetation (see GR-11). Therefore, the greater the uncontrolled use of the site, the more severe the erosion of the steep hillsides. Furthermore, the removal of vegetation, whether for restoration, safety, or beautification, can increase the risk of erosion.

Recommendation GR-12a: To promote general soil stability on steep slopes, areas of very thin vegetation cover shall be revegetated (see GR-1b). This includes revegetation of areas where invasive plants are removed. Straw mulch and other measures described below can be applied to protect the bare soil. Revegetation may not be possible on some rocky thin soil areas. Many areas with thin vegetation cover are high in native plant diversity and may need to be fenced to maintain soil stability.

Recommendation GR-12b: Reduce the erosion risk during the transition period between removal of non-native species and the growth of natives that replace them. Where feasible, implement restoration efforts gradually in erosion-prone areas so that exposure of large, unvegetated areas is minimized. Multi-layered vegetation (mixed stands of oaks, shrubs and grasses) is better at controlling erosion than monocultures of eucalyptus or ice

plant (Huntsinger and Bartolome 2005). Eucalyptus decreases soil permeability and contributes to erosion. Ice plant, long thought to be the best soil stabilizer of dunes, may in fact increase erosion risk on sandy slopes. Work that involves exposure of large areas of soil shall be completed during the dry season whenever possible. If this is not feasible, or if extensive areas of soil remain exposed after work is completed, revegetation or erosion control measures shall be implemented to control movement of soil from work sites during storms. An example of a temporary method of reducing downslope erosion is to install a row of abutting, securely anchored straw bales as required on work area slopes. These bales would be removed once areas were revegetated. See Section 5.3 for additional erosion control BMPs. In the case of ice plant removal, using herbicides and leaving a dead mat of plant matter is recommended. Leaving the root structure of trees in place will also help reduce erosion risk (Huntsinger and Bartolome 2005).

Issue GR-13 Safety: During management of the Natural Areas it is important to pay attention to conditions that may affect the safety of visitors and surrounding homes. These include development of vegetation that creates fire hazards, decreased site-lines on trails, and dense vegetative screening that allows concealment from other view points. Use of the Natural Areas for illicit reasons decreases the enjoyment and safety of Natural Area visitors and often leads to increases in trash and human waste.

Recommendation GR-13a: As resources are available, SFRPD should discourage establishment of vegetation with high fire hazard ratings such as dense and aging French broom and eucalyptus stands adjacent to homes and other structures (EBMUD, 1992). When possible, minimum fire reduction zones of 30 feet should be maintained. Examples of fire reduction zones include grasslands and shaded fire breaks (i.e., open forests and scrub). Also, no brush piles shall be created within this zone. Trees determined to be hazardous to adjacent homes by the SFRPD Arborist should be removed.

Recommendation GR-13b: To increase safety on trails, maintain clear passage ways by removing encroaching vegetation and maintaining site lines. Areas that become a focus for illicit activities and homeless encampments should be jointly addressed by SFRPD and the San Francisco Police Department as required.

EDUCATION

Issue GR-14 Education: There is little public awareness about native ecosystems and their importance to humans as well as native plant and animal species. However, because of the wealth of resources, ease of access, and diverse locations, the Natural Areas provide abundant ecological educational opportunities.

Recommendation GR-14a: The SFRPD shall continue to network with local schools and research institutions to provide environmental education resources and opportunities for school children in San Francisco (or Pacifica as in the case of Sharp Park). Additionally,

SFRPD shall continue to identify research projects and funding opportunities for on-going research.

Recommendation GR-14b: The SFRPD shall develop signage appropriate for installation within Natural Areas that explains the importance of the natural resources, ecosystem functions, management activities and goals, and public involvement contacts. Installation of signs in large regional parks shall take precedence over signs in small parks (see Section 6). Signs already installed within Natural Areas shall be maintained and updated as required to provide current and correct information to park users.

Recommendation GR-14c: Educational materials, including signage to be installed at the appropriate locations and informational handouts, shall be created that discuss the impacts of feeding wildlife and wild animals as well as the problems associated with releasing unwanted pets into Natural Areas. Wild animals in this context refers to pigeons, raccoons, ducks, etc., not feral cats (see GR-7 for recommendations regarding cats). Specific topics to be discussed include, but are not limited to, transfer of disease, decreased sensitivity to humans, negative effects on other wildlife (in the case of pigeons), and the potential long-term need for control of animal populations maintained by artificial feeding.

