

Yerba Buena Island : Habitat Management Plan



Prepared for : Treasure Island Community Development

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An Introduction to the Habitat Management Plan

This Habitat Management Plan has been developed at the direction of Treasure Island Community Development (TICD) and Treasure Island Development Authority (TIDA), as part of the Treasure Island / Yerba Buena Island Redevelopment Project. The proposed Redevelopment Project includes dense, compact development on portions of the two Islands, thereby freeing up the remainder of the land for the creation, restoration and/or enhancement of both developed and natural open space. A guiding principle of the proposed Redevelopment Project is to transform the Islands into a regional destination. This would be accomplished by providing a vibrant mix of visitor and destination serving programs such as arts, cultural, entertainment and educational uses, as well as a diversity of parks and open space experiences. On Treasure Island (TI), the proposed programming for the open space is primarily for active recreation areas, whereas on Yerba Buena Island (YBI), most of the open space is proposed to be managed as natural habitat and passive open space. This Habitat Management Plan explains how this will be accomplished.

Yerba Buena Island is a special place. In stark contrast to its neighbor to the north, YBI is a steep and rocky natural island. It is relatively densely vegetated, although non-native and invasive species represent a large and increasing threat to the remnant native habitat. Nevertheless, there are pockets of nature remaining on YBI that represent the best of California landscapes.

From the perspective of TICD and TIDA, the project sponsors, it is important to note that the preservation, restoration and enhancement of the natural areas on YBI would not be possible without the proposed project. Volunteer-based and/or grant-funded stewardship projects, however, should be explored and encouraged to begin to remove some of the worst threats. While areas for new development are generally aggregated and overlap with existing developed areas, in some locations new development will affect land that has not previously been developed. In most of those locations, the ability of the existing landscape to support habitat is quite poor; in those few locations where exceptionally large native trees exist today, efforts will be taken to protect them. While the extent and impacts of site preparation and infrastructure improvements required to support new development cannot be known at this time, TICD and TIDA have proposed development standards and design guidelines that would control development within such areas that are not subject to this Habitat Management Plan.

Beyond development, another mandate on the project is to comply with the public trust (sometimes known as the "tidelands trust"). The project's goal of creating a regional destination on YBI that provides enhanced public access, preservation and restoration of wildlife habitat, protection of views, and visitor uses of historic building areas is consistent with the public trust.

In order to enable the development of housing and other non-public uses on Treasure Island, TIDA has obtained legislative authorization, subject to the approval of the State Lands Commission, to lift the public trust from portions of Treasure Island and impress it on portions of Yerba Buena Island, which as a natural island would not normally be subject to the trust. As trustee of the public trust, TIDA will be responsible for assuring that the development of new areas to be brought into the trust proceeds in a manner that complies with the public trust doctrine. The Treasure Island / Yerba Buena Island Redevelopment Project proposes a complementary mix of public uses, such as hotel development, recreational open space, wildlife habitat and trails, consistent with the following policy:

Traditionally, public trust uses were limited to water-related commerce, navigation, and fishing. In more recent years, however, the California Supreme Court has said that the public trust embraces the right of the public to use the navigable waters of the state for bathing, swimming, boating, and general recreational purposes. It is sufficiently flexible to encompass changing public needs, such as the preservation of the lands in their natural state for scientific study, as open space and as wildlife habitat. The administrator of the public trust "is not burdened with an outmoded classification favoring one mode of utilization over another."¹

The goal of providing public access while respecting wildlife use is also supported by the San Francisco Bay Plan. The San Francisco Bay Conservation and Development Commission has given Yerba Buena Island a Park Priority designation, and also has jurisdiction over development within the 100-foot shoreline band around the edge of YBI. The development proposal responds to the Park Priority designation by creating a diversity of regionally serving open spaces including a hilltop park, and an interconnected trail network, which includes an extension of the San Francisco Bay Trail from the new East Span of the Bay Bridge. Within the 100-foot shoreline band, the steep terrain will gener-

¹ http://www.slc.ca.gov/Policy_Statements/Public_Trust_Home_Page.html.



Yerba Buena Island

ally prohibit much enhancement of public access; however, those areas that are accessible (e.g. the Clipper Cove Beach and portions of the flat areas surrounding the Senior Officers' Quarters Historic District) will need to allow for public access consistent with Bay Plan policies:

If not properly located, improved or managed, recreation activities can have adverse effects on wildlife. This problem can be addressed by applying the Bay Plan public access findings and policies that address the compatibility of recreational activities with wildlife and their habitats when considering recreation-related development proposals.²

The timeline for implementation of the HMP is a long one, longer in fact than the timeline for the build-out of the proposed project. The HMP, proposed by TICD and TIDA as part of the Redevelopment Project, would not be implemented unless and until the project is approved. Should the proposed project be approved, HMP activities could begin as early as the redevelopment of YBI commences. However, there is no "end" to the HMP – long term monitoring and adaptive management of the habitat areas on YBI will be required so long as habitat provision remains a goal.

The HMP presented here is a plan and a process, a framework but not a result. The HMP will ultimately be overseen and implemented by TIDA, as the long-term owner of the habitat management areas. TIDA will in turn likely call on the resources of many different groups to implement the HMP: TICD, who will provide initial capital for a portion of the early HMP work to be completed; professional biologists, who will be hired to oversee activities as they are carried out; paid staff, who will complete necessary maintenance and more complex projects; and volunteers, who will likely do everything from conducting docent-led tours of the Island to hand weeding and clean-up. The long term vision described in this document is of broad goals, best management practices, and Management Zone prescriptions and priorities, but the vision will need to get translated into more and more specific plans as the work progresses. The responsibility for permitting these specific plans in a timely manner will rest with TIDA.

The HMP is meant to be a living document and the prescriptions set forth in this Plan are not meant to preclude additional studies but in fact recommends them. Site-specific plans are required to be developed at a level of detail simply beyond the scope of this Plan itself. Long-term monitoring will also help to inform future planning and the HMP will continue to be refined in the future according to the principles of adaptive management.

The HMP provided here has two parts. Part I describes existing conditions and discusses what is proposed for Yerba Buena Island. Part II prioritizes the proposed actions and talks about how the HMP might get implemented.

² http://www.bcdc.ca.gov/laws_plans/plans/sfbay_plan#2

Habitat Management Plan, Part I

Section I, *Overview*, of the HMP provides the reader with the background and planning context for the YBI HMP, as well as a summary of recommended strategies and management actions for YBI that are detailed in Section IV of this document.

Section II, *Existing Conditions* contains a discussion of the physical setting, including topography, geology, and climate. Vegetation communities were mapped for the entire island and are characterized here, with unique or otherwise notable attributes for each vegetation map unit described. While it was beyond the scope of the preparation of the HMP to conduct a detailed wildlife inventory, much of what is currently known about YBI's wildlife, including native and non-native species, as well as special-status species, is also described.

Section III, *Future Vision* summarizes TICD and TIDA's proposed plans for developed areas on YBI and provides a discussion of the public vision for the habitat management component of YBI's redevelopment.

Section IV, *Habitat Management Strategies and Recommendations* discusses two ecologically based concepts for habitat management underlying the HMP, managing for special-status species and managing for biodiversity. This section moves on to a discussion of three basic strategies, preservation, restoration, and enhancement, that will be used to achieve HMP goals. The section then sets forth the goals and objectives of the HMP, with the three management strategies incorporated as the primary objectives of the HMP. Finally, this section discusses the primary management actions recommended by the HMP.

Section V, *Best Management Practices* identifies measures to be taken to minimize potential impacts of plan implementation, including, among others, impacts that could result from recommended actions such as revegetation, fence installation, and invasive species removal.

Section VI, *Management Zone Prescriptions* provides detailed recommendations on habitat management on the Island. The section first defines the HMP Management Zones, providing a rationale for their boundaries and a discussion of some of their specific attributes, as well as actual and potential threats to natural communities, within each zone. Basic overarching management prescriptions were developed for each zone by considering the existing constraints, threats, resources, and opportunities in each zone. More detailed management prescriptions are then given for each Habitat Map Unit. These will be the guide for future actions as the HMP is implemented over time.

Habitat Management Plan, Part II

Section I, *Introduction to the Implementation Plan* frames the implementation of the Plan and describes how improved habitat can be sustained in the long term.

Section II, *Management Plan Priorities* provides direction for implementation of prescriptions based on ecological priority.

Section III, *Coordination with Treasure Island Development* considers the Plan components in the context of the actions of the larger Treasure Island Redevelopment Project and the Islands' management bodies.

These considerations, ecological priority and coordination with development, are the source material for Section IV, *Implementation Schedule*.

Section V, *Long-term Monitoring and Maintenance* outlines a process for assessing the success of management actions and approaches to rectifying problems identified after implementation.

Lastly, *Literature Cited and References Consulted* provides the literature and other references consulted in the preparation of the HMP.

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Part I : Habitat Management Plan

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I. Overview

A. Background

Treasure Island and Yerba Buena Island (collectively, the Islands) are in San Francisco Bay, about halfway between the San Francisco mainland and Oakland. The Islands are the site of the former Naval Station Treasure Island (NSTI), which is owned by the United States Navy. The Naval Station was closed on September 20, 1997, as part of the Base Realignment and Closure III program. The Islands also include a United States Coast Guard Station, a United States Department of Labor Job Corps campus, and land occupied by the San Francisco-Oakland Bay Bridge and tunnel structures.

The Treasure Island Development Authority is proposing a Redevelopment Plan for Treasure Island and Yerba Buena Island (Redevelopment Plan) that would provide the basis for redevelopment of most of the NSTI lands (the TIDA Plan Area or project site) from a primarily low-density residential area with vacant and underutilized non-residential structures to a new mixed use community with a variety of housing types, a retail core, a variety of open space and recreation opportunities, on-site infrastructure, and public and community facilities and services.

The Redevelopment Plan and other planning documents would establish the land use controls and design standards for the project site. Implementation of the Redevelopment Plan would be through a Disposition and Development Agreement (DDA) between TIDA and Treasure Island Community Development, LLC, and related transactional documents. The basis for the Redevelopment Plan and the DDA is the Development Plan and Term Sheet for the Redevelopment of Naval Station Treasure Island (the Development Plan) endorsed by TIDA in October 2006 and by the San Francisco Board of Supervisors in December 2006. The Development Plan was prepared along with supporting studies that address project design concepts, transportation, infrastructure, sustainability, community services, affordable housing, jobs, and other aspects of the development.

The proposed development program includes approximately 8,000 housing units and a mixed-use urban core, with approximately 550,000 square feet of commercial/retail space, including both new construction and adaptive reuse, centered around an intermodal transit facility. Approximately 200-300 of the new homes will be built on YBI. The project also includes approximately 300 acres of parks and open space in total, of which approximately 74 acres are on YBI.

While both TI and YBI are to be redeveloped as part of the Redevelopment Plan, YBI's history and character are greatly distinct from that of TI. The history of YBI is complex and similar to that of California in microcosm, with most of the associated assaults on natural ecosystems: extensive goat grazing beginning in the 1830s, occupancy by the U.S. military beginning in 1868, and extensive attempts to "improve" YBI through the planting of thousands of Monterey pines, Monterey cypress and eucalyptus. Tree planting efforts began with California's first celebration of Arbor Day in 1887 and continued through the 1940s and have had a profound negative effect on much of the Island's vegetation. Yet from the perspective of habitat planners, it has retained, again in microcosm, many areas that either reflect the ecological diversity of the Bay area, or, in a few cases, have preserved unique examples of it. The Bay Area environmental community has long taken notice: the California Native Plant Society offers tours of the Island's native habitats, work parties organized by Nature in the City "weed" these areas to protect them, and bird counts and other wildlife inventories on Yerba Buena Island are conducted by the Golden Gate Audubon Society.

In recognition of this, in the 2006 endorsement of the Development Plan, the Board of Supervisors added a requirement that "a management plan for the natural areas on Yerba Buena Island shall be developed and adopted" as a condition of the Board's approval of the final DDA.



San Francisco Bay Area

I. Overview

In 2008, Conger Moss Guillard (CMG), working with EIR team members Turnstone Consulting and Environmental Science Associates (ESA) of San Francisco, were tasked by TIDA and TICD to prepare this Habitat Management Plan (HMP) for YBI.

B. Summary of the Planning Process

The planning process undertaken by TIDA and TICD to develop the HMP included the following:

- *Mapping of habitat types and describing the existing conditions on YBI, including those on parts of YBI that are not actually part of the HMP arena of interest, in order to fully inform the planning process.*
- *Reviewing any constraints (and the identifying new opportunities) to the design or implementation of the HMP, especially regarding expectations of the interested public.*
- *Developing “prescriptions” for each habitat type, or aggregation of types, in sufficient detail to allow implementation by a restoration ecologist.*
- *Describing Best Management Practices (BMPs) that will be required to minimize any potential impacts from activities associated with HMP prescriptions.*
- *Prioritizing HMP prescriptions and actions, both in terms of ecological importance and cost-effectiveness.*
- *Sequencing HMP actions in coordination with Treasure Island development activities.*
- *Developing a long-term Monitoring and Maintenance Program, which would include performance criteria and actions to be taken in response to changing conditions (i.e. adaptive management).*

The HMP reflects the outcome of each of these steps.

Limitations on the Scope of the HMP

This HMP is bounded in a number of respects. First, geographically, the HMP applies to the natural areas of YBI that are within the TIDA area. It does not apply to the Coast Guard lands, the Caltrans right of way, intertidal and off-shore areas, or to TI.



Redevelopment Plan for Treasure Island and Yerba Buena Island

This HMP is also bounded by the presence of other, overlapping regulations and documents. In any complex development project such as this one, with collocated lands with multiple uses, decisions on land designations and treatment are essentially shared or partitioned between planning authorities, and this division of labor needs to be clear at the outset. Accordingly, the YBI HMP recognizes that many actions that will benefit or protect natural systems are more logically and effectively dealt with as part of the analysis of Treasure Island development under the California Environmental Quality Act (CEQA) process. As the Treasure Island project is implemented, and both Islands are managed over the long term, certain natural resource issues will fall under the mitigation measures for the substantial changes in, or threats to, current environmental conditions. For example, tide pools along the western shore of YBI and eelgrass beds on the eastern side are best “managed” by CEQA commitments to control uses and avoid impacts, even when this Plan – for the sake of completeness – provides a discussion of them in Section II, *Existing Conditions*. In other cases, the HMP defers to the Redevelopment Plan for commitments regarding policies that pertain to residential development. (For example, control of feral cats and free-roaming pets, night lighting, and landscape planting around houses).

C. Summary of Management Actions

This section summarizes the primary actions to be implemented in order to achieve HMP goals and objectives; these actions are discussed in more detail in Section IV, *Habitat Management Strategies and Recommendations*. The actions are grouped below under the three main strategies or objectives discussed in Section IV: Preservation, Restoration, and Enhancement.

Recommended Actions Under All Strategies:

- *Establish permanent or seasonal access restrictions through fencing and/or signage. Trails through especially high value areas, such as the oak woodland in Map Unit 6 could be fenced on both sides to ensure that recreational users remain on trails.*
- *Establish educational programs on the importance of YBI’s biological resources as well as supporting established stewardship programs and developing new ones.*

Recommended Actions Under the Preservation Strategy:

- *Map rare plant populations and other resources of interest.*
- *Conduct regular early detection monitoring for non-native plant invasions and remove promptly if found.*

Recommended Actions under the Restoration and Enhancement Strategies:

- *Revegetate to establish site-specific and appropriate habitat that provides desirable habitat values and functions. Revegetation may involve installation of irrigation and temporary and permanent fencing, hand-seeding, hydro-seeding, and planting container stock of native, local, and ecologically appropriate plant species.*
- *Reintroduce special-status plants to suitable habitat on YBI to enhance a valuable natural resource that contributes to the overall biodiversity and unique natural history of YBI.*
- *Remove invasive plant species to support existing relatively high-quality habitat and to re-establish native communities on YBI. The most problematic species on YBI are eucalyptus, French broom, iceplant, veldt grass, Algerian ivy, sticky eupatorium, Canary Island marguerite, and sweet fennel. Removal of invasive species will allow native vegetation to re-establish naturally or provide more suitable habitat for revegetation efforts.*
- *Construct trails and install recreational facilities as a method to educate the public, to increase public appreciation of YBI’s natural resources, and to reduce human impact in the Island’s natural areas.*

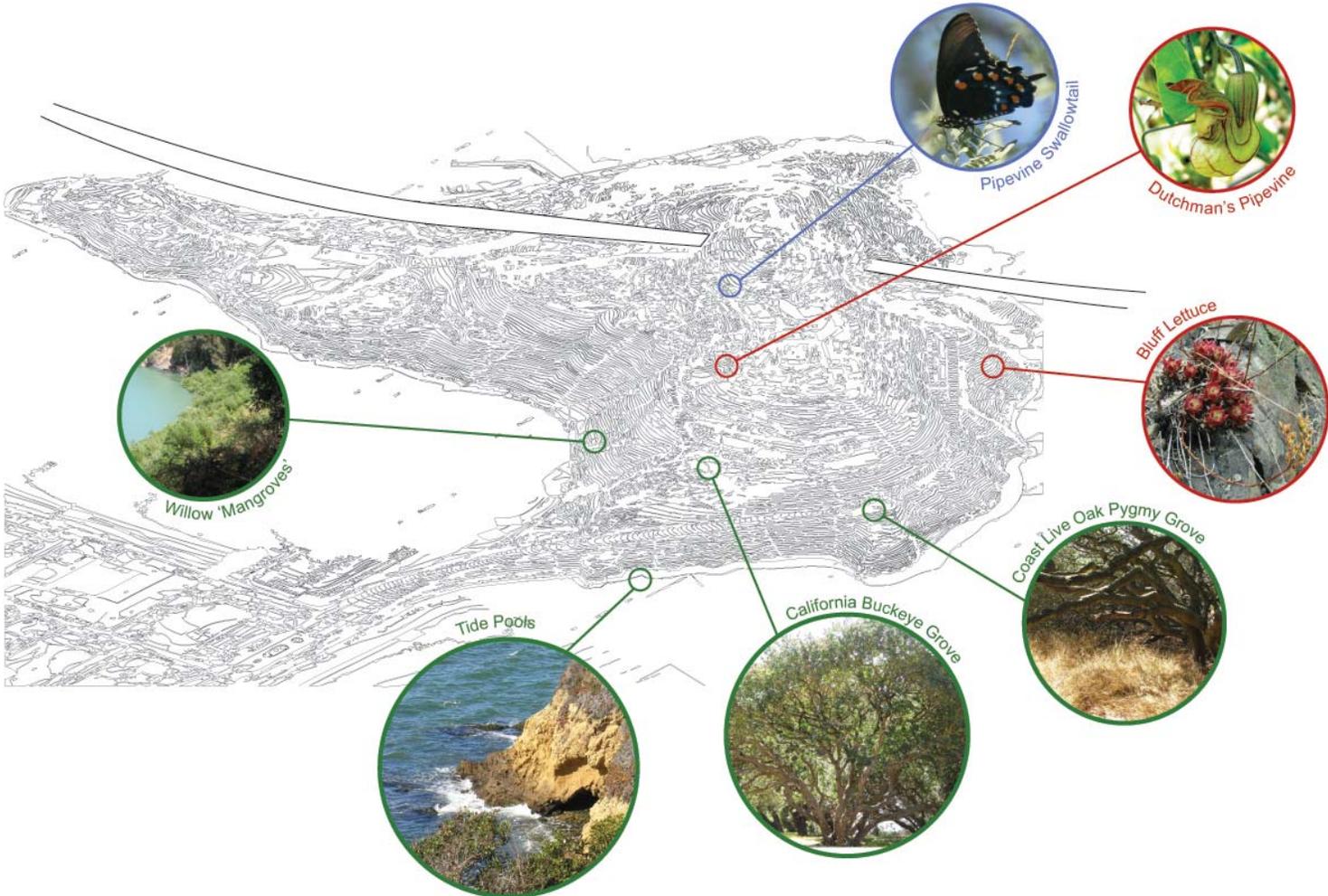
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II. Existing Conditions

A. Physical Setting

Situated only a few miles from major metropolitan areas, in between San Francisco and Oakland, Yerba Buena Island is a remarkable ecological resource. Noteworthy ecological features offer a memorable encounter for the interested public. These include: an intriguing pygmy grove of native coast live oaks shaped by unrelenting on-shore winds from the Golden Gate; a buckeye grove of large mature specimens that over the past century were incorporated first into a cemetery and then a public park; and a willow 'mangrove', accessible from a sandy beach, with tree branches hanging in salt water and covered with barnacles. Intact native habitats such as valley wild rye grassland, northern coastal scrub and tide pools used for haul out by harbor seals galvanize the remarkable conditions described above. Native plant species can be found on YBI and include dune gilia, the fiesta flower and dutchman's pipevine. The Dutchman's pipevine is directly connected to the pipevine swallowtail butterfly, also found on YBI. If conditions are right, the pipevine swallowtail can be seen "hill-topping" the peak of YBI.

Yerba Buena Island is approximately 150 acres in size. Historically, topography was broadly sloping from the Island's summit at 338 feet above mean sea level, becoming steeper further from the summit. Current topography includes a series of terraces engineered for development beginning at the top of the Island, with steep slopes and cliffs down to the Bay on all sides. Slopes on YBI range from five to 75 percent.³



³ Information for the physical setting was adapted from Tetra Tech and Michael Wood (1996).

II. Existing Conditions

YBI is thought to have been uplifted by faulting along a branch of the Hayward Fault approximately one million years ago. The Island is described as a rock outcrop comprised of greywacke sandstone interbedded with shale and siltstone of the Franciscan formation (Baise et al., 2001). Bedrock on the Island is covered by thin sandy deposits from the Pleistocene Colma formation or derived from the underlying sandstone. Artificial fill was placed at the northeastern tip of the Island in 1943. The soils on YBI are mapped as a complex consisting of the Candlestick, Kron, and Buriburi series. The texture of these soils ranges from fine sandy loam to gravelly loam, reflecting the underlying bedrock. Native soils on YBI range from ten to 40 inches in depth and have been highly altered throughout the Island by grading, excavating, filling, and otherwise reshaping topography. Developed and paved areas on YBI are mapped as developed land and soils on the steepest slopes are mapped as Orthents.⁴

Marine influences exert a strong control on YBI's climate, which is characterized by frequent nightly fog, which sometimes persists all day during the summer, and strong prevailing winds coming from the northwest through the Golden Gate. In keeping with California's Mediterranean climate, precipitation occurs primarily from October through April, with an average annual rainfall on the Island of around 20 inches. Temperatures are moderate year-round, with an average annual high of 57° F and an average frost-free period of 300-350 days. Relative humidity ranges from 50 percent during the day to 75 percent or more at night. Prevailing wind speeds are less than six miles per hour and exceed 12 miles per hour only 10 percent of the time, with stronger winds usually associated with winter storms.

The Island supports several microclimates that influence the distribution of the plant species and assemblages present. Thin soils over rocky substrate support the pygmy oak stands on the warm, wind-swept western part of the Island. Coastal scrub is found on steeper, sandier slopes. Taller oaks and toyons, along with lush fern grottoes are present on the shady north-facing slope above Clipper Cove, sheltered from the prevailing winds and receiving fog drip from the surrounding eucalyptus trees. Stands of willows have evolved at the base of sandy slopes where groundwater is present near the surface. Rocky outcrops on western exposures support coastal scrub species such as seaside woolly sunflower and powdery dudleya.

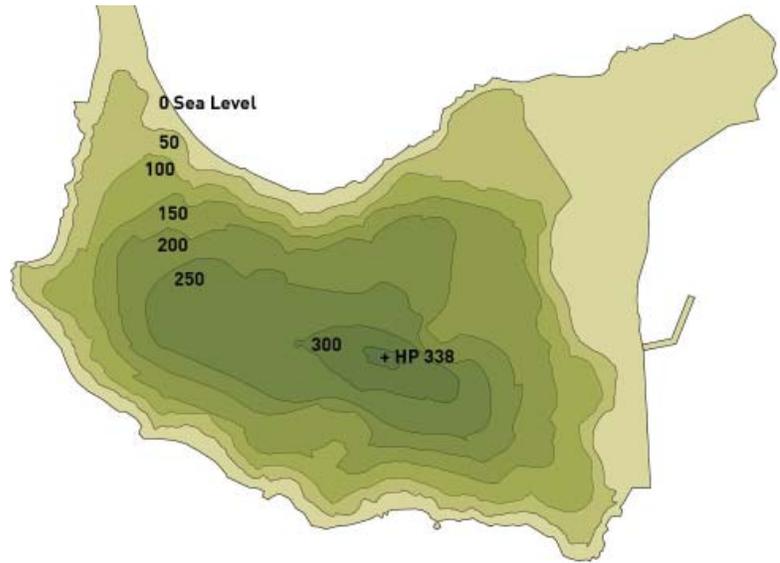
B. Vegetation Communities

Vegetation Communities Maps A-C show the existing plant communities and developed areas on YBI, focusing on undeveloped areas of the Island. Although the HMP's management scope excludes lands owned by the Coast Guard and Caltrans, the existing conditions of those properties are mapped along with the property to be transferred to TIDA, since plants and animals are not constrained by political or ownership boundaries. A number was assigned to each Map Unit (or polygon) so that unique attributes could be captured in Table 1. The methods used in the creation of the vegetation maps are described below, followed by descriptions of the vegetation communities used to classify and evaluate the vegetation on the Island.

Several resources were consulted in the creation of the existing conditions map, including existing reports (e.g., Tetra Tech and Michael Wood, 1996); maps and notes from extensive floristic surveys conducted by Michael Wood from 1995 through 2006; more recent personal communications with Mr. Wood; high resolution aerial photographs; and field notes and data from ESA's site visits in 2008 and 2009. The vegetation map was generated in the Geographic Information System (GIS) program ArcMap 9.2 by digitizing polygons that represent discrete vegetation units. Each polygon was assigned a unique reference number. The vegetation classification used to describe YBI plant communities is loosely based on Holland (1986) and Keeler-Wolf (1995) and each type is based on the dominant plant species, where there is one, or on the physiognomic form (structure, size, and appearance), if there are two or more dominant species.

A brief description of each vegetation community type on YBI follows.

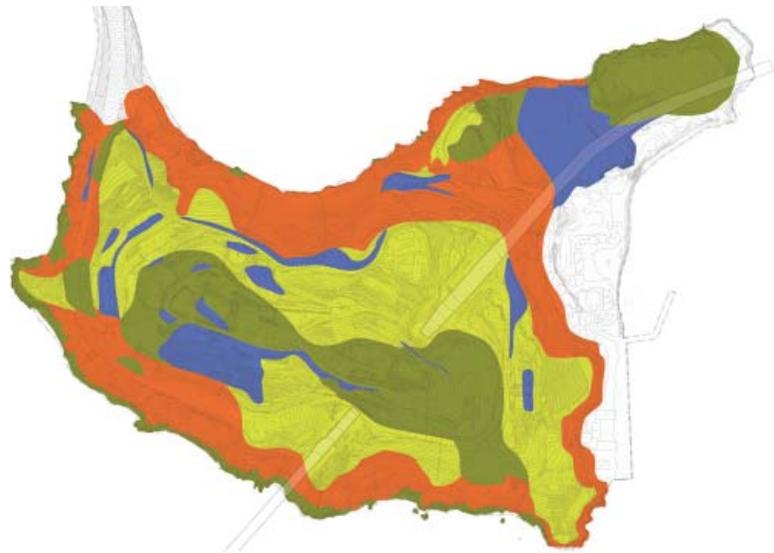
⁴ Orthents are a class of Entisols, which are young soils, shallow and with no horizons and little organic matter. Orthents form on steep slopes where erodible material is so rapidly removed by erosion that a permanent covering of deep soil cannot establish itself.



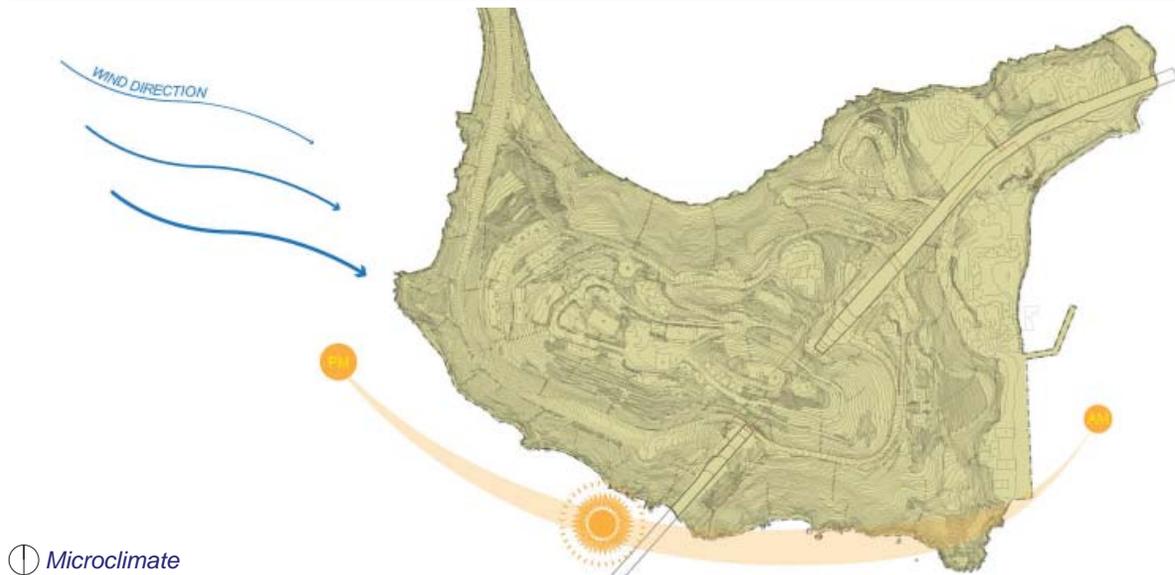
① *Elevation Analysis*

Geologic Materials

- Franciscan Bedrock:**
Sandstone, siltstone.
- Dune Sand and Alluvium:**
Dense fine sand. Locally cemented with gravel lenses. Covering rock up to 80 feet thick.
- Colluvium and Landslide Debris:**
Unstable loose sand and rock debris covering island.
- Manmade Fills:**
Thin deposits under most roads and building pads. Thick deposits under causeway and Coast Guard port facilities.



① *Geologic Map*



① *Microclimate*

II. Existing Conditions

B. Vegetation Communities

● California Annual Grassland

The California annual grassland community consists primarily of annual non-native grasses and herbaceous annuals and generally corresponds to areas that have been disturbed by human activities. On YBI, this plant community lacks a significant tree or shrub layer and is dominated by brome grasses, Italian ryegrass, and wild oats (see Appendix A for a checklist of plant species identified as occurring on YBI, including common and scientific names). Several areas dominated by California annual grassland in the Coast Guard lands support dune gilia and cobwebby thistle, two plants of local importance for conservation. This plant community covers only a small area on the Island, approximately 1.8 acres. Originally, much of the Island would appear to have been covered by coastal prairie, but this community has been extirpated over time as a result of grazing, development, grading, and tree planting.



● Valley Wildrye Grassland

Although their total cover is not large, approximately 1.42 acres, wildrye grasses are common on YBI, especially creeping wildrye. These are native, perennial grasses that spread by creeping rhizomes (underground stems). Few areas are dominated by these grasses – they are usually a minor component of a woodland understory – however, there are three specific areas on the island where wildrye grasses are dominant (Map Units 1, 12, and 39) and there is a rapidly spreading stand near the north end of Clipper Cove beach.



● Central Coast Riparian Scrub

Approximately 1.55 acres of central coast riparian scrub vegetation occurs on YBI. This community is dominated by arroyo willow, which in most cases is growing in dense, impenetrable thickets, often at the base of steep slopes. The establishment of this community in many areas seems to be associated with natural seeps and/or artificial ones caused by irrigation from leaky pipes. These areas generally have relatively low plant species diversity, and some stands are being invaded by Himalayan blackberry and sticky eupatorium or encroached by eucalyptus.



● Northern Coastal Scrub

The northern coastal (Franciscan) scrub vegetation community is dominated by small to medium-sized shrubs, such as California sagebrush, coyote brush, sticky monkey flower, lizard tail, and yellow bush lupine, and occurs in relatively undisturbed areas along the steep bluffs of YBI. Much of the 14.3 acres of northern coastal scrub on YBI is relatively undisturbed and has a high diversity of native plant species. This community also supports populations of the special-status plant dune gilia.



● California Buckeye Woodland

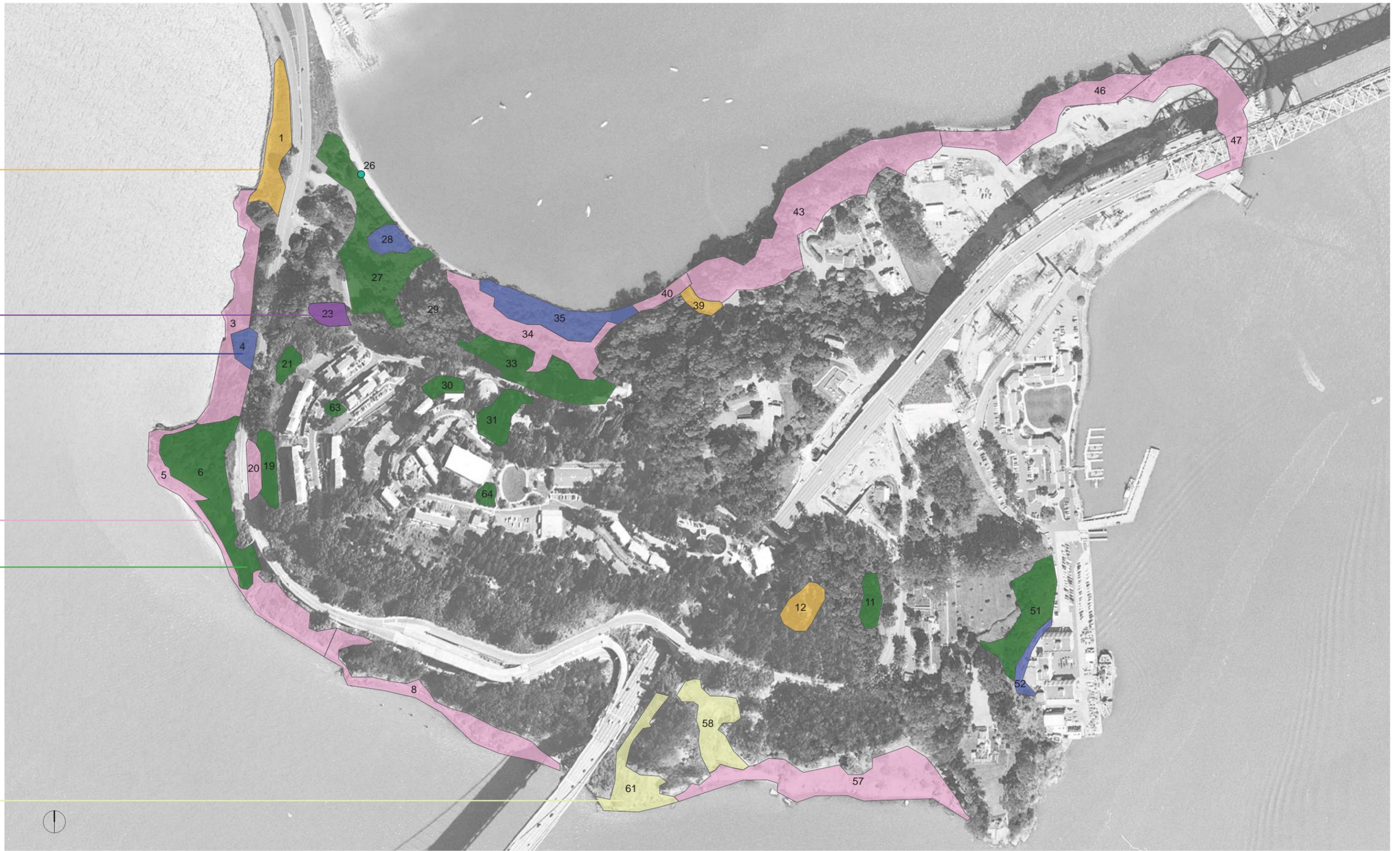
California buckeye is a native tree species that occurs throughout the state in a wide variety of habitats but is considered locally rare in San Francisco (CNPS, no date). There is only one stand of vegetation dominated by this tree on the island and it is relatively small (approximately 0.2 acre), with a lawn understory (see Map Unit 23). However, the trees are mature and represent a historic remnant of the vegetation that most likely existed on the island prior to human disturbance.