Recommendation GR-14d: Special outreach shall be conducted to educate adjacent property owners about the impacts mentioned above in GR-14c, as well as the potential impacts associated with planting invasive plant species. Information should be distributed “door-to-door” in the form of handouts or brochures. Specific topics to be discussed include impacts of invasive plant species on sensitive species that are in danger of going locally extinct. Suggestions regarding native plant species that would thrive at a specific site should be made as alternatives to invasive plant species.

FORESTRY

Issue GR-15 Urban Forests: Urban forests found in Natural Areas are resources for people and wildlife. The year-round greenscape provided by urban forests, as well as the stature and character of these stands of large trees, are valued by residents and visitors. Also, urban forests provide shade and windbreaks that can enhance the park user experience. Urban forests also are valuable to wildlife, providing nesting, foraging and escape habitats for many species.

Almost all urban forests in Natural Areas are classified as MA-3 areas. Of the approximately 362 acres of invasive forest, approximately 199 acres are classified as MA-3 urban forests. These urban forests are located in Bayview Park, Glen Canyon Park, Edgehill Mountain, Lake Merced, McLaren Park, Mount Davidson, Pine Lake, Interior Greenbelt, Dorothy Erskine Park, Corona Heights, Fairmount Park, and Sharp Park. It is estimated that about 35,000 trees occur in the MA-3 urban forests within San Francisco (see Appendix F for details on tree estimation

methodology).⁶ The MA-3 areas are, by definition, the lowest-priority areas within Natural Areas (see Section 1). Urban forest stands that contain significant native plant understory and are planned for native plant and animal habitat restoration are classified as MA-1 or MA-2 and are not considered here. Recommendations for MA-1 and MA-2 areas are described in individual chapters in Section 6 and Appendix F describes the species to be removed, removal methodology, snag retention and debris removal, target basal area, impacts on aesthetics, potential windthrow hazards, sightlines, and other tree removal impacts.

The urban forests in Natural Areas are comprised largely of mature blue gum eucalyptus with smaller numbers of Monterey cypress (*Cupressus macrocarpa*) and Monterey pine (*Pinus radiata*). Many of these MA-3 urban forests were planted roughly at the same time and have reached maturity. In most cases these urban forests are dominated by large trees, although density is often highest at forest margins. Management actions within MA-3 stands should promote age diversity. Many of the urban forests are heavily infested with English (*Hedera helix*), Algerian (*Hedera canariensis*) and Cape ivy that climbs the trees, eventually killing them. In other areas of the forest, mature trees are aging, damaged by storms, and potentially hazardous to Natural Area users. In addition, there are several insect and fungal pests that are known to infect blue gum eucalyptus and can weaken trees and urban forest stands. The size of trees within a given stand varies depending on the Natural Area, age of stand and past management actions. Some stands are mostly smaller trees (e.g., Bayview Park) while others are mostly larger trees (e.g., Mount Davidson). Stands within mature forests at Natural Areas tend to have fewer relatively large trees. For example, one area of McLaren Park was estimated to have as few as 62 trees per acre,⁷ most of which were large (over 18 inches in diameter at breast height). The same survey in Glen Canyon Park resulted in over 1,400 trees per acre, most of which were small (less than 6 inches in diameter at breast height). According to recent surveys conducted by the Natural Areas Program, the average basal area per acre of the urban forests within Natural Areas ranges up to 600 square feet.⁸

Recommendation GR-15a: Urban forests within the MA-3 areas should be maintained with a basal area per acre of between 200 and 600 square feet. This range encompasses most of the existing MA-3 areas within the Natural Areas at this time. Management of the stands will be driven primarily by opportunities created by the natural aging of the stand, or other natural factors that affect the health of the urban forest (e.g., windthrow, disease,

⁶ There are approximately 118,000 trees within Natural Areas urban forests. Of these, approximately 54,000 trees are at Sharp Park; therefore, there are approximately 64,000 trees within San Francisco. MA-3 areas account for approximately 55 percent of the 362 acres of urban forest. Therefore, MA-3 acres should contain approximately 55 percent of the trees, or approximately 35,000 trees (see Appendix F for calculation details).

⁷ For purposes of this Final Draft, a tree is defined as “a plant with one dominant vertical trunk and a height greater than 15 feet (Harris 2003).

⁸ Basal area measurements are a standard method used in the California Forest Practice Rules by the California Department of Forestry and Fire Protection for determining post harvest stand stocking levels after timber harvest operations (California Department of Forestry and Fire Protection 2005). Post harvest stocking levels refers to the density of trees in an area after tree removal activities have occurred. In a study of state-owned forest land in Hawaii, stocking of eucalyptus forests ranged from a low of 117 square feet per acre to a high of

insects, invasive species), but will focus on improving and maintaining the health of each stand. For example, if trees in the stand become infected with a disease, tree removal activities should be conducted to remove the trees to improve forest health and prevent the spread of the disease to other trees in the stand. In some cases, to achieve the management goals, periodic removal of trees in the MA-3 urban forests may be required.