● Coast Live Oak Woodland

Coast live oak trees are present across YBI and are the dominant native tree. Aspect, slope, density, age and associated species differ greatly from one stand of coast live oak woodland to another. Some stands have a healthy understory of toyon, California hazelnut, blue elderberry, and Dutchman's pipevine – native plant species common to oak woodlands throughout the state, while other stands are being invaded by non-native species like French broom, Algerian and English ivy, or are encroached upon by eucalyptus trees. One unique stand of coast live oak woodland (Map Unit 6) is a pygmy grove that has developed in response to environmental factors like wind and poor soils. Coast live oak woodland covers approximately 7.5 acres on YBI.





Existing Conditions : Vegetation Communities Map A

II. Existing Conditions

B. Vegetation Communities

● Coast Live Oak Woodland/Eucalyptus

The 19.5 acres of coast live oak woodland/eucalyptus supports a co-dominance of coast live oak and eucalyptus trees. The two species form a mosaic distributed throughout these Map Units and it was not practical to map them separately. Distinguishing this community from eucalyptus woodland is important since there may be a greater potential to implement habitat restoration or enhancement within the mixed woodland by removing eucalyptus trees and enhancing the existing oak woodland than within the woodland dominated exclusively by eucalyptus.



● Eucalyptus Woodland

Non-native eucalyptus trees were planted on YBI beginning in the late 1880's. The trees are now very large and dominate approximately 31 acres of the island's vegetation, but their density within mapped stands is variable. The understory in these areas varies greatly, with some areas being completely dominated by non-native species like French broom and iceplant and other stands that include the presence of the special-status plant dune gilia (Map Unit 9). Most of the eucalyptus woodland dominated areas have been disturbed in one way or another and present significant restoration challenges.



● Ruderal/Landscaped

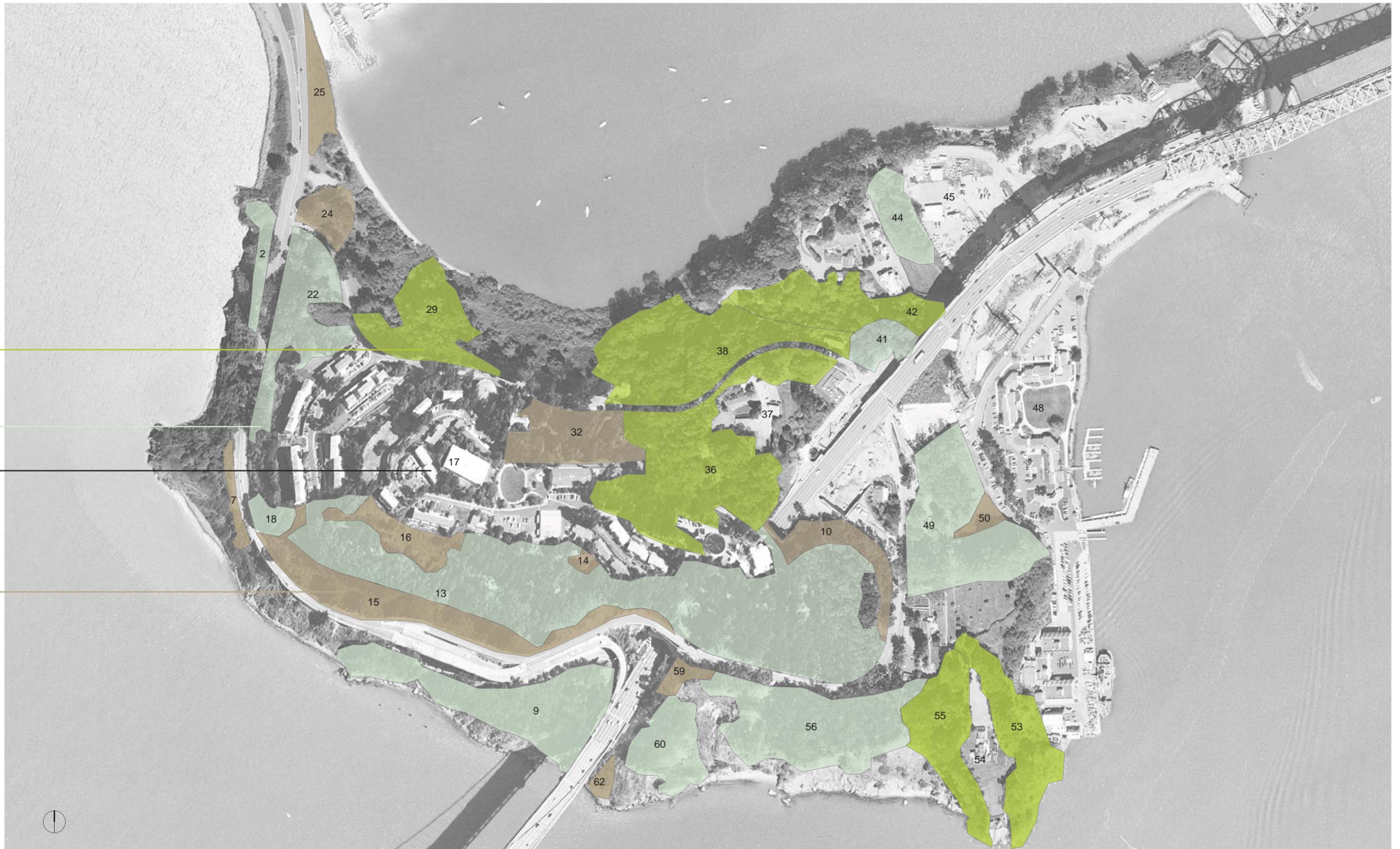
Ruderal and landscaped areas are sites where the natural vegetation has been significantly altered by people. These are areas that have either been landscaped or impacted by road construction, development, or other significant disturbance. Existing vegetation in these areas is generally composed exclusively of non-native, and often invasive, plants. Common invasive non-native plants found on YBI include common periwinkle, French broom, fennel, and Algerian ivy. This vegetation type covers approximately 10 acres on YBI.



○ Existing Development

The 57 acres mapped as "developed" in Vegetation Communities Map C include the existing building at the top of the hill, the northeast corner of the island, and much of the Coast Guard lands (Map Units 48 through 61). These areas are characterized by a variety of existing structures, roads, and paved areas that are surrounded by both planted landscape vegetation and naturally occurring vegetation such as mature coast live oak trees. There is a wide variety of landscaping in this area that cannot be characterized in a uniform way. Map Units 30 and 31 represent two significant stands of coast live oak trees within Map Unit 17 that are distinguished from the surrounding developed area because of the size and structure of the native oak trees and the presence of unique native plant species occurring in the understory. In addition, there are a number of single oaks and other native tree and understory species. The preponderance of land cover within these Map Units is hardscape associated with the Coast Guard Station and the Bay Bridge.





Existing Conditions : Vegetation Communities Map B

II. Existing Conditions

Table 1: Existing Conditions Vegetation Map Units : Classification and Unique Attributes

Map Unit	Vegetation Community/Land Use	Unique Attributes	Map Unit	Vegetation Community/Land Use	Unique Attributes	Map Unit	Vegetation Community/Land Use	Unique Attributes
1	valley wildrye grassland	Fairly large and dense stand of Valley wildrye grassland on former wagon trail.	24	ruderal/landscaped	Clipper Cove Park. Landscaped, with lawn and stairway to beach. Swallows forage for insects over lawn .	45	existing development	The Great Whites are located at the western end with historical landscaping and housing that will be retained.
2	eucalyptus woodland	Coastal scrub species persist at edges of stand.	25	ruderal/landscaped	Completely weedy, on fill slope connecting YBI to TI.	46	northern coastal scrub	Northern coastal scrub with eucalyptus woodland overstory. Western gulls observed nesting on bluffs. Some large old toyons, osoberry.
3	northern coastal scrub	Diverse mix of coastal scrub species, on Pleistocene sand and exposed sandstone of the Colma Formation, extending to the high water line. Tide pools are present along the southern shoreline of this Map Unit.	26	high marsh	Pickleweed, jaumea, saltgrass, grindelia, atriplex, beach bur. Linear area along high tide line. A good example of 'natural restoration' after area was cleared of invasives by volunteers.	47	northern coastal scrub	South slope has scrub, east slope has more ferns. Remnant coastal terrace prairie used to rim the top of the hill.
4	central coast riparian scrub	Small stand of arroyo willows established on site with seep on west-facing cliff face. Has expanded over the years.	27	coast live oak woodland	Nice specimens of coast live oak, toyon, some scrub species. Monterey pine, cotoneaster, butterfly bush also present.	63	coast live oak woodland	Large coast live oaks .
5	northern coastal scrub	Diverse and intact stand of scrub on steep western slopes; supports nesting western gulls.	28	central coast riparian scrub	Willows rooted at base of slope below stairway. Well above high tide line.	64	coast live oak woodland	Large coast live oaks.
6	coast live oak woodland	Very diverse, wind-pruned elfin stand. With the exception of veldt grass, few weeds. Supports fiesta flower and native grasses. Views of San Francisco.	29	eucalyptus woodland	Many mature oaks, toyons, some California hazelnut. Fiesta flower, stinging phacelia, coastal wood fern in the understory.			
7	ruderal/landscaped	Ruderal, French broom scrub, fennel, non-native grasses, mowed.	30	coast live oak woodland	Dutchman's pipevine.			
8	northern coastal scrub	Relatively nice stand with lots of California melic grass. Supports populations of dune gilia.	31	coast live oak woodland	Large coast live oaks. Dutchman's pipevine.			
9	eucalyptus woodland	Eucalyptus woodland with areas of iceplant in the understory. Includes small patches of dune gilia.	32	ruderal/landscaped	Landscaped park along Yerba Buena Road. Turf grass, eucalyptus, acacia, pittosporum.			
10	ruderal/landscaped	Extensive patch of California polypody on slope facing westbound I-80 off-ramp growing beneath a stand of Monterey pines. Considerable native diversity on slopes above eastern tunnel portal including buckeye, oaks, hazelnut, phacelia.	33	coast live oak woodland	Nice specimens of coast live oak, toyon, some scrub species. Butterfly bush and French broom also present.			
11	coast live oak woodland	Impressive patch of Dutchman's pipevine on one oak.	34	northern coastal scrub	Densely vegetated by Pacific pea, with California blackberry, bee plant.			
12	valley wildrye grassland	Creeping ryegrass grassland with phacelia, coastal wood fern, Dutchman's pipevine, elderberry.	35	central coast riparian scrub	Barnacles on willow branches. Unique mangrove-like stand. Only stand of horsetails on YBI upslope near eastern end of patch.			
13	eucalyptus woodland	Scattered live oaks, buckeyes. Native species present in understory, especially in areas with open overstory, as well as French broom, non-native grasses, and other ruderal species.	36	coast live oak woodland/ eucalyptus woodland	Coast live oak and eucalyptus overstory, ivy is dominant groundcover. Toyon, hazelnut, elderberry, and poison oak also present, as is French broom.			
14	ruderal/landscaped	Monterey cypress, annual grasses.	37	existing development	Area includes landscaping, large oaks, and small remnant areas that support native shrubs and herbaceous species.			
15	ruderal/landscaped	French broom scrub, acacia, iceplant.	38	coast live oak woodland/ eucalyptus woodland	Steep, deep, loose Colma Formation sand deposits. Abundant swordfern, oaks, toyon.			
16	ruderal/landscaped	Annual grasses, fennel dominant, with young eucalyptus.	39	valley wildrye grassland	Narrow band of creeping ryegrass grassland with some wildflowers.			
17	existing development	Area includes landscaping, large oaks, and small remnant areas that support native shrubs and herbaceous species. Black phoebes and dragonflies forage for small insects over the lawn in the park.	40	northern coastal scrub	Narrow strip of coastal bluff scrub, relatively diverse.			
18	eucalyptus woodland	Fairly dense eucalyptus with non-native grasses in understory.	41	eucalyptus woodland	Perhaps of cultural interest. There used to be an old wooden staircase here with a wooden canopy. It may have been torn down. M. Wood made initial reconnaissance and concluded that it was of no botanical interest.			
19	coast live oak woodland	Small remnant patch of oaks with toyon.	42	coast live oak woodland/ eucalyptus woodland	Coast live oak and eucalyptus overstory, ivy is dominant groundcover. Toyon and poison oak also present, as is French broom.			
20	northern coastal scrub	Weedy—being invaded by French broom and sweet fennel; but includes nice stand of <i>Dudleya farinosa</i> .	43	northern coastal scrub	Western gulls observed nesting on bluffs. Relatively rich remnants of native scrub species with eucalyptus woodland overstory. Habitat has been colonized by the non-native plant Canary Island marguerite.			
21	coast live oak woodland	Small remnant patch of oaks with toyon.	44	eucalyptus woodland	Supports some buckeyes, but not as those in Map Unit 24. In addition to eucalyptus, site is comprised entirely of ornamental plantings.			
22	eucalyptus woodland	Northern limits overlap former cemetery site; fiesta flower present.						
23	california buckeye woodland	California buckeye with lawn as understory. Very large, presumably indigenous stand at edge of former cemetery site.						

	Lands owned by	The Coast Guard and Caltrans
48	existing development	Dominated by hardscape with some landscaped areas.
49	eucalyptus woodland	Highly disturbed, modified hillside.
50	ruderal/landscaped	Highly disturbed, modified hillside.
51	coast live oak woodland	Dense, gnarled oaks on sandstone cliffs.
52	central coast riparian scrub	Dense patch of willows at base of moist slope.
53	coast live oak woodland/ eucalyptus woodland	Dense, gnarled oaks on steep sandstone cliffs.
54	existing development	Historic housing and lighthouse, landscaping.
55	coast live oak woodland/ eucalyptus woodland	Supports the only patch of coyote mint found on YBI. Site is now fenced off and not accessible except under Coast Guard escort.
56	eucalyptus woodland	Patches of dune gilia and cobwebby thistle. Oaks and toyon also present.
57	northern coastal scrub	Coastal scrub with foothill needlegrass grassland. Possibly the largest bunchgrass grassland in San Francisco County. Tremendous amount of blue dicks; big patches of coffee fern. Nice patches of elfin oaks/toyon on thin soils; reminiscent of southern California bluffs. Overlooks harbor seal haul-out beach.
58	California annual grassland	Dune gilia and cobwebby thistle might be here, too.
59	ruderal/landscaped	French broom scrub.
60	eucalyptus woodland	Oaks and toyon also present.
61	California annual grassland	Dune gilia and cobwebby thistle might be here, too.
62	ruderal/landscaped	French broom scrub.



Existing Conditions :
Vegetation Communities Map C

- Legend
- Coast Guard and Caltrans Lands
 - 21 Map Unit
 - California Annual Grassland
 - Valley Wildrye Grassland
 - Central Coast Riparian Scrub
 - Northern Coastal Scrub
 - California Buckeye Woodland
 - Coast Live Oak Woodland
 - Coast Live Oak Woodland/Eucalyptus
 - Eucalyptus Woodland
 - Ruderal/Landscaped
 - Existing Development

II. Existing Conditions

C. Wildlife

This section identifies all currently documented fauna found on YBI. The relatively small size of YBI and the modest amount of habitat affords a relatively limited group of fauna. However, future studies will be important to continue to inform the ongoing planning process because knowledge of YBI's wildlife is incomplete. Some studies will be required under this Plan's BMPs [Section V], such as pre-construction bird surveys that must be done to avoid direct and indirect impacts on the reproductive success of the Island's avifauna. Others could be conducted by volunteers or professionals in order to add to the knowledge base and could include a continuation of wildlife inventories, such as breeding bird surveys or monthly bird monitoring at established points, continued invertebrate surveys, and small mammal trapping. Further areas for study could include documentation of important wildlife resources on YBI, such as bat roost location and nectar plants for different butterfly species.

Invertebrates, Herpetofauna

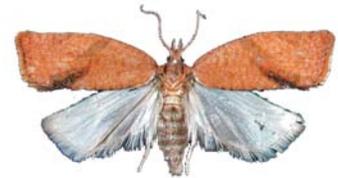
Recent surveys carried out by lepidopterists have catalogued several butterflies and moths that use habitat on YBI including the orange tortrix moth, which is rarely found in San Francisco (Powell, 2009), the umber skipper, and the rural skipper, which is a new breeding species for the county and an Island endemic that has not been documented from the mainland (O'Brien, 2009). Other species likely to occur on YBI due the presence of their host plants include the echo blue, Mylitta crescent, painted lady, sandhill skipper, woodland skipper, acmon blue, and green hairstreak.

Dutchman's pipevine is the host plant for the pipevine swallowtail butterfly. While not of high conservation concern generally, the butterfly is now very rare in San Francisco and indicative of an intact native habitat. Dutchman's pipevine is found in Map Units 11, 30, and 31 and is more abundant here than it is throughout all of San Francisco County. Other butterfly habitat may occur at the Island's summit. "Hilltopping" is a phenomenon among mating butterflies, a mate-searching strategy where males and virgin or multiple-mating females seek a topographical summit on which to mate. Mated females descend from the summits thereafter to search for host plants.

Western fence lizards and garter snakes have been observed on YBI. Alligator lizards, California slender salamander, arboreal salamander, and gopher snakes are possible residents of the Island as well.



Pipevine swallowtail butterfly



Orange tortrix moth



Umbler skipper



Rural Skipper



Alligator lizard

II. Existing Conditions

Birds

San Francisco Bay is the largest estuary on the west coast and an important stop along the Pacific Flyway. Hundreds of thousands of birds from 281 species (USFWS 1987) fly over or near YBI and TI each year. Although most are migrants along the Pacific Flyway, 70 percent of these birds spend some time each year in the Bay. Remnant habitat on YBI may well provide important refugia and breeding habitat for migratory and local birds.

Breeding Birds

Little direct information is readily available on the exact composition of YBI's avifauna. Using the San Francisco Breeding Bird Atlas (2003), three species lists from Golden Gate Audubon bird surveys (Hopkins, 2002; GGAS, 2007; GGAS, 2010), and a breeding bird monitoring report (Ganda, 2003), we compiled a list⁵ of birds that have been observed on YBI and in the waters nearby (see Appendix B for the full list). Species listed here are potential or actual nesters on the Island.



Red-tailed hawk



Killdeer

- *Double-crested cormorant*
- *Black-crowned night-heron*
- *Canada goose*
- *Red-tailed hawk*
- *Killdeer*
- *Western gull*
- *Mourning dove*
- *Rock dove*
- *Anna's hummingbird*
- *Allen's hummingbird*
- *Black phoebe*
- *Common raven*
- *Steller's jay*
- *Western scrub jay*
- *Cliff swallow*
- *Barn swallow*
- *Chestnut-backed chickadee*
- *Bushtit*
- *Brown creeper*
- *American robin*
- *Northern mockingbird*
- *European starling*
- *Orange-crowned warbler*
- *Wilson's warbler*
- *Spotted towhee*
- *California towhee*
- *White-crowned sparrow*
- *Song sparrow*
- *Dark-eyed junco*
- *Brown-headed cowbird*
- *Red-winged blackbird*
- *Brewer's blackbird*
- *House finch*
- *American goldfinch*
- *Lesser goldfinch*

In addition, birds that are known to use the Bay Bridge for nesting or regular roosting and therefore presumably use the Island and adjacent bay waters for foraging or roosting include the American peregrine falcon and double-crested cormorant.



American goldfinch



Wilson's warbler



Black phoebe

Mammals

Yerba Buena Island provides habitat for two small terrestrial mammal species: the pocket gopher and the California ground squirrel. In addition, raccoons are currently known to be on the Island. These omnivores are somewhat problematic on YBI—not only are they raiding residents' trash cans, but they are foraging in the tide pools on the west side of the Island and impacting the native oyster populations there.

ESA investigated the presence of bats on YBI using acoustic detectors in August 2009. Detectors were placed in eucalyptus woodland in Map Unit 13 and in woodland adjacent to an area of open grassland and coastal scrub in Habitat Unit 27. Analysis of calls recorded overnight on two occasions detected calls from one species, Mexican-free tailed bats. These bats are not listed as special-status but their presence will affect management actions under the HMP. These were not exhaustive surveys and there may be other bat species that use habitat on YBI.

There is a year-around harbor seal “haul-out” on a sandy beach at the Island’s southwestern corner, which is part of the Coast Guard Lands and outside of the TIDA Plan Area. It is not a pupping site for seals, but pups are occasionally seen there (Kopec and Harvey, 1995).

Finally, the occasional California mule deer has been known to swim to YBI,⁶ but the species has not established a population on the Island.

Non-native Wildlife

Non-native wildlife on YBI includes European starlings. Given the history of habitation of the Island, and the nearby anchoring of ships over the past century and a half, house mice and Norway rats are almost certainly resident.

There is also a feral cat population on YBI, and a feeding station near the old Coast Guard tower. We assume they are being fed by residents and/or Coast Guard personnel. Feral cats are very problematic for maintaining a healthy native faunal assembly, particularly on an island.



California ground squirrel



Pocket gopher



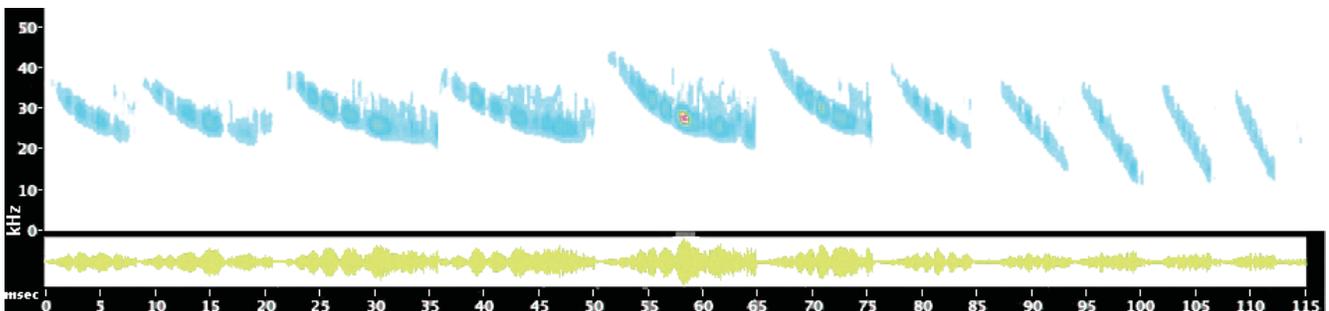
Raccoon



Harbor seal



Mexican-free tailed bat



SONOGRAM OF A MEXICAN FREE-TAILED BAT PASS, USING SONOBAT SOFTWARE

Using a Peterson detector, ESA biologist Dana Ostfeld recorded several Mexican free-tailed bat echolocation calls at two locations on Yerba Buena Island. Using Sonobat software, she then viewed these calls visually as sonograms, and identified them to species when possible. *Tadarida brasiliensis*

⁶ Anecdotal information posted on Nature in the City's YBI Local Ecology web page: <http://natureinthecity.org/ybi.php>

II. Existing Conditions

D. Special-status Plants and Wildlife

Special-status Plants

There are several special-status plant species on YBI. For the purposes of the HMP the term 'special-status species' is defined as those species that are:

- listed by the federal or state government as threatened or endangered;
- listed by the state as rare;
- listed at the state-level by the California Native Plant Society (CNPS) as species of conservation concern; or
- listed by the Yerba Buena Chapter of CNPS as locally significant.

No state or federally listed special-status plant species have been documented on YBI, despite extensive plant surveys conducted over the past decade. There are several populations of the state-level CNPS-listed species dune gilia on the Island. These are located in coastal scrub and annual grasslands with eucalyptus overstory, along the western bluffs in Map Units 8, 9, 56, and possibly 61. The remaining special status plants are of local significance—plant species known from only one or very few locations in San Francisco County. These species have no protected status under existing laws or policies. However, impacts to such species may be considered in CEQA documents and, although these species may be widespread elsewhere, their small populations in San Francisco represent a unique local biological resource. The CNPS Yerba Buena Chapter maintains a list of locally significant species for all of San Francisco County on their website.⁷ There are nine locally significant plant species occurring on YBI, pictured below. The two species marked with an asterisk are proposed by CNPS members for addition to the list.



California buckeye



California hazelnut



Cobwebby thistle*



Coffee fern



Dutchman's pipevine*



Fiesta flower



Hollyleaf cherry [based on typical species' distribution this is not likely a native occurrence]



Maidenhair fern



Serpentine spring beauty



Vancouver's ryegrass



Wood rose

Special-status Wildlife

There are no known federally or state listed terrestrial special-status wildlife species known to breed on YBI. As mentioned earlier, the federally delisted peregrine falcon and the double-crested cormorant, whose nesting colonies are protected by California Department of Fish and Game (CDFG), are known to nest on the Bay Bridge and may use the Island or surrounding waters for foraging and roosting. The federally endangered brown pelican may also use offshore structures and forage in the waters off YBI. Nearly all bird species in California are protected by the Federal Migratory Bird Treaty Act (MBTA) and California Fish and Game Code, particularly when nesting. Most bat species are also protected, particularly maternity roosts and winter hibernacula.

E. Intertidal and Offshore Resources

Intertidal and offshore resources are discussed as part of the existing conditions at YBI, as are the resources found on the Coast Guard Lands. However, these areas are not proposed for management under the HMP, rather they will be analyzed in the Redevelopment Project's Environmental Impact Report (EIR). Any management actions proposed would be governed by mitigation measures identified in the EIR.

The intertidal regions of YBI contain highly diverse and varied habitats that support an abundance of flora and fauna. The Island's proximity to the Golden Gate and the Pacific Ocean has resulted in YBI's intertidal zone being inhabited with many coastal and estuarine taxa. The natural bluffs and exposed rocky shoreline of YBI, which are interspersed with sandy pocket beaches, provide a different assortment of ecological niches and environments, including tide pools, than are presented by rippapped shoreline areas that are also present on YBI. The natural shoreline provides numerous protected havens in which assorted marine species are able to survive and flourish, including the native California oyster (AMS, 2009). This previously assumed extinct species is making a substantial recovery throughout the Bay and has established a multi-year residency in the lower rocky intertidal areas of YBI.

The intertidal regions of YBI support numerous marine and estuarine species of red and green algae, bryozoans, sponges, ectoprocts, barnacles, mussels, chitons, crabs, and anemones. The hybridized bay mussel and the coastal mussel are both present, with the coastal mussel inhabiting the western shorelines and the bay mussels along the eastern sides of the Island. Eelgrass beds occur in Clipper Cove, adjacent to the northeast shore of YBI.

The shallow waters of Clipper Cove, immediately adjacent to YBI, are frequented by rays that come to feed on benthic infauna (AMS, 2009). The submerged aquatic vegetation attached to the rocky intertidal and subtidal habitat surrounding YBI, and especially the eel grass beds, are considered "habitat forming" species that create unique biological environments for spawning Pacific herring, serve as nursery grounds for many important Bay fish and invertebrate species including shrimp and Dungeness crabs, and provide important foraging areas for black brandt (Merkel & Associates, 2005).

Offshore Resources

The entire Bay Area is a crucial resting and foraging area and wintering ground for birds in the Pacific Flyway, which extends from South America to the Arctic Circle. More locally, the waters off YBI support shoals of substantial numbers of foraging and roosting diving ducks, such as scaup and scoter.

The San Francisco Bay is identified as Essential Fish Habitat (EFH) for various life stages of rockfishes, flatfishes, sharks, northern anchovy, Pacific sardine, Pacific herring, jack mackerel, halibut, and Chinook salmon. There are two species (Distinct Population Segments [DPS]) of fish present in Bay waters that are listed under the federal Endangered Species Act: Central California Coast steelhead DPS and North American green sturgeon. YBI lies along the dividing line between two designations under which endangered or threatened fish species receive special consideration. To the north of YBI, San Francisco Bay is designated as Critical Habitat for Sacramento River winter-run and Central Valley spring-run chinook salmon and central California coast coho salmon. To the south of YBI, San Francisco Bay waters are designated as EFH - for these same species. The waters of most of San Francisco Bay are also important as juvenile rearing grounds for the Dungeness crab, which is not only an important commercial and sport species for the region, but also a critical predator and food source for many fish taxa that inhabit Bay waters.

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III. Future Vision for YBI

A. Proposed Redevelopment Plan

The redevelopment of Yerba Buena Island aims to balance development of the Island and provision of active open space with protection of the Island's natural character in a way that respects its ecological diversity and habitat. YBI's extensive open space also contributes to, and complements the establishment of, Treasure Island as a comprehensive, regional open space destination.

Development of YBI can be generally characterized in five categories:⁸

1. *New Residential and Commercial Development, including associated private or semi-private open space; and*
2. *Creation of Infrastructure needed to support the overall project;*
3. *A Hilltop Park;*
4. *The Senior Officers' Quarters Historic District, and potential relocation of historic Quarters 10 and Building 62;*
5. *Natural areas, generally governed by this Habitat Management Plan.*

Collectively, items 1-4 above constitute "development" on the Island. Development of Yerba Buena Island will be regulated through a Design for Development to be adopted by TIDA pursuant to the proposed Redevelopment Plan. The Design for Development will lay out specific design requirements (guideline and standards) for Yerba Buena Island and will be used by TIDA to evaluate whether proposed development for the Island meets the project's design requirements. Development principles are sensitive to the many unique ecological attributes of the Island and are intended to be supportive of and sustain YBI's flora and fauna, and minimize the impact of development and the presence of Island residents and visitors.

It is important to note that while efforts have been made to concentrate development in areas that have been previously developed, some currently vegetated areas are in areas proposed for future development. Generally, that vegetation is quite compromised and does not currently support significant habitat. In some particular locations, there are more valuable trees that support habitat. As is described in more detail in Section VI, *Management Zone Prescriptions*, the development project is proposing to prioritize maintaining those areas if feasible.

The following development principles outline what will be described in detail in the Design for Development.

Design Intent - Yerba Buena Island

The planning and design of Yerba Buena Island will strive to respect and highlight the many significant features and experiences on the island. These include the topography, with its steep, vegetated hillsides; dramatic views of the Bay and Treasure Island; fascinating cultural history and intact communities of native flora and fauna, some unique to the City of San Francisco and rare on the Peninsula.

The goals of the open space plan for YBI are primarily to provide native habitat (through preservation, restoration, and enhancement, as discussed in this document) as well as open space areas from which the public can enjoy the beauty of the Island and views of the Bay. There will be vista points and overlooks from the hilltop, bluffs and trails, integrated within ecologically preserved and restored habitat areas. The Hilltop Park will be created as a destination for picnics, recreation and sightseeing.

New planting in development areas will support the goals of the Habitat Management Plan. Planting in the new development sites will consist primarily of native or climate-appropriate plants that are non-invasive and maximize faunal diversity. Recreational amenities such as trails, play areas, benches and tables will be provided to give a range of opportunities and experiences in the landscape. Trail access throughout the Island will be enhanced and expanded to not only control but also allow visitors to hike through native habitat areas such as coastal bluffs, oak woodlands and natural beaches, while respecting sensitive natural resources. Within the Senior Officers' Quarters Historic District, the historic character of the contributing landscape features will be maintained. The following outlines the general concepts for each area of YBI:

⁸ Please note the Redevelopment Plan does not include any improvements to the property on YBI owned by Caltrans or the Coast Guard.

III. Future Vision for YBI

① *New Development*

YBI's zoning will permit the new construction of approximately 200-300 homes and a 50-room spa-hotel. The Redevelopment Plan calls for a lower density of development as compared to Treasure Island, primarily (but not exclusively) occupying already disturbed and developed areas, which will assist in preserving the Island's natural character.

Landscaped areas within the developed areas will be encouraged to use native plants and other climate-appropriate plants with habitat value for native wildlife, to complement the goals of the HMP.

New Development also includes the potential adaptive reuse of Building 62.

② *Infrastructure*

Portions of YBI will be dedicated to the provision of public infrastructure that supports the development of and public access to both Islands. As with the development areas, the project generally tries to locate new infrastructure as much as possible within the footprint of existing infrastructure, although some expansion of infrastructure is required. The proposed infrastructure includes rebuilding of the regional access roads on the Island, new roads within private development parcels, the construction of new water tanks, construction of retaining walls, and stormwater treatment areas.

③ *Hilltop Park*

Hilltop Park is intended to be programmed and designed as a YBI destination point, with picnic facilities, view overlooks, open lawn areas, and recreational amenities. Universal access and visitor parking will be incorporated into the park design as well as opportunities to take advantage of panoramic views from this park. In conjunction with park development on the Hilltop Park, TIDA shall cause the removal of non-native vegetation to improve, enhance and protect views of San Francisco Bay from the Hilltop Park, and shall maintain the removal of such vegetation, consistent with the applicable non-native vegetation removal policies set forth in the Habitat Management Plan.

④ *Senior Officers' Quarters Historic District [SOQHD]*

The SOQHD includes both buildings that once housed officers on YBI and specific contributing landscape features. These contributing features consist of the expansive greensward in front of Quarters 1-3, a formal terraced garden behind Quarters 1, the central terraced garden behind Quarters 2-5, planting beds set adjacent to each residence, as well as walkways, patios, and masonry walls. Depending on the ultimate reuse of the Great Whites themselves, the landscape may be enhanced in a way that supports the re-use of the District and can serve as a destination for Island visitors. As part of the development project, the historic character of the landscape features will be maintained. The Design for Development includes 3 sites for potential new development in the SOQHD. The historic Quarters 10 and Building 62 will potentially be relocated to new sites on the Island and restored as well.

⑤ *Natural Areas*

The goals for the natural areas of YBI are detailed in this HMP and include restoration, enhancement, and preservation of native and climate-adapted plant communities to maximize habitat and biodiversity and control of public access through the construction of designated trail systems for pedestrians and bicyclists. Unnecessary structures and social trails will be removed and newly designated trail systems will avoid sensitive habitat areas.





Overlay of Redevelopment Areas and Vegetation Communities

- Legend
- Development Parcels
 - Coast Guard and Caltrans Lands
 - Limit of Grading for Site Improvements
 - Existing Development
 - California Annual Grassland
 - Valley Wildrye Grassland
 - Central Coast Riparian Scrub
 - Northern Coastal Scrub
 - California Buckeye Woodland
 - Coast Live Oak Woodland
 - Coast Live Oak Woodland/Eucalyptus
 - Eucalyptus Woodland
 - Ruderal/Landscaped

21 Map Unit

III. Future Vision for YBI

B. Public Input on the Habitat Management Plan

During a previous planning effort conducted by Garcia and Associates, interviews were conducted with individuals to solicit information and feedback about YBI today as well as the overall vision, the vision for native and non-native species, and the implementation of a habitat management plan.

One of the major themes from these interviews was that there is an opportunity to learn from habitat restoration projects in the Bay Area within proximity to YBI such as Angel Island, Crissy Field, the Presidio, and parks within the City of San Francisco Natural Area Program. Respondents drew from their experience being involved in similar projects and described their successes and challenges as they made specific recommendations.

Many commented generally on public participation. A range of public involvement was seen as instrumental in the development of a habitat management plan, from providing ideas and resources in the initial stages of development, to the labor necessary for the upkeep and stewardship of natural areas. Volunteer groups have provided the backbone of many of the large scale community-based restoration efforts in San Francisco, but some interviewees cautioned that this effort requires time and resources to train and coordinate volunteer efforts. Other restoration efforts did not rely on volunteers to do hands on work, but instead solicited their involvement during the design of the management plan.

Interviewees also described the need for a balance of uses. The variety of public users could range from residents, bicyclists, hikers, and dog walkers. It was suggested that the design for use be in compliance with the Americans with Disabilities Act (ADA) and provide opportunities to promote ecotourism. However, it was also suggested that all uses be compatible with the preservation of sensitive habitat. Some interviewees mentioned concern with remediation of potential contamination, which, if left unaddressed, could compromise public safety and the safety of volunteers working on site.