Recommendation GR-15b: In order to maintain the forest as it ages, it is necessary to maintain a stocking rate that will perpetuate the urban forest and promote forest health. Over time, it will be necessary to grow a new age class of trees, which will eventually replace the existing mature canopy. This will be accomplished through natural and artificial regeneration methods. Natural regeneration refers to the seedlings and saplings that establish naturally. Blue gum eucalyptus is likely to be the primary species that regenerates naturally although the other invasive species also regenerate. Artificial regeneration refers to the planting of trees by people for management purposes. California native trees that offer the greatest value to wildlife such as Monterey cypress, Monterey pine and Douglas fir (*Pseudotsuga menziesii*) will be used. Tree planting can take advantage of openings in the urban forest canopy that are created either naturally or from other management activities.

Regeneration rates for individual MA-3 stands will be determined by SFRPD staff or the SFRPD Arborist and generally conform to stocking rates between 50 and 150 seedlings, saplings or poles per acre. Areas exceeding 150 seedling per acre may require thinning of some suppressed or stressed trees or if overcrowding is adversely affecting forest health. In many cases, planted areas may not be as large as one acre. In these locations the SFRPD Arborist shall determine the appropriate stocking level.

Recommendation GR-15c: To promote forest health, removal of trees shall focus on the removal of dead or dying trees, trees with disease or insect infestations, storm-damaged or hazardous trees, and trees that are suppressed because of overcrowding.

Recommendation GR-15d: No sensitive species shall be planted in the MA-3 urban forests.

Recommendation GR-15e: Removal of invasive Cape, English and Algerian ivy and Himalayan blackberry may be required in some MA-3 stands to promote and maintain urban forest health. Stems of ivy that are growing into the canopy of trees can be severed near the base of the tree, but this should be done without damaging the tree itself. In areas where natural regeneration is limited by invasive plant species, artificial regeneration may be used if resources are available to prepare the site prior to planting. Site preparation could include removal of invasive understory vegetation; control of the initial growth of invasive species; and, the piling and chipping of woody debris. Urban forest

356 square feet per acre (Constantinides et al. 2000). For comparison, 300 square feet of basal area per acre could equate to 550 trees with diameters of 10 inches, or 22 trees with diameters of 55 inches, in a single acre.

weed and tree management may expose soils that would be prone to erosion. Erosion control measures described in Section 5.3 shall be implemented, where appropriate, for projects in the urban forest.

Recommendation GR-15f: The SFRPD Arborist will be consulted when tree removals or planting are proposed in MA-3 urban forests.

Recommendation GR-15g: To the extent possible, install trees and shrubs in the urban forests to promote species diversity and improve wildlife habitat. The diversity of species that will grow in the understory and in gaps will be limited by canopy density and chemical composition of the soil and litter layer of the primary overstory trees proposed for the forest. Certain species, specifically blue gum eucalyptus and Monterey cypress, suppress the growth and survival of many species. However, some species such as coast live oak (*Quercus agrifolia*), Douglas fir, and Monterey pine may survive in gaps. These trees provide wildlife habitat, and if planted around the edge of openings will enhance structural diversity in the forest. Based on observations of current plant distribution, toyon (*Heteromeles arbutifolia*), osoberry (*Oemleria cerasiformis*), and elderberry appear to be the most tolerant of conditions in the eucalyptus understory. These species will improve wildlife habitat structural diversity where the urban forest canopy is dense.

Recommendation GR-15h: Where appropriate, use City-approved insecticides to treat cut stumps.

5.3 BEST MANAGEMENT PRACTICES (BMPs)

EROSION CONTROL

Removal of vegetation prior to revegetation can create a situation where exposed soils may be subject to erosion. Most BMP manuals focus on management of exposed soils during construction projects. While these projects are different in scope from those being conducted by the Natural Areas Program, some of the BMPs are applicable. The following is a brief annotated list of appropriate measures taken from the referenced documents. Each of these manuals is a public document that is available for free download from different internet sites. Full citations and website addresses are included in Section 8.

The California Department of Transportation (Caltrans) has published a useful document, *Guidance for Temporary Soil Stabilization* (Caltrans 2003). Hydroseeding and hydromulching involve a combination of seeds or straw mulch mixed with water and a binding material that is sprayed to form a solid blanket over exposed soils. In hydroseeded areas the seeds in the mix germinate and root into the ground, thus holding the soils in place. Hydromulching relies on the straw mulch to prevent erosion. While both of these applications are typically used for large-scale projects, many elements are applicable to erosion control projects in Natural Areas. The BMPs from the Caltrans manual that are most applicable to smaller-scale projects include the

application of straw mulch (SS-6), rolled erosion control products (SS-7), wood mulch (SS-8), silt fences (SC-1), and fiber rolls (SC-5) (Caltrans 2003).