Methods of habitat restoration suggested by interviewees focused on strategies for removing or containing non-native species and preserving or enhancing native species populations. Prioritizing non-native species removal where they are directly threatening native species biodiversity was described in several instances. The proposed methods of restoration varied. Protecting intact areas from invasion by non-native plants and focusing on habitat edges where invasive species are encroaching were two suggested approaches. Eucalyptus removal was described as a potentially contentious issue based on previous experience on similar restoration efforts in the Bay Area. While eucalyptus removal can open and expand views and promote greater biodiversity of native understory and grassland habitats, some people were concerned about the historic significance of the eucalyptus plantings. Interviewees deferred to individuals with specific expertise for the habitat requirements of birds, butterflies, and other wildlife. Another issue raised regarding habitat restoration was concern about steep slopes. Because they are easily eroded and subject to saturation in some areas, there was concern about potential stormwater issues resulting from vegetation removal during habitat restoration or enhancement activities.

Many of the suggestions, concerns and concepts received during that outreach effort are reflected in this Plan. Ongoing opportunities will be provided for the public to participate in multiple aspects for implementing the Habitat Management Plan.

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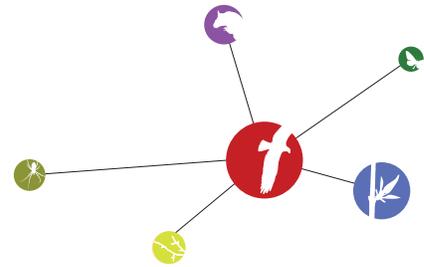
IV. Habitat Management Strategies and Recommendations

A. Concepts and Strategies

Habitat management plans are typically written with specific goals in mind but under a few uniform guiding principles. Management planning goals are ecosystem-based and thus include the basic characteristics of the land to be managed, the goods and services to be produced,⁹ and the desired conditions to be obtained, e.g., biodiversity, health and integrity, and sustainability (Wagner, 1995). Like most such plans, this HMP includes a combination of these concepts or principles. The resulting management concepts and strategies are discussed below.

Managing for Special-status Species

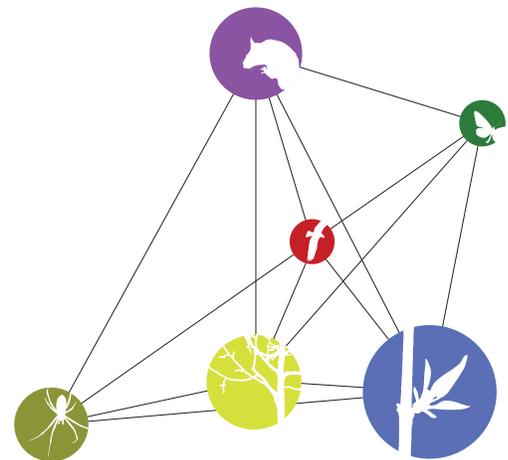
Habitat planning for special-status species (i.e., rare or endangered plants or animals) essentially uses the natural history of a species to custom design habitat to a fairly precise set of habitat parameters, e.g. plant cover, successional stage, degree of disturbance, and to maintain those in roughly the same conditions indefinitely. To some extent this planning emphasis may exclude biodiversity planning, and project sites may need constant attention over time to compensate for natural ecological changes. While this HMP does not advocate an emphasis on managing for special-status species to the exclusion of other goals, applications of this principle on YBI might include construction of artificial roosts or rookeries for cormorants or black-crowned night herons, bat or bird boxes, and protection of key raptor perch trees.



Managing for Biodiversity

Biological diversity, or biodiversity, can be defined on many levels and scales. Simply defined, the term encompasses the variability of life on earth at all levels of biological systems, from the genetic level, to species, to ecosystems. Ecologists have long recognized the critical interconnections between healthy ecosystems and biodiversity. While ecosystem processes promote and maintain biodiversity, an ecosystem's stability, resilience, and persistence are, in large part, a function of its biodiversity.

Biodiversity on YBI has been severely compromised over the past 150 years as a result of historical and current land uses. The Island's original biotic communities have been fragmented, degraded, or eradicated from large parts of the Island, and replaced by hardscape and a near monoculture of eucalyptus, French broom, and other non-native species. Nonetheless, remnants of native biodiversity, as expressed in relatively intact native vegetative communities, persist on YBI. **Improving biodiversity is the primary, but not the exclusive, focus of preservation, restoration, and enhancement efforts under this HMP.**



⁹ People benefit from resources and processes supplied by natural ecosystems. Collectively, these benefits are known as ecosystem services and include products like clean drinking water and processes such as the decomposition of wastes. Ecosystem services are distinct from other ecosystem products and functions because there is human demand for these natural assets. Services can be subdivided into five categories: provisioning such as the production of food and water; regulating, such as the control of climate and disease; supporting, such as nutrient cycles and crop pollination; cultural, such as spiritual and recreational benefits; and preserving, which includes guarding against uncertainty through the maintenance of diversity.

IV. Habitat Management Strategies and Recommendations

Management Strategies: Preservation, Restoration and Enhancement

Managing for biodiversity and, in some cases, for special-status species, on YBI will require several different strategies. These strategies will be applied in different Management Zones according primarily to existing conditions and the levels of disturbance in each Management Zone.



Preservation consists of identifying and protecting relatively intact ecosystems or biotic communities, as well as other features of interest related to the Island's living organisms (e.g., exceptionally large native trees, colonial nesting sites of certain bird species, rare plant populations) from degradation. Preservation activities may include permanent or seasonal access restrictions through fencing, signage, and educational programs, as well as regular early detection monitoring for non-native plant and animal invasions.

Restoration is defined for the purposes of the HMP using the Society for Ecological Restoration's (Clewell et al., 2005) definition of ecological restoration:

...the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed.

Restoration '...is an intentional activity that initiates or accelerates ecosystem recovery with respect to its health (functional processes), integrity (species composition and community structure), and sustainability (resistance to disturbance and resilience).' (Clewell et al., 2005).

The concept of an ecosystem refers to a specific, functionally integrated natural unit comprised of the interrelationships between various organisms and between organisms and their environment. Thus, a pool in a stream, a redwood forest, or the watershed that contains them both, can each be referred to as an ecosystem. When ecosystem processes, functions, and species cannot be restored to a self-sustainable state, then full 'restoration' of a system cannot be achieved.

The scale at which restoration of habitats and processes can be achieved without ongoing future maintenance on YBI is unknown, particularly when the reintroduction of ecosystem shaping processes may not be possible and the threat of reinvasion by non-native plant species will remain high for many decades to come. In some cases, removal of invasive plants may be all that is required for restoration of a site – released from competition with invasive species, native seeds lying dormant in the soil for many years can germinate, and nearby native populations can re-colonize the site. In other cases, it may be possible to restore natural processes. For example, native seed germination may be more likely where blue gum debris is removed from the soil surface; pollination can be encouraged by restoring habitat for native bees and/or reintroducing insects that may have been extirpated by loss of native plant species or by pesticide use; plant reproduction may be enhanced by restoring the sun exposure required for flowering, fruiting and seed production; and restoring natural soil chemistry might enhance or restore decomposer populations and enhance soil nutrient cycling.

Enhancement is the process of modifying a site to increase or improve habitat for plants and animals and thus increase the ecological value of the land. Ecological enhancement can be carried out in cases where ecosystem processes and functions are no longer intact and/or cannot be restored. The necessary implication of this strategy is that ongoing management of the systems being enhanced will likely be required. Ecological enhancement entails activities such as invasive plant and pest animal control, as well as revegetation with native plant species to re-establish wildlife habitat and prevent reinvasion by non-native plant species.

Discussion

Habitat management on YBI will be driven, in large part, by consideration of the principles defined above. While no endangered species are known to breed or grow on the Island, there are, for example, a number of locally significant¹⁰ plant species that persist. Known populations of these species will be protected and enhanced and attempts may be made to reintroduce some of these species into suitable habitats on YBI.

Many of the management activities recommended in this HMP are aimed at protecting and enhancing YBI's biodiversity, which is made up of many more common plants and animal species, each an important component of the system. The primary tool to achieve this goal is the manipulation of existing vegetation. Control of invasive plant species, including the removal of eucalyptus trees from some areas, and revegetation with native species will all serve to enhance, and potentially increase, native vegetative biodiversity and sustain it over time. The Management Zones described in Section VI were, in part, delineated on the basis of the existing biodiversity that they support.

On YBI, preservation of larger existing relatively intact areas, as well as smaller populations of special-status plants or even single native trees, will be important in maintaining the overall biodiversity of the Island. At its most fundamental level, ecosystem restoration involves restoring the ecosystem processes and functions that maintain biodiversity, but it is often impossible to implement restoration at this level. For example, urbanized areas are generally so degraded that they impose enormous constraints upon restoration efforts because loss of ecosystem components, functions, and processes make it impossible to re-create a self-sustaining system and regain full ecosystem integrity. As noted above, on YBI, the term restoration in the purest sense could best be applied to activities which could be carried out in fairly intact areas of the Island where, due to the diversity of extant vegetation, the presumption is made that ecosystem process and functions are also relatively intact. It will also be important to continue to identify opportunities to restore ecosystem processes. Even in the face of lost ecosystem processes, enhancement activities can be used to effectively promote structural and habitat diversity, leading to increases in native biodiversity, and provision of relatively high quality wildlife habitat.

The primary basis for the HMP is preservation, restoration, and enhancement of vegetative diversity with the assumption that "if you build it they will come," i.e. that island wildlife is best served by creating diverse habitats native to an island. The wildlife resource on YBI is determined not only by the quality and diversity of its habitat, but by its size. Basic island "biogeography" is a matter of common sense: larger isolated landforms contain larger habitat areas and provide opportunities for more types of habitat – and hence more species. Put another way, birds (for example) with small home ranges or territories should do best on YBI, and that appears to be the case, with resident mockingbirds, robins and song sparrows occupying territories of about an acre (Michener and Michener 1935, Young 1951; Nice 1937). In contrast, birds with larger territories – jays, woodpeckers or grosbeaks – although they are present and may breed on YBI, would likely be difficult to support in any numbers over a long period of time due to the Island's small size.

It is unlikely, therefore, that managing for future resident species (not already present as breeders) would be effective. Vegetation management can increase breeding activity of resident birds by providing a greater food supply. For example, increasing sun exposure through tree removal can allow more flowering of nectar-producing plants, thereby helping nectar-gathering birds as well as the insect-eating birds that will consume the insects attracted to the flowers. The HMP also considers smaller taxa – butterflies, for example – for which habitat polygon size is less of an issue; species that might use the Island as a stopping point during migration or dispersal; and species such as cormorants and black-crowned night herons, whose territories include open water. In the latter case, wildlife habitat enhancement might not be vegetation-related at all, but might include construction of artificial structures for nesting or roosting. Habitat enhancement might also include designation and protection of tree stands for species such as black-crowned night heron that currently use Monterey cypress and pines on TI as roosting habitat.

This does not mean that vegetation-based habitat management on YBI would not benefit wildlife on a broader scale, including, for example, migratory birds. Managing for intact native habitats, by removing the competitive pressures of invasive plant species, and otherwise encouraging diversity without regard to patch size would result in improved habitat by creating an improved foraging and resting situation for a variety of migrants. Such management may serve to increase the suite of migratory and incidental species that use habitat on YBI beyond those that are considered residents.

¹⁰ Plant species known from only one or very few locations on the San Francisco Peninsula. These species are not considered to be "special-status species" by the U.S. Fish and Wildlife Service, California Department of Fish and Game, or the greater California Native Plant Society. As such, they have little protected status under most existing laws or policies. However, the California Environmental Quality Act (Article 9) states that "special emphasis should be placed on environmental resources that are rare or unique to ... [a] ... region" and, although these species may be widespread elsewhere, their small populations in San Francisco represent a unique local biological resource. The CNPS Yerba Buena Chapter maintains a list of locally significant species for San Francisco County on their website, http://www.cnps-yerbabuena.org/experience/plant_guides.html.

IV. Habitat Management Strategies and Recommendations

B. Goals and Strategies

This section takes the general management concepts and primary strategies discussed in the prior section and translates them into goals for YBI, and specific strategies that will guide the achievement of the desired future condition of productive, stable, diverse habitats on YBI, as feasibly permitted by the proposed Redevelopment Plan. Later prescriptions (see Section VI, Management Zone Prescriptions) will focus again on the three main strategies: preservation, restoration, and enhancement.

Goals:

- Maintain and expand, where possible, the existing biodiversity on YBI.
- Re-establish native habitat diversity, structure, and ecosystem function and processes to the extent feasible in areas that have been degraded and that are not proposed for new development.
- Maintain and expand areas of native habitat.
- Maintain and expand, where possible, viable populations of all existing special-status plants.
- Reduce the threats posed by invasive plants and animals to native habitat and special-status species.

Strategies:

- Preserve intact habitat and features on YBI where no restoration or enhancement is necessary, including habitat assets such as raptor perch sites or bat roosts.
- Restore areas of YBI where ecosystem process and functions are relatively intact and, due to the diversity of extant vegetation, minimal action is needed to reverse degradation.
- Enhance those areas of YBI where ecosystem processes and functions are no longer intact to increase or improve habitat and habitat functions and values for plants and animals. Establish a long-term monitoring and maintenance program to:
 - Detect changes in special-status species populations.
 - Detect significant changes in native species richness and cover.
 - Detect significant changes in invasive species abundance.
 - Assess success of preservation, restoration, and enhancement efforts.
 - Provide a framework for adaptive management of YBI's natural areas.
- Coordinate HMP prescriptions to provide public access and recreational opportunities compatible with habitat goals.
- Support and develop stewardship opportunities as part of habitat restoration and enhancement projects and in long term monitoring and maintenance activities. Consider the feasibility of establishing a native plant nursery on YBI to propagate locally harvested stock for revegetation projects on both YBI and TI. The nursery would also serve as an environmental education and resource center for Island residents and visitors and as such, could serve as a central repository for information regarding the Island's natural resources, including species inventories, monitoring data, and site-specific restoration and enhancement plans. Partnership with local stewardship and advocacy groups, such as Nature in the City and CNPS, would involve those who know the most about the Island's resources and could also enable funding from a variety of sources.

C. Recommended Management Actions

This section recommends the actions to be implemented to achieve HMP goals. The number of major actions necessary to implement this HMP are actually quite few, and it is those that are discussed here. The actions then provide the basis for the management prescriptions in Section VI. The actions are grouped below under the main strategies discussed in the previous subsections: preservation, restoration, and enhancement.

Preservation, restoration, and enhancement activities considered for specific habitats on YBI, although inherently beneficial, could also result in negative impacts. Habitat management planning should weigh potential benefits against potential negative impacts as part of the planning process. This section therefore also identifies and describes potential impacts associated with the recommended management actions.

Management Strategy: Preservation

Preservation of existing intact ecosystems or biotic communities and other valuable biological resources, such as exceptionally large native trees, colonial nesting and/or roosting sites of herons, cormorants, and Western gulls, and rare plant populations will entail identifying these resources and protecting them from degradation. Specific actions recommended under the preservation strategy include:

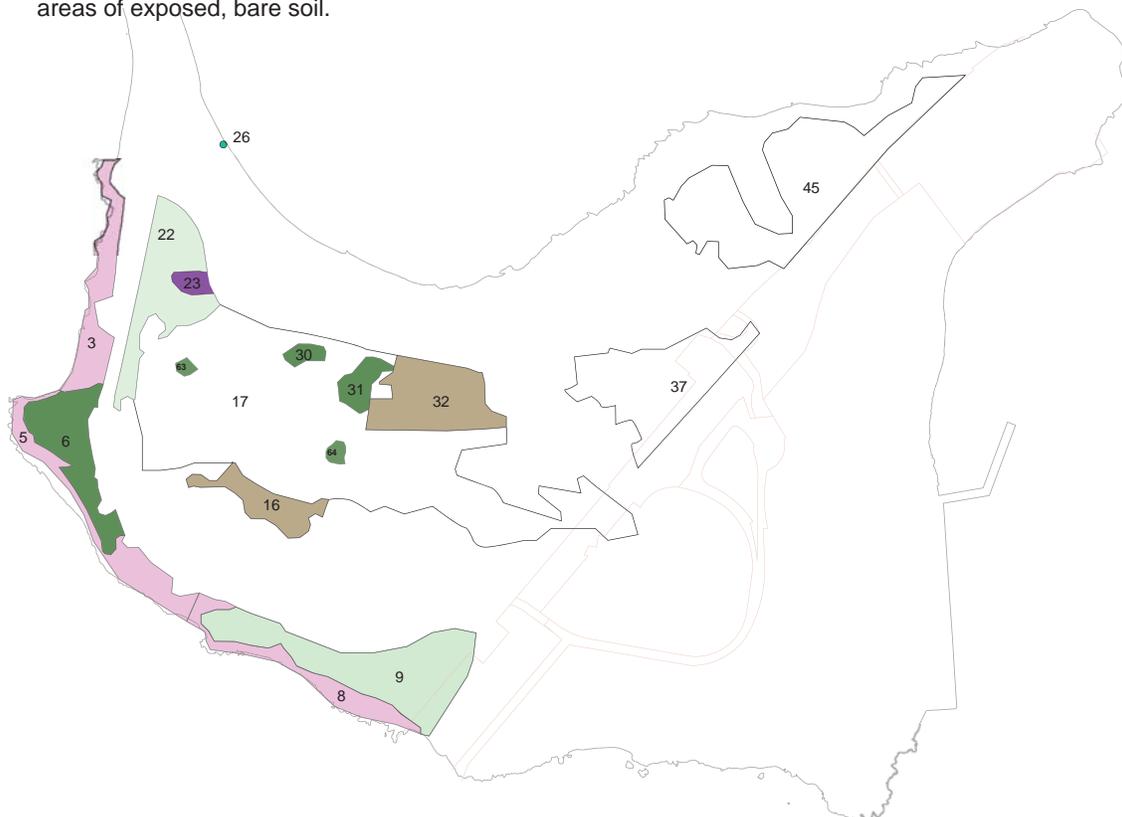
Recommended Actions:

- Map rare plant populations and other resources of interest.
- Conduct regular early detection monitoring for non-native plant invasions and remove promptly if found.
- Establish permanent or seasonal access restrictions through fencing and/or signage if warranted. Trails through especially high value areas, such as the oak woodland in Map Unit 6 could be fenced on both sides to ensure that recreational users remain on trails.
- Establish educational programs on the importance of YBI's biological resources as well as supporting established stewardship programs and developing new ones.

These actions will serve to locate areas that need protective measures implemented and may provide the basis for enhanced stewardship and volunteer programs capable of implementing much of the HMP.

Potential detrimental affects that can result from poorly implemented preservation efforts include:

- *Fencing*- To protect revegetated areas from recreational damage during the initial stages of establishment, it may be most effective to fence the entire area. Fencing can also inhibit wildlife passage, although the basic absence of large mammals on YBI makes such an impact unlikely.
- *Erosion*- The potential for erosion in revegetated areas is highest on steep slopes and sites with large areas of exposed, bare soil.



Actions related to resource preservation are prescribed for Map Units: 3, 5, 6, 8, 9, 16, 22, 23, and 26 and recommended for the following Map Units within the redevelopment area: 17, 30, 31, 32, 37, 63 and 64.

IV. Habitat Management Strategies and Recommendations

Management Strategy: Restoration and Enhancement

As strategies, restoration and enhancement are driven by essentially the same set of actions, and therefore these are considered together. The difference between the two strategies lies in their definition and application. Restoration is possible within, and applied to, areas that are more or less intact, in terms of biota and ecosystem functions and processes and are in need of minimal work in order to be returned to a self-sustaining system. An enhancement strategy is applied to areas that have been degraded to a point where re-establishment of a self-sustaining system is not possible but where there is potential to restore some ecosystem components, and hopefully some functions and processes, in order to increase the value of these areas as wildlife and plant habitat.

Recommended Actions:

Revegetate to establish site-specific appropriate habitat

Revegetation may involve installation of irrigation and temporary and permanent fencing, hand-seeding, hydroseeding, planting container stock of native, local, and ecologically appropriate plant species in order to recreate site-specific and appropriate habitat that provides desirable habitat values and functions. Invasive species removal is often conducted in areas to be restored prior to planting. In conjunction with planting, there is sometimes an addition of soil amendments, mulch, and plant protection implements such as wire cages or plastic tubes. Beneficial impacts associated with revegetation include improved wildlife habitat, establishment of ecologically and culturally valuable plant communities, improved aesthetics, possible increases in biodiversity, and the potential introduction of a natural history community education element.

Potential detrimental effects of revegetation may include:

- *Erosion*- The potential for erosion in revegetated areas is highest on steep slopes and sites with large areas of exposed, bare soil. Areas that are subject to concentrated water flows from hardscape areas are vulnerable to erosion.
- *Wildlife displacement*- Most natural areas are used by at least a few wildlife species. If an area is being converted from one vegetation type to another via habitat restoration or enhancement, some wildlife species may be displaced.
- *Special-status species damage or destruction*- There is less potential for impacts to special-status species and communities during revegetation than there is during invasive species removal. However, in the site preparation phase it is possible that an area supporting a special-status plant population might accidentally get cleared if volunteers are not aware of the presence of special-status plant populations in the area.
- *Fencing*- To protect revegetated areas from recreational damage during the initial stages of establishment, it may be most effective to fence the entire area. If the area is reasonably large, fencing can inhibit wildlife passage, although the basic absence of large mammals on YBI makes such an impact unlikely.
- *Vandalism*- Revegetation projects in areas visible to the public are frequently subject to vandalism. Vandalism is often restricted to the revegetation site and usually occurs in the form of destruction or damage to installed plantings and irrigation systems. In addition, a revegetation site could potentially serve as an entry-way to adjacent undisturbed natural areas that might also suffer acts of vandalism and disturbance.



Revegetation is prescribed for Map Units: 2, 3, 7, 8, 13, 14, 15, 16, 22, and 25.

Reintroduction of special-status plants is prescribed for Map Units: 8 and 9

Reintroduce Special-status Plants

Several special-status plant species populations occur on YBI, primarily in the West Bluff South and Summit Management Zones [Section VI]. In these areas, one of the management prescriptions is to preserve and enhance special-status plant habitat and potentially introduce additional populations to other nearby suitable habitat. In addition, the native groundcover, yerba buena, which, while not considered special-status, is the Island's namesake but no longer occurs there, should be reintroduced to YBI as a symbol of the spirit of the HMP. These activities would enhance a valuable natural resource that contributes to the overall biodiversity and unique natural history of YBI.

Potential detrimental affects of protecting and enhancing special-status plant species habitat are few, but nonetheless may include:

- *Introduction of invasive plant species*-Soil preparation and disturbance for the reintroduction of special-status plant populations have the potential to open the way for establishment of non-native invasive species as well, particularly if the area under consideration currently supports invasive species.
- *Erosion*- Potential restoration areas for special-status plants located in the West Bluff South Management Zone include steep hill slopes that could be subject to erosion if the soils are disturbed to a great enough degree.

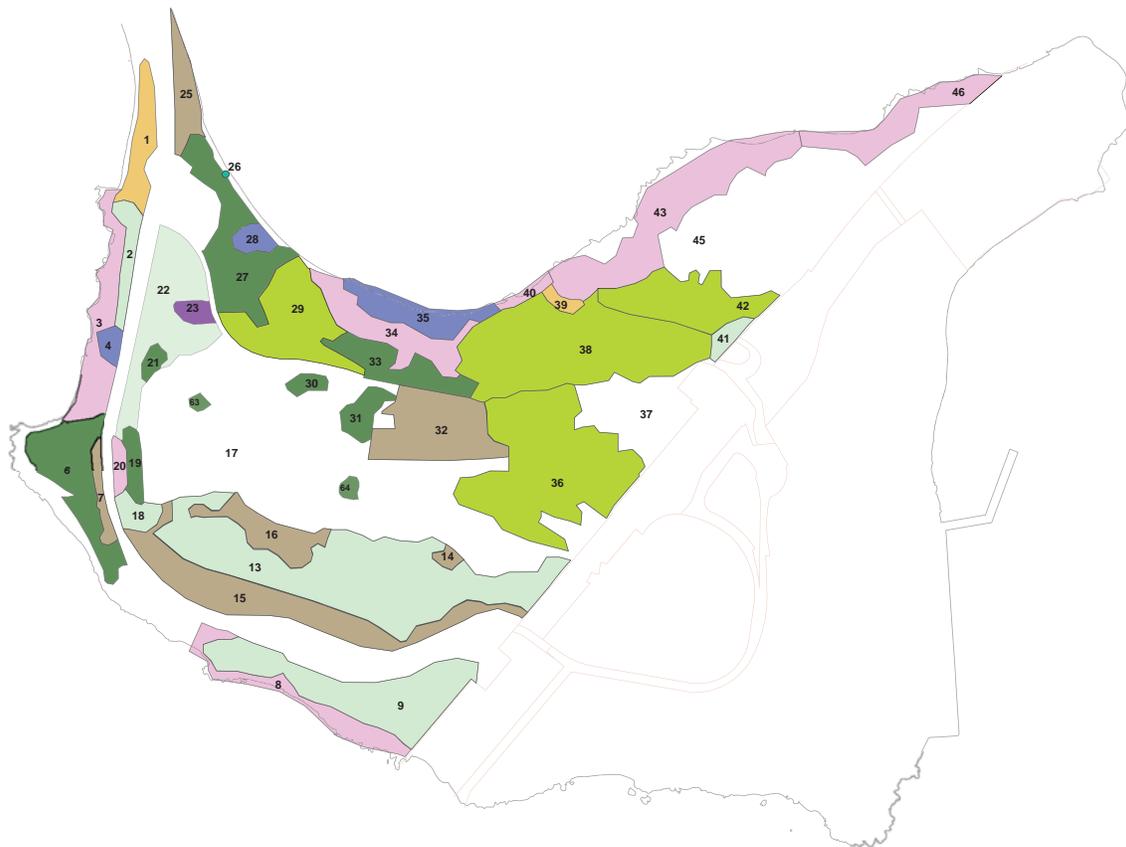
IV. Habitat Management Strategies and Recommendations

Remove Invasive plant species

Invasive plant species are present throughout YBI, but large infestations are mostly confined to disturbed lands and surrounding developed areas. Typically, invasive species germinate and begin to dominate natural areas after a disturbance and begin to displace native species. Invasive species are capable of substantially altering habitat by increasing the amount of vegetative cover and disrupting the natural stratification of vegetation within a community, outcompeting plants that provide valuable food and habitat for wildlife, altering soil chemistry and reducing overall species diversity. The most problematic species on YBI are eucalyptus, French broom, iceplant, veldt grass, Algerian ivy, sticky eupatorium, Canary Island marguerite, and sweet fennel. Removal and control of infestations of these species in selected Map Units could allow native vegetation to re-establish naturally (i.e. after the selective thinning of eucalyptus trees in areas with a moderate cover of coast live oak) or provide more suitable habitat for revegetation efforts.

Removal of large trees such as eucalyptus would require a detailed implementation plan (see Section V, *Best Management Practices*) and long-term monitoring because there are many potential adverse impacts to carrying out removal on a large scale. Eucalyptus removal would include typical tree removal equipment and, depending on the method used, could result in considerable disturbance of understory vegetation, where it occurs, and soils. Removal of smaller invasive shrubs, herbs, and groundcovers could be accomplished by hand pulling, mechanical mowing or grubbing, herbicide application, or other appropriate means. Beneficial impacts may include improved wildlife habitat, restoration and enhancement of ecologically and culturally valuable plant communities, improved aesthetics, improved views of San Francisco and the Bay from various vantage points (eucalyptus removal), and a reduction in the local spread of noxious weeds. Potential detrimental affects of invasive species removal could include:

- *Erosion* - The potential for disturbed soil and sediment to be carried downslope by surface flow rainwater is high in areas of steep slopes, and increases with the amount of soil disturbance. For example, removal of eucalyptus tree stumps has the potential to create extreme soil disturbance because of their extensive root systems. Skidding of trees out of removal areas for disposal also disturbs the soil surface. Removal of smaller invasive species also has the potential to cause erosion. When dense infestations are cleared from an area (especially those on steep slopes), it will leave the area temporarily bare with exposed topsoil. However, removal of invasive species also creates the opportunity to establish native vegetation, such as perennial bunchgrasses or shrubs, that are known to hold soil far better than eucalyptus roots.
- *Increased potential for wind throw of remaining trees* - Removal of some trees and retention of others may increase the potential for wind throw of remaining trees that are no longer protected from strong winds by adjacent trees.
- *Removal of nesting habitat* - Removal of large eucalyptus trees, especially if carried out in a way that dramatically reduces the canopy cover in a certain area, can potentially impact nesting raptors and other birds, which is why the BMPs call for the breeding bird surveys. A few species may even nest in dense stands of broom or fennel.
- *Invasive plant spread* - Despite the goal of eliminating non-native invasive species, certain areas, when not restored to a natural community and actively managed as such, may be susceptible to a new invasive species infestation as a result of being recently disturbed by invasive species removal activities. It will be necessary to have a stewardship plan in place for follow up maintenance and monitoring.
- *Herbicide leakage and drift* - If herbicides are used in invasive species removal, they should be used in accordance with the City of San Francisco's Integrated Pest Management (IPM) Plan and applied only by a licensed professional.
- *Special-status species and communities destruction* - Several special-status and locally rare species and plant communities are present on YBI including dune gilia, Dutchman's pipevine, and valley wildrye grass land. Removal of invasive plants using manual techniques, mowing, mechanical thinning techniques, or herbicides could have impacts on individual special-status plants or populations when they are interspersed with invasive species.



Invasive plant species removal is prescribed for all Map Units except 5, 24, and 44 and is recommended for Map Units 17, 37 and 45.

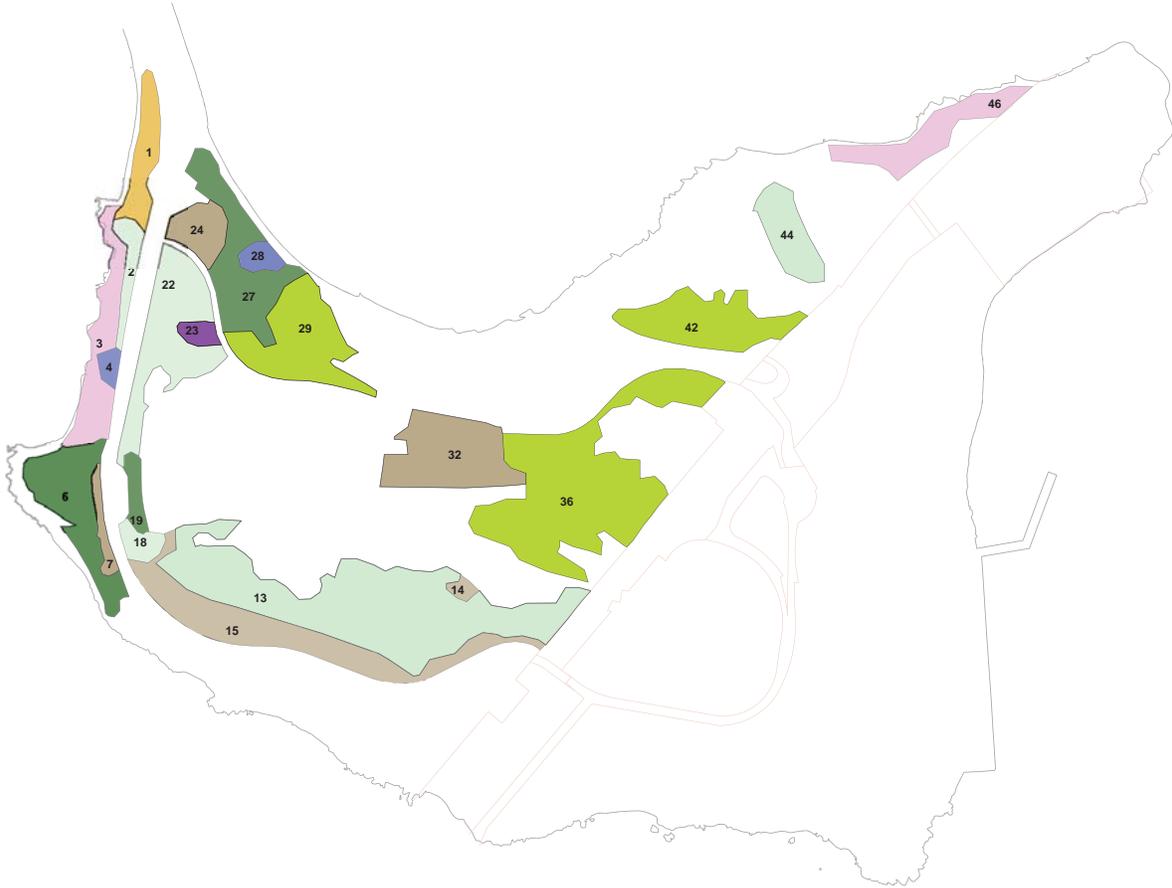
IV. Habitat Management Strategies and Recommendations

Allow designated Public Access through Trail Construction and Installation of Recreational Facilities

Currently, there are undeveloped social trails in many areas on YBI. These trails are found mostly near the coastline, but human use within natural areas throughout YBI may increase with future development on the Island. To date, the primary reason for both formal and informal trail development has been to obtain access to beaches and views. Development of new public access trails is proposed as part of the HMP as a method to educate the public, to increase public appreciation of YBI's natural resources, and to reduce human impact in the popular natural areas. Well-designed trails will require less maintenance and cause less runoff related erosion. Beneficial impacts of public access trails for wildlife and natural communities in high use areas are obviously great because carefully located designated trails can effectively concentrate and isolate human impacts. However, for this benefit to be fully realized, informal social trails must be eliminated in conjunction with new trail construction and a monitoring program implemented to discourage the creation of new social trails. Another beneficial impact is the public enjoyment of experiencing nature in such a unique and scenic setting. Appropriately signed trails can provide an outdoor classroom for environmental education. This benefits the natural communities and wildlife by increasing public awareness and appreciation for protecting natural areas.

There are also potential detrimental affects associated with constructing public access trails:

- *Plant community and wildlife habitat disturbance* - Trees and understory plants may be removed or trimmed while routing trails. During construction or installation of the trails, wildlife could be displaced or negatively impacted by the noise from machinery. Habitat fragmentation may occur.
- *Invasive species infestation* - Creating a disturbed area, as well as increasing edge habitat, opens pathways for the introduction of invasive plants into relatively intact areas.
- *Erosion* - Much of YBI is comprised of loosely consolidated sands and loams occurring on steep slopes that are prone to erosion. Alteration of drainage patterns can cause water erosion. In addition, people taking shortcuts across switchbacks and off-leash dogs can denude vegetation and disturb soils, resulting in erosion.
- *Human impacts* - These include: garbage in natural areas; vandalism or destruction of natural vegetation; picking wildflowers; harassment of wildlife (deliberate or accidental); increases in off-leash dog activity, which can lead to slope erosion, negative impacts associated with pet waste, trampling of vegetation off trails and wildlife harassment; soil compaction in trail areas; and an increased risk of fire. Human presence can also interfere with wildlife reproduction if appropriate seasonal closures are not implemented. For some trails, access might be best limited to docent-led tours, or limited seasonally.
- *Picnic areas* - Outdoor food consumption is often associated with the deliberate or inadvertent feeding of wildlife, which harms the environment in a number of ways. Animals that associate food with humans can become aggressive. Animal health can suffer from ingesting inappropriate food (and wrappers). Non-native animals can proliferate due to an increased food supply. Opportunistic natives, such as raccoons and several corvid species, can increase in numbers disproportionate to the natural species composition for the area. Any picnic areas constructed on YBI will need signage about feeding wildlife, well-designed receptacles for trash, recyclables and compostables, and regular clean-up and monitoring.



Providing public access through appropriate development of trails and other recreational facilities is prescribed for Map Units: 1, 2, 3, 4, 6, 7, 13, 14, 15, 18, 19, 22, 23, 24, 27, 28, 29, 32, 36, 42, 44, and 46.

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V. Best Management Practices

Best management practices (BMPs), as they apply to the management actions introduced in Section IV, Habitat Management Strategies and Recommendations, are intended to provide guidance for protecting existing resources and limiting unintended environmental disturbance during the implementation phase of the HMP. This section describes the individual BMPs that should be reviewed and considered when planning to carry out the recommended habitat management actions (identified generally in Section IV and detailed in Section VI). Important aspects of the BMPs are discussed in numerical order, and the management actions to which they apply are listed at the end of the discussion of each BMP. While Section IV describes possible impacts associated with each management action, implementation of the BMPs listed here should eliminate or reduce those detrimental environmental affects.