- **Straw Mulch (SS-6)** – This method lends itself to quick applications of areas where long-term erosion protection is not required. One of the limitations to the application of straw mulch is that if it is not anchored, it may be blown offsite. Additionally, the labor required to cover large areas can make this method prohibitively expensive. However, restoration sites are typically relatively small and hand application of straw mulch could help meet immediate erosion control needs.
- **Rolled Erosion Control Products (SS-7)** – These products include geotextile blankets, plastic covers, erosion control blankets, netting, and mats. They are provided typically in rolls and are used to protect exposed soils from water and wind erosion. They can be used on their own, or in conjunction with other measures such as mulching or revegetation. There are a wide array of products within this category of materials. Most of them are pervious to water, biodegradable, and readily available. Plastic covers can be used for those areas where it is necessary to prevent water from penetrating into the soil. Regardless of the measure to be installed, they need to be anchored to the ground properly.
- **Wood Mulch (SS-8)** – Wood mulching is the application of chipped wood products to the soil surface to prevent erosion generated by wind and water. Wood mulch helps prevent erosion by increasing infiltration and thereby decreasing runoff. Additionally, it can help retain moisture, thereby reducing irrigation needs. As a drawback, it should not be applied to steeper slopes, greater than 1:3 (vertical : horizontal) because it has a tendency to move downslope. Also, wood mulch tends to tie up available nitrogen, thus making this important nutrient unavailable to plants. Finally, because wood mulch typically is installed by hand, substantial amounts of labor may be required.
- **Silt Fences (SC-1)** – Silt fences are commonly made of a permeable geotextile fabric that is attached to stakes and installed along the contours of a slope. The bottom of a silt fence is typically trenched into the soil to create a complete barrier. The fence is intended to intercept and reduce the velocity of sediment-laden sheet flow.
- **Fiber Rolls (SC-5)** – Fiber rolls are comprised of wood, straw, or coconut fibers that have been compacted and rolled into a long tube shape. These are then installed along the contour of a slope and held in place by stakes. They may be slightly trenched into the soil to help intercept sediment-laden sheet flow. Fiber rolls may also be installed around inlets of storm drains and culverts to help control release of sediment.

The California Stormwater Quality Association (CASQA) has assembled a set of stormwater best management practice handbooks for different types of activities: construction, new development and redevelopment, municipal, and industrial and commercial. The manual that provides the most pertinent BMPs for the work SFRPD conducts within the Natural Areas is the *Stormwater Best Management Practice Handbook, Construction* (CASQA 2003). This manual is

one of the standard documents used in the preparation of stormwater pollution prevention plans for all major construction projects. In general, the BMPs that could be used in relation to restoration projects and potential erosion issues include straw mulch (EC-6), geotextiles and mats (EC-7), and wood mulching (EC-8). Additionally, the measures identified as sediment control BMPs that could apply include silt fence (SE-1), fiber rolls, (SE-5), and straw bale barriers (SE-9). These measures are similar to those described above in the Caltrans BMPs. The straw bale barrier BMP involves the placement of straw bales on contour through a project site. These bales are then staked in place, allowing them to intercept sheet flow, thereby slowing the movement of water and allowing sediments to be deposited onsite. Straw bale barriers can be especially useful in areas where a substantial amount of water or sediment may move during rain events because they are taller and sturdier than fiber rolls and do not overtop as quickly. Also, they are relatively easy to install and maintain.

A third BMP source is the CDFG *Salmonid Stream Restoration Manual* (Flosi et al. 1998). This document is the standard reference for restoration work to be conducted within a flowing water ecosystem. It contains a multitude of restoration design elements, including instream log structures, weirs, check dams, brush boxes, willow wattling, and erosion control mattresses made from brush. Most of the measures within this document pertain specifically to instream situations, of which there are very few within the Natural Areas (one being Islais Creek in Glen Canyon). However, some measures may be easily adapted to upland uses.

PATHOGEN CONTROL

The spread of pathogens from one area to another is possible through a variety of means. Infected plants obtained from a nursery can transmit infections to healthy plants when they are planted. Personal equipment, clothing, tools, and vehicles used at an infected site and then used in an area of healthy plants without being subjected to a disinfection process can release pathogens into an otherwise healthy site.