It is assumed that the field implementation of project components will be carried out under the supervision of a restoration specialist or qualified biologist who will:

- be knowledgeable about the biological resources on the Island,
- oversee development of specific plans to support the stated goals associated with each management action,
- ensure the correct use of field equipment both for safety and environmental protection,
- verify that the correct plant species are installed in an ecologically appropriate arrangement for habitat restoration work,
- have a working knowledge of herbicide use and application, specifically with respect to the target invasive plant species on YBI, and
- follow these BMPs and the goals and objectives of the HMP to ensure protection and enhancement of the Island's unique natural resources and habitats.

A. Revegetation

Enhancement and restoration of native plant communities and wildlife habitat through invasive species removal and revegetation with native species is proposed in many of the management areas on YBI. The scale of restoration or enhancement and characteristics of each site will vary. The following general BMPs should be followed to ensure that revegetation is carried out in an ecologically appropriate manner and provides the best possible future habitat.

1. Assign oversight of habitat restoration or enhancement activities to a qualified biologist or habitat restoration specialist. This specialist should be responsible for ensuring that the planting material is healthy, locally harvested, and appropriate for the goals and strategies of the specific planting area (e.g., for revegetation of coastal scrub habitat, the plant palette should include native plant species found in coastal scrub habitat on YBI).
2. Develop a site-specific plan. This plan can build on information provided in the HMP and will include: a description of site conditions, identification of target habitat restoration components (native plant community, wildlife species that will benefit), designation of a reference site, plant species palette, methods for carrying out the work, phasing of revegetation and monitoring actions, irrigation plan (if necessary), schedule, and list of responsible parties. The plan should also include success criteria and an adaptive approach to monitoring the restored or enhanced areas at regular intervals that will provide an assessment of project success and identify areas of follow up work or modification.
3. To preserve the genetic integrity of plant populations on YBI, revegetation should emphasize the planting of YBI harvested plant material (seeds and propagules¹¹). Local harvest should be carried out only from populations that are large enough to support materials collection. Some general guidelines for carrying out ecologically sustainable local seed and propagule collection are modified from the Seeds of Success seed collection protocol¹² and are as follows:

¹¹ Propagules are plant matter such as rhizomes and other root material, stem and leaf cuttings and seeds that can be harvested and grown into mature plants.

¹² Seeds of Success is a native plant seed collection partnership between many resource agencies, non-profit conservation organizations, and botanic gardens world-wide. The seed collection protocol is available online: <http://www.nps.gov/plants/sos/protocol/index.htm>

V. Best Management Practices

- If seeds will require storage prior to planting (e.g. if seeds are collected one year for planting the following year), determine the viability period for the species and the most appropriate location for storage based on the individual characteristics of the seeds so that the maximum seed viability is maintained while seeds are in storage.
- Assess the target population and confirm that a sufficient number of individual plants (> 50) have seeds at natural dispersal stage or propagules ready for harvest.
- Sample equally and randomly across the extent of the population, maintaining a record of the number of individuals sampled.
- For seed collection: collect no more than 20 percent of the viable seed available on the day of collection. For plant material collection: collect no more than 10 percent of the total organ material of an individual (e.g. when collecting rhizomes, harvest only 10 percent of the rhizome material of the individual) from approximately 20 percent of the population.
- Collect seeds from a population throughout its dispersal season.
- Impose other guidelines or modify the above guidelines as determined by the restoration specialist or qualified biologist based on restoration species' characteristics or population limitations.

4. For development of the plant palette, the restoration specialist or qualified biologist should consider plant species that are found at a local reference site,¹³ in addition to native species already occurring naturally in the area, and native plant species that are known host plants for native insects and food plants for wildlife. Native species that are not currently known to be from YBI will only be introduced after careful consideration of their natural histories, including the potential for interactions (e.g., competition, hybridization) with species that currently exist on the Island.

5. During revegetation and removal of invasive species [see Section D, below] install temporary signage and fencing to prevent establishment of social trails, vandalism, and access by dogs in areas receiving treatment. Notify residents in advance of projects and request their cooperation and support.

6. If hydroseeding is required during revegetation or removal of invasive species, use only certified weed free seed.

7. Follow all BMPs provided in the sections on protection of sensitive areas and wildlife, erosion control, herbicide application, and invasive species (prevention and removal).

8. Learn from local restoration agencies, such as the Presidio and the SFRPD Natural Areas Program, the best timing and germination techniques for the seeds of each species (heat, soaking, scarification, etc.) and determine whether soil amendments, mulching, and supplemental watering are appropriate on a case-by-case basis.

These BMPs apply to the following recommended management actions:

- Revegetation

B. Protection of Sensitive Resource Areas

Sensitive resource areas on YBI include populations of special-status or locally rare plants and plant communities, host plants for special status invertebrates, nesting sites for various bird species, and mature native trees. The following BMPs provide guidelines for carrying out HMP planned activities in a way that allows for protection of sensitive resource areas.

1. Implementation of management actions should be scheduled to avoid seasonally sensitive areas. For example, invasive species removal activities near populations of dune gilia and fiesta flower can be scheduled to avoid the active life stage of these annual species and thus avoid adversely affecting pollination and seed production. However, even during the late summer, fall, and winter, work within areas known to support annual special-status or locally significant plants should be done with great care so as to not create extensive ground disturbance that would damage the seed bank or

¹³ Preferably the reference site will be located on YBI and in no event will it be located more than 25 miles from YBI.

promote establishment of invasive species. As another example, projects with the potential to impact butterfly host plants, particularly invasive species such as fennel, which is a host plant for the anise swallowtail butterfly, should be timed to avoid the reproductive phase for the species or phased so that the plants in question are not removed all at once if other suitable host plants are not located nearby.

2. Prior to project work within or near sensitive resource areas, the restoration specialist will carry out a pre-implementation survey that will establish precise boundaries of the areas to be avoided. The boundary of the sensitive areas should include an appropriate buffer, depending on the type of work taking place, and will be determined by the restoration specialist.

3. The boundary of the sensitive area should be identified with flagging, fencing, area closure notification signs or other designation at the discretion of the restoration specialist.

4. The field implementation team, whether it consists of a hired contractor, volunteers, or field staff (or combination thereof), should be educated as to the nature of the sensitive resources and area closure and how to best avoid impacts to the sensitive resources.

These BMPs apply to the following recommended management actions:

- Revegetation
- Invasive plant species removal
- Trail construction and installation of recreational facilities

C. Wildlife Protection

The limited space for wildlife habitat and resources on YBI provides a unique challenge for planning and implementing habitat management activities. The following BMPs will ensure adequate protection for wildlife during habitat management work.

1. Surveys should be conducted by a qualified biologist for nesting birds between February 1st (or earlier as determined by local monitoring) and August 15th if work with potential for disrupting avian reproduction is scheduled to take place during that period in any given year. If bird species protected under the MBTA or the California Fish and Game Code are found to be nesting in or near any work area, an appropriate no-work buffer zone should be designated by the biologist. Depending on the species involved, input from the CDFG and/or the U.S. Fish and Wildlife Service (USFWS) Division of Migratory Bird Management may be warranted. As recommended by the monitoring biologist, no activities should be conducted within the no-work buffer zone that could disrupt bird breeding. Outside of the breeding season or after young birds have fledged, as determined by the biologist, work activities may proceed.

2. Surveys should be conducted by a qualified biologist for special-status or maternity bat roosts that could be adversely impacted by management actions. YBI has large trees that may provide roosting habitat for bats. With the exception of tree removal, few HMP actions will directly affect this type of habitat. However, indirect effects from management actions such as noise could cause roost abandonment. Therefore, concurrent with nesting bird surveys, a qualified bat biologist should survey suitable structures and large trees for roosting bats to the extent that work on them or within 200 feet of them is proposed. If a maternity roost is present, a no-disturbance buffer of 200 feet should be created around the roost during bat maternity season (April 15 through August 15) and should remain in place until juvenile bats are self-sufficient and would not be impacted by habitat management project activities. Trees to be removed for the project that are showing evidence of bat activity should be removed during the period least likely to affect bats, as determined by a qualified bat biologist (e.g., roost sites of maternity colonies would be removed during the non-maternity season, August 15 through April 15). If exclusion is necessary to prevent direct or indirect impacts (e.g., resulting from roost removal, construction noise, or increased human activity), exclusion should also occur during these minimal-impact periods. Any special-status bat roosts that are destroyed should be replaced at a 1:1 ratio with a roost suitable for the displaced species. The roost should be monitored periodically for five years to ensure proper roosting habitat characteristics (e.g., suitable temperature and no leaks). The roost should be modified as necessary to provide a suitable roosting environment for the target bat species.

3. If work is planned to take place near the boundary of a wildlife no-work buffer, protective fencing and/or area closure notification signs should be installed to designate the areas.

V. Best Management Practices

4. The field implementation team should be educated as to the nature of the sensitive resources and area closure and how to best avoid impacts to the sensitive resources.

5. Site specific plans for habitat management actions (such as the plans described in the sections for restoration/enhancement, invasive species removal, and prevention of recreation impacts) should include an assessment of the total area of wildlife species habitat that will be impacted by a given project. The aim of this assessment is to ensure that adequate comparable habitat exists in the vicinity to provide habitat. If the management action is large in scale and will result in removal of significant portions of available habitat, vegetation removal and replacement should be phased, as appropriate, so that large areas are not impacted all at once. This may require the implementation of management actions to be spread out over longer periods of time. However, considering the diversity of habitats on the Island, even at very small scales, the slow pace of eucalyptus removal proposed by this plan (see the eucalyptus removal strategy), and the focus of this HMP on the long-term management, the probability of impacts to a large area all at once is very low.

These BMPs apply to the following recommended management actions:

- Revegetation
- Invasive species removal, non-native tree removal
- Trail construction and installation of recreational facilities

D. Invasive Plant Removal

Most successful invasive plant control programs are based on the adaptive implementation of a wide variety of control methods with the overarching goal of long-term control of invasive species and their replacement with native species and plant communities. In fact, a wide variety of control methods will be necessary for management of the invasive species on YBI and invasive plant species removal activities should be coupled with habitat restoration and enhancement projects as much as possible to maximize the creation of high quality wildlife habitat. This sub-section applies to all invasive plant species on YBI except the invasive and non-native trees eucalyptus, Monterey pine and Monterey cypress, which are addressed in a separate sub-section. The BMPs listed below identify methods for avoiding or reducing impacts to YBI's environmental resources during invasive plant species removal activities.

1. Develop a site-specific invasive species removal plan that includes: Setting objectives for eradication or control, assuring that resources are available for necessary follow-up work, setting a timeline, step by step methods for removal, tools and equipment required for removal, plant materials disposal methods, and identification of sensitive resources within or near the treatment site.

The plan should provide an adaptive approach to continued monitoring and weed treatment following the initial removal activities to ensure that any future small outbreaks can be treated quickly and effectively so as to not diminish the effort of the initial removal activities.

2. Assign oversight of removal activities to a qualified biologist or habitat restoration specialist with experience working with target invasive plants and knowledge of their removal methods including: most effective time of year for various removal methods (pulling, mowing, spraying etc.), herbicide application and precautions, and use of weed removal tools.

3. Consult the previous sections on sensitive area and wildlife protection, and follow all applicable BMPs described therein, with special emphasis on educating field staff and volunteers about sensitive resources in the vicinity of the removal activities.

4. Clean invasive plant species removal equipment, personal clothing, shoes, and vehicles to prevent the spread of small seeds (such as those of Australian fireweed, veldt grass, sticky eupatorium, Canary Island marguerite, invasive grasses, and others).

5. When feasible, prior to any large-scale removal of vegetation used as food or cover for native wildlife, establish an appropriate alternative.

These BMPs apply to the following recommended management actions:

- Revegetation
- Invasive species removal

E. Prevention of Invasive Plant Spread

Invasive plant species unfortunately grow throughout YBI and spread easily into cleared or disturbed areas and, less often, into undisturbed areas. Invasive species are easiest to eliminate when infestations are small or consist of few individuals, and before they set seed. Therefore it will be most successful to implement a monitoring program, as recommended in following sections and set forth in Part II, Implementation Plan of this document, which will allow resource managers to assess changes in infestations on the Island over time and adapt the invasive species removal strategy to fit the current circumstances.¹⁴

1. A qualified biologist should survey areas of recent disturbance and known nascent infestations at regular intervals to help inform the decision-making and prioritization for the HMP invasive plant removal actions.
2. Educate invasive plant removal field staff and/or volunteers about seed dispersal mechanisms and methods of spread of invasive plants in the project vicinity so that they can avoid being a vector.
3. Clean invasive plant removal tools, equipment, personal clothing and boots following removal activities to prevent seed/propagule dispersal.
4. Coordinate invasive species removal projects with habitat restoration to promote the establishment of native plant species in areas where invasive species are removed.
5. Install and encourage developed trails and recreation areas to limit the amount of off-trail human use and development of social trails in natural areas.

These BMPs apply to the following recommended management actions:

- Revegetation
- Invasive species removal, non-native tree removal
- Trail construction and installation of recreational facilities

F. Hazard Tree Assessment

Trees become hazards to people, infrastructure, buildings, and sensitive biological resources as they become old, diseased, or develop hazardous structural deficiencies such as split branches. Large eucalyptus trees are prone to structural deficiencies and can cause tremendous damage and personal harm when branches drop during storms or in hot weather. In order to protect people and buildings and reduce the potential damage to infrastructure and sensitive resource areas, hazard trees should be trimmed or removed in an ecologically sensitive way (such as the guidelines presented in the next sub-section: Non-native tree removal). The following BMPs provide necessary parameters for assessing hazard trees on YBI and can be used when prioritizing tree removal under the HMP.

1. Surveys for hazard trees should take place at regular intervals, such as once every two or three years, by a qualified biologist or arborist to identify hazard trees and potential hazard trees. Identification of hazard trees will reduce the risk of damage to infrastructure and people, and can help prioritize tree removal. The surveys should focus on areas with known sensitive resources, public access, and infrastructure.
2. In areas where human uses are expected to be low (e.g. in the interior of a woodland or forest community far away from main trails), mature and damaged trees should be left to complete their natural life cycle. In high human use areas, such as major trails, trail heads, parking lots, playgrounds, and picnic facilities (concrete paths, buildings, restrooms, etc.), hazardous trees should be identified, their potential for failure evaluated, and removed as needed.

Hazard trees in and around habitat restoration sites or sensitive areas (such as rare plant populations or sensitive vegetation communities) should also be prioritized for removal in order to reduce the potential for damage to sensitive resources.

¹⁴ An invasive species removal strategy resource is the Bay Area Early Detection Network at <http://www.baedn.org>

V. Best Management Practices

3. Hazard trees should be assessed using the following criteria:

- High probability of failure including consideration of slope stability
- Observed poor health
- Evidence of significant die-back
- Problematic tree structure
- Root damage and/or exposure
- Visible cankers and/or rot
- Observed or suspected disease or pest infestations
- Probability of striking humans, vehicles, structures or otherwise damaging roads or infrastructure

These criteria, in addition to location of the tree in relation to sensitive resources should provide the basis for prioritizing removal of hazard trees.

4. Where hazard trees are recommended for removal, all BMPs in the non-native tree removal section should be followed to ensure the maximum protection to wildlife and vegetation.

This BMP applies to the following recommended management actions:

- Revegetation
- Preservation of sensitive resources, including wildlife
- Trail construction and installation of recreational facilities

G. Non-native Tree Removal

The strategic removal of selected eucalyptus, Monterey pine and Monterey cypress trees is perhaps the largest scale management action proposed in this HMP. Therefore, a detailed eucalyptus reduction strategy has been developed that incorporates the goals and methods for removing eucalyptus trees, as well as a discussion of the advantages of this approach, and BMPs that will ensure protection of natural resources and surrounding habitats. The reduction strategy discusses eucalyptus trees in particular since they are the dominant non-native tree on YBI, continue to spread, and pose the largest threat to existing native plant communities. They also pose a considerable maintenance problem due to leaf, bark and branch litter that falls on landscaped areas, roads and roofs.

Tree stands that are deliberately retained, for their habitat or cultural value, will benefit in health and longevity from being thinned. Monterey pine and cypress trees on the Island are mostly large trees and are not included in the eucalyptus reduction strategy because of their different life history characteristics and limited potential to spread naturally. However, Monterey pine and cypress trees located near access areas and within specific communities will be proposed for removal where feasible. While the eucalyptus forest reduction strategy does not apply to Monterey pine and cypress trees, the BMPs for tree removal at the end of this subsection should be followed for all non-native tree removal to provide the maximum environmental protection. As noted elsewhere, pines should be inspected for pitch canker and cypresses for heart rot.

Eucalyptus Forest Reduction Strategy

For the sake of convenience, the term “eucalyptus” will be used in this document to refer only to the Blue Gum Eucalyptus and not to any of the many other eucalyptus species.

With increased public access to and use of YBI, there is an increased concern regarding the safety of persons and property. The ground beneath eucalyptus groves is typically covered with a tremendous amount of branch and leaf litter, creating a tripping hazard for pedestrians. Eucalyptus trees are subject to wind throw and may shed large limbs with no warning, posing a safety hazard for people and property. Finally, the oil-rich litter and the trees themselves are highly flammable. Once a fire gets started, burning eucalyptus bark and foliage may be carried by the wind, contributing to a fire's spread. With increased human access to the groves on YBI comes an increased risk of fire from carelessly discarded cigarettes and homeless encampments. Even embers from residents' fireplaces could ignite eucalyptus debris nearby. Since many of the eucalyptus stands are at upper elevations on the windward (western) side of the Island, a fire could quickly spread to the nearby housing complexes.

From an ecological standpoint, dense eucalyptus groves outside their native habitat are widely considered to be detrimental to native vegetation. Eucalyptus trees aggressively spread by the production of copious amounts of light-weight seeds. As young trees develop, their canopies rapidly begin to shade out native plants. Most eucalyptus species produce a large volume of debris comprised of leaves, capsules, bark strips, limbs and branches. Not only does this debris physically bury plants in the understory, but plant growth is inhibited by the allelopathic effects of chemical compounds in the debris. Within the fog incursion zone along the California coast, eucalyptus trees also alter the moisture regime of the understory by fog drip, facilitating the growth of non-native vines such as English ivy, Algerian ivy, and Cape ivy, further impacting native plants.

Conversion of native plant communities to eucalyptus groves also largely displaces the bird and wildlife species adapted to native habitats. Still, eucalyptus trees do provide habitat for numerous bird species such as hawks and owls, herons and egrets, crows and ravens, hummingbirds, warblers, kinglets and chickadees, among many others, even if not necessarily better habitat than the eucalyptus replaced.

Complete eradication of the eucalyptus trees on YBI is not recommended. There are biological reasons to retain some of the stands, and the trees that should be removed cannot and should not be removed all at once. Therefore, an incremental approach to removing eucalyptus trees consistent with the ecological goals of the HMP is being proposed. Even this type of approach will require development of a Tree Management Plan to guide the phased reduction of eucalyptus on YBI. There are nine components to this plan. These include:

1. Identification of trees and tree stands that should be preserved. Locate bat roosts, raptor nests that are used year after year, trees frequently used for perching, and healthy trees that are well located to be part of an interpretive program about the Island's history.
2. Remove hazard trees as discussed on pages 49-50.
3. Removal of all saplings within a given stand of trees.
4. Selective thinning of smaller diameter trees (at a minimum $\leq 8-12$ " dbh), including resprouts.
5. Removal of litter and downed limbs from the ground within eucalyptus groves.
6. Removal of lower branches of remaining trees to a height of 10-15 feet to reduce fire ladders.
7. Removal of hazardous limbs near trails, roads and structures.
8. Selective cutting of trees and saplings at the periphery of eucalyptus groves where trees are encroaching upon high priority native plant stands.
9. Incremental removal of larger trees as funding, public awareness and decision maker understanding evolve.

This approach has numerous advantages:

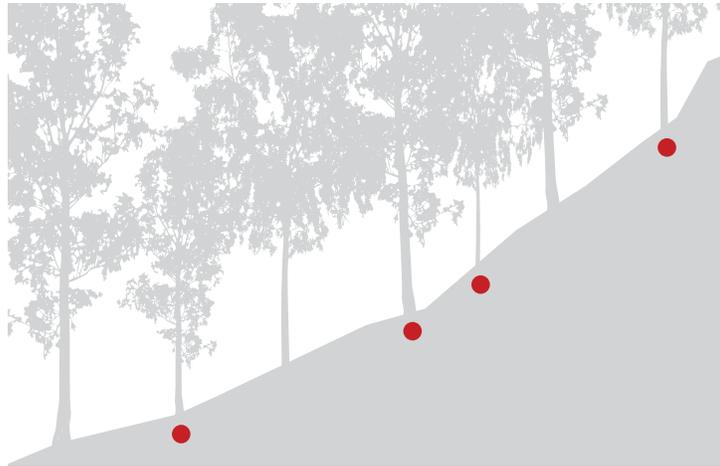
- The visual impact would be minimal as viewed from the City or the Bay Bridge.
- Recreational uses and aesthetics within the stands would be enhanced by eliminating tripping hazards for pedestrians and "cleaning up" the forest floor.
- Soil impacts resulting from felling and off-hauling large trees would be reduced, reducing the potential for erosion and damage to native species.
- Nesting, roosting and foraging habitat values provided by eucalyptus trees for birds and bats would be preserved.
- Opening up of the tree canopy and removal of forest debris would provide opportunities for limited re-introduction of native plant species.
- The fire hazard would be reduced.
- Safety hazards to pedestrians and property from falling limbs would be reduced.
- The spread of eucalyptus into nearby natural plant communities would be limited.

V. Best Management Practices

Eucalyptus Forest Reduction Strategy

Phase 1

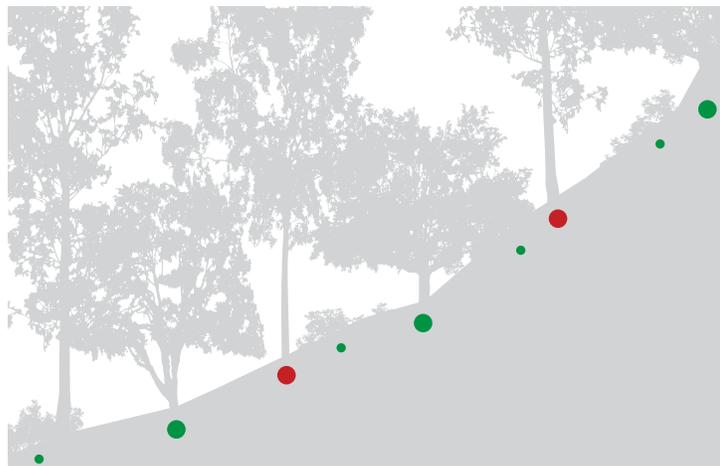
- Identify and remove existing small, diseased, and hazardous eucalyptus trees.



Existing Condition

Phase 2

- Plant native oak trees.
- Plant native understory.
- Monitor existing eucalyptus trees and remove small, diseased, and hazardous specimens.



Phase 3

- Maintain and reinforce native oak woodland and understory.



Future Condition

Finally, this would be a cost-effective approach to meeting the ecological and aesthetic goals of the HMP by:

- incorporating the use of smaller ground-based equipment,
- requiring little to limited tree climbing,
- allowing for the chipping and mulching of all debris on developed and landscape areas of YBI (or on TI), and
- eliminating the need for off-hauling unless it is handled and paid for privately.

Best Management Practices for Non-native Tree Removal

Best management practices for the implementation of the six components listed above are described below. The habitat Map Units for which these BMPs should be followed are: 9, 13, 18, 22, 29, 38, 36, 41, 42, 43, and 46. Habitat Map Units that afford the easiest access for equipment are: 13, 18, 22, 36, and 46. (Note: portions of units 38, 41, and 42 are approachable by road, but pose difficulties due to steep slopes.)

1. Each work area should be evaluated by the contractor in coordination with a qualified arborist and biologist before work commences. Based on proposed trail routes and recreational areas (i.e., picnic tables, view points), the arborist should identify trees and hazardous limbs to be removed, and trees requiring the removal of lower limbs for fire safety. The biologist should provide guidance on the timing of work, placement and operation of equipment, access and haul routes, and staging areas to minimize inadvertent impacts to desirable plant species and habitats. The biologist should also provide guidance on the identification of additional plant species (if any) to be removed, as well as those to be preserved.

2. If work is scheduled to occur during the bird breeding season (February 1 – August 15), a preconstruction nesting bird survey should be performed by a qualified biologist. If bird species protected under the MBTA or the California Fish and Game Code are found to be nesting in or near any work area, an appropriate no-work buffer zone should be designated by the biologist. Depending on the species involved, input from the California Department of Fish and Game (CDFG) and/or USFWS Division of Migratory Bird Management may be warranted. As recommended by the biologist, no activities should be conducted within the no-work buffer zone that could disrupt bird breeding. Outside of the breeding season (August 16 – January 31), or after young birds have fledged as determined by the biologist, work activities may proceed.

3. Small saplings may be pulled out by hand or with a Weed Wrench™. Trees too large to be pulled out by the roots, or when doing so would significantly harm the soil or understory, should be cut with a hand- or chain-saw. Trees should be cut flat and as low to the ground as possible. For eucalyptus, which are prone to resprouting after cutting, herbicide should be applied to the outer portion of the stump's cut surface immediately after cutting. Recommended herbicide treatments include triclopyr (as Garlon 4® and Garlon 3A®) or imazapyr (tradenames Chopper, Arsenal, and Assault) at a rate of 80 percent in an oil carrier, or glyphosate (as Roundup® or Rodeo®) applied at a rate of 100 percent. Because some resprouting of stumps is still likely to occur, periodic follow up visits are necessary to prevent tree regrowth. Sprouts three to five feet tall may be treated with a foliar application of 2 percent triclopyr or glyphosate. With the exception of acacia, removal of trees of most other species (either native or non-native hazard trees, for example) will not require herbicide application. A non-toxic alternative would be to smother the stumps with plastic.

4. To avoid significant ground damage, felled trees should either be chipped on site or moved using a rubber-tired grapple skidder or equivalent.

5. All forest debris, trees, limbs and branches should be chipped on site and either spread out on site (as specified by the project biologist) or transported to appropriate stockpiling or disposal areas elsewhere on YBI or TI. Wood chips may be laid down in a 4" layer for weed control (i.e., at Map Unit 8, picnic area at Map Unit 38, or other approved park or landscape areas). Depending on phasing of work, the east point of YBI, currently used for staging by Caltrans during construction of the new eastern span of the Bay Bridge, may be an appropriate stockpiling area for wood chips. Long term storage of wood chips at this location may facilitate rehabilitation of the ground after bridge construction, thereby aiding in the potential restoration of native habitat to the site. The use of wood chips and other forms of mulch can be beneficial for weed control, soil moisture retention, and in some cases, soil development. However, this practice is not without controversy. Mulch can aid in the development of, or distribute, pathogens and decrease bare soil area for ground dwelling bees and other beneficial insects.

V. Best Management Practices

H. Prevention of Sudden Oak Death

Sudden oak death (SOD), a fungal pathogen that can kill coast live oak, other oaks species, and oak relatives (such as tanoak), has not been detected on YBI. However, its spread throughout coastal California's oak woodlands and forests indicates that the threat exists for SOD to spread to YBI. Below is a list of known native host plants that are found on YBI.¹⁵ Planted horticultural species on the Island in the developed areas could also potentially host the fungus and are not included in this list because the developed areas have not been extensively surveyed and there is not a comprehensive record of horticultural plantings on the Island within those areas.

Scientific name	Common name
<i>Adiantum jordanii</i>	California maidenhair fern
<i>Aesculus californica</i>	California chestnut
<i>Ceanothus thyrsiflorus</i>	Blueblossom
<i>Corylus cornuta</i>	California hazlenut
<i>Heteromeles arbutifolia</i>	Toyon
<i>Quercus agrifolia</i>	Coast live oak
<i>Sequoia sempervirens</i>	Coast redwood
<i>Toxicodendron diversilobum</i>	Poison oak
<i>Umbellularia californica</i>	California bay

Since SOD is not currently present on YBI, the focus of these BMPs is prevention rather than treatment. The California Oak Mortality Task Force has put together excellent materials on limiting the spread of SOD once it has been introduced including: sanitation measures for tools and workers, planning vegetation removal field work during the dry season, and limiting the amount of ground disturbance within infected areas. The following BMPs will help prevent SOD from being introduced to the Island as a result of HMP related activities.

1. A restoration specialist familiar with the signs and symptoms of SOD should inspect all nursery stock, plants and propagules brought to the Island for habitat management projects. All infected plants should be quarantined immediately- away from any potential host plants- and returned to their source to be disposed of properly.
2. Regular habitat monitoring associated with HMP projects should include a survey for SOD infection of known host plants.
3. Restoration workers, hired contractors and volunteers working on HMP projects should adhere to the following sanitation measures that should prevent SOD from being imported to the Island:
 - Excess soil and mud should be removed from shoes, clothing, and tools before arriving on the Island if restoration workers and equipment have been operating in areas of known infestation.
 - Work vehicles should be washed in an equipment yard or car wash to remove any soil or plant matter prior to arrival on YBI if restoration workers and equipment have been operating in areas of known infestation.
 - Tools, equipment, shoes and gloves should be sanitized using a solution of chlorine bleach and water (1:9) prior to arrival if restoration workers and equipment have been operating in areas of known infestation.

These BMPs apply to the following recommended management actions:

- Revegetation
- Invasive species removal, non-native tree removal
- Trail construction and installation of recreational facilities

¹⁵ Known SOD host plants, natives and ornamentals, are identified by the California Oak Mortality Task Force at www.suddenoakdeath.org

I. Herbicide Application

The application of herbicides to invasive plant species may be a necessary component of habitat restoration or enhancement projects, or simply as a method to prevent the spread of invasive plant species into adjacent, mostly intact natural habitats. The use of herbicides is not meant to be pervasive in the implementation of this plan, but rather, herbicides should be used only when absolutely necessary and in accordance with the City of San Francisco's IPM policies and ordinances. Strict adherence to the BMPs that address herbicide application is imperative since strong chemicals can have deleterious effects on the biotic environment (in addition to target weeds) when improperly used.

1. An herbicide application program should utilize staff with herbicide application certification and training in specific target species.
2. Herbicide applicators should utilize approved methods for transport, mixing, application, and clean-up of all herbicide application activities.
3. Herbicide application in sensitive areas should be closely planned and overseen by the restoration specialist to prevent any accidental damage to sensitive resources. If necessary, sensitive areas should be flagged or fenced for maximum protection.
4. The herbicide program should use only approved chemicals, and should follow all seasonal and weather restrictions and specific label instructions for use.
5. Within sensitive wildlife habitat, the herbicide program should use the least environmentally damaging herbicides and surfactants or non-chemical alternatives, such as hand-weeding, tarping, or mulching. Direct application to cut stems or stumps, when feasible, is preferable to spraying.

The above BMPs apply to the following recommended management actions:

- Revegetation
- Invasive plant species removal, non-native tree (specifically eucalyptus) removal

J. Erosion Control

Erosion is a threat throughout YBI in areas with steep slopes and/or loose, sandy substrate. Erosion can cause damage to plant communities and animal habitats by complete removal of the soil surface layer, and can lead to invasive plant species invasions and an alteration of the soil profile. Fortunately, the majority of the habitat management actions proposed in this plan do not require extensive or deep ground disturbance, and the erosion control BMPs presented below are mostly complementary to the management actions.

1. Strategic planning for carrying out trail construction and vegetation removal with a ground disturbance component (e.g. manual removal of plants such as French broom and iceplant, including removal of root systems) should be done in a way that will minimize the risk of erosion. This can be achieved by focusing ground disturbing projects in areas of gentle slopes and areas of consolidated substrates, by carrying out plant removal activities in the late spring after the rainy season has ended, or by using a phased approach to vegetation removal in steep areas with loose soil so that only relatively small areas are bare at any given time.
2. Hydroseeding and hydromulch should be used to stabilize areas with slight to moderate slopes. There are a wide variety of hydroseed and hydromulch products on the market that all offer different benefits. The restoration specialist overseeing the project implementation should make a site specific recommendation and ensure that the hydroseed mix follows the plant palette specifications for the project.

V. Best Management Practices

3. Straw wattles, natural fiber blankets, and jute matting are typically used in areas that have a high risk of erosion due to steeper slopes or more concentrated seasonal water flow. Again, there are a variety of products that can be used depending on the particular situation and the restoration specialist or biologist will make a site appropriate recommendation. The products selected should always be made of natural, biodegradable materials, and should not include any plastic.

The above BMPs apply to the following recommended management actions:

- Revegetation
- Invasive plant species removal, non-native tree removal
- Trail construction and installation of recreational facilities

K. Minimizing Recreational Impacts on Natural Areas

The development plans for YBI include plans to install public access trails and recreation areas such as picnic areas and facilities; refer to Section III. Future Vision for YBI. Recreation areas and trails will encourage public use of the natural areas on YBI, within certain boundaries, and will provide significant benefits both to Island residents and visitors, as well as to the natural environment by promoting visitor appreciation of the natural resources of the Island. Recreational opportunities will allow people to be active and enjoy the unique natural setting of the Island while protecting the overall environment by concentrating human impacts in specific areas. The following BMPs present methods for minimizing human and pet recreational impacts on natural areas of YBI while allowing for the beneficial public use of these areas.

1. New trail construction should be carried out in such a way as to minimize impacts on natural resources. For example, whenever possible, trails should be located along the edges of habitat areas, rather than passing through them, to avoid further habitat fragmentation. Fencing should always be kept to the minimum to encourage people to stay out of an area and should allow for small animal passage.

2. Signs should be installed within recreation areas and at trailheads that indicate the following guidelines for public use:

- People and pets must stay on designated trails and within designated recreation areas at all times.
- Dogs must remain on a leash at all times, except for designated off-leash areas.
- Trash, recyclables and compostables must be disposed of in covered and secured bins, or carried out where bins are not available.
- Wildlife and feral cats should not be fed by visitors anywhere.
- Harassing, chasing, or hurting wildlife, destroying nests and habitat, collecting without a permit and damaging vegetation are prohibited at all times.
- Fires are prohibited at all times, except within designated areas.

3. Interpretive signs should be posted that present information about the impacts that unleashed dogs and feeding of wildlife and feral cats can have on wildlife.

4. Wildlife-safe trash and recycling receptacles should be installed in recreation areas and at trail heads to encourage disposal in bins and reduce littering. Receptacles should be emptied daily so as not to attract wildlife.

5. Regular monitoring of recreational areas and trails should be conducted to detect any resulting erosion, spread of invasive species, or harassment of wildlife resulting from human use.

This BMP applies to the following recommended management actions:

- Trail construction and installation of recreational facilities

VI. Management Zone Prescriptions

A. Introduction

YBI consists of approximately 108 acres. Of these, approximately 40.5 acres is proposed for development (including housing, commercial development, recreation areas, historic adaptive reuse, and infrastructure). The remaining 67.5 acres of natural areas will be actively managed under the HMP. These natural areas are generally comprised of the following vegetative cover types: California buckeye woodland (0.2 acre), central coast riparian scrub (1.5 acres), coast live oak woodland (6.3 acres), coast live oak/eucalyptus (14.8 acres), eucalyptus woodland, (22 acres), northern coastal scrub (12 acres), ruderal/landscaped (9.3 acres), and Valley wildrye grassland (1.4 acres).

Mindful of the general goals and objectives of the project, as well as the constraints and opportunities discussed above, the Map Units described in Section II were aggregated into eight Management Zones (see Management Zones Map). The Redevelopment Area Management Zone includes all areas proposed for development; proposed HMP actions in this Zone are generally limited. The remaining seven Management Zones are, by and large, contiguous areas that assemble the diversity of the YBI habitat Map Units into larger Zones. Map Units within each Zone have similar levels of existing native biodiversity,¹⁶ similar levels of invasion and/or habitat type conversion, and similar anticipated levels of future public access, suggesting that the application of similar overarching management prescriptions for each Zone would be appropriate.¹⁷

B. Management Zones: Attributes and Threats

The project team examined a variety of basic ecological attributes that contribute to the value that a particular habitat unit might have for wildlife or plants in a holistic fashion rather than by using an absolute relative ranking system. The values of a particular unit or a zone are therefore intrinsic qualities that suggest how different areas of YBI might be treated for ecological diversity and stability, and for wildlife and human use. These attributes, and their presence or absence within each Management Zone are presented in Table 2, as well as existing and potential threats to YBI's natural communities. The existing conditions information summarized in Table 1 (see Section II, *Existing Conditions*) is