One of the more recent diseases of concern has been sudden oak death, now found in most coastal California counties from Humboldt to Monterey, including San Francisco County.⁹ Precaution should be taken when work is being conducted in a known site for sudden oak death. According to the California Oak Mortality Task Force, as a precaution, tools should be cleaned and disinfected after use on confirmed or suspected infested trees. Additionally, tools should be sanitized before being used on healthy trees. Vehicles should be cleaned of mud, dirt, leaves and other woody debris before leaving an infected area. Tools and clothing should be disinfected with either Lysol® spray, 70 percent or greater alcohol, or chlorine bleach (1 part bleach to 9 parts water) (COMTF 2004). In addition to helping to prevent the spread of sudden oak death, these standard measures will help prevent the spread of other pathogens that may affect plants or amphibians.

⁹ Sudden oak death is caused by a fungus-like organism (*Phytophthora ramorum*). Large numbers of coast live oaks, tanoaks (*Lithocarpus densiflorus*) and black oaks (*Quercus kelloggii*) have died from this disease. In addition to oak trees, 35 other plant species are susceptible to the pathogen (COMTF 2004).

Similar measures should be applied to all aquatic sampling, restoration, or monitoring activities to prevent pathogen spread (USFWS 2003). Essentially, all dirt and debris (including snails, mud, plant material, and algae) should be removed from any surface that has come in contact with the potentially infected water before leaving each study site. Equipment should be scrubbed with a bleach solution, 70 percent ethanol, QUAT 128 (quaternary ammonium at a 1:60 dilution), or a 6 percent sodium hypochlorite 3 solution. All equipment should be rinsed with clean water before being re-introduced to a new site. If a site is known or suspected to contain infected organisms, disposable gloves should be worn and changed before moving between sites. All used cleaning materials should be properly disposed of and cleaning should not occur in the immediate vicinity of a wetland.

WEST NILE VIRUS

First detected in the United States in 1999, West Nile virus (WNV) is a mosquito-borne disease that is common in Africa, west Asia and the Middle East. In 2004, California cases totaled 829 WNV human infections from 23 counties. West Nile virus activity has been detected in all counties, but there have been no cases reported from San Francisco (DHS 2005). Although it can be fatal to birds (and even humans), most of the people infected with WNV do not exhibit any symptoms. The San Francisco Health Department currently participates in the statewide IPM program targeting WNV. In Natural Areas, two types of BMPs are recommended:

1. Staff should be provided education regarding the most effective way to avoid contracting WNV, which is to not get bitten by mosquitoes. Clothing such as long pants, long-sleeved shirts, and application of a mosquito repellent may all be helpful in this regard. Volunteers and site stewards working with the program should also be informed.
2. Some Natural Areas contain small water features such as abandoned tires and other refuse that holds water. In some cases, it is desirable to remove these features, especially if they do not provide value to wildlife. In other cases, it may be important to encourage the development of small water sources for wildlife. Whether intentional or not, these standing water features could provide breeding habitat for mosquitoes. If small water features are to remain or be developed in Natural Areas, the water can be treated with BT (*Bacillus thuringiensis israelensis*), a safe and ready-to-use biocontrol treatment for mosquitoes, if Public Health Services indicates a potential health hazard. The SFRPD/PM Program will work closely with PHS and SFRPD staff to respond to a potential WNV outbreak.
3. Staff should be encouraged to drain any standing water that is caused by equipment in storage or temporary depressions.

Table 5-1: Current and Proposed Dog Play Area Acreages

Facility Name	Current Acreage	Plan Recommendation	Proposed Acreage	% to remain
Bernal Hill	21.0	Reduce by 6 acres in MA1 and erosion prone areas	15.0	71%
Buena Vista	1.0	Monitor for impacts to oak woodlands	1	100%
Corona Heights	0.4	No change	0.4	100%
Golden Gate Park SE	2.6	No change	2.6	100%
Golden Gate Park NE	0.2	Monitor for impacts to oak woodlands	0.2	100%
Lake Merced	5.0	Keep open and monitor, investigate other locations and relocate if necessary	5	100%
McLaren Park Crocker Amazon	1.8	No change	1.8	100%
McLaren Park Geneva	0.9	No change, needs signs to delineate northern edge	0.9	100%
McLaren Park Shelley Loop	59.0	Reduce by 8.3 acres for wildlife, monitor MA1 areas	50.7	86%
Pine Lake	3.3	No change	3.3	100%
Total Acres in Natural Areas	95.2		81	85%
Other RPD DPAs	22.3		22.3	
Total DPA Acreage on RPD Property	117.5		103.24	88%
These acreages are estimates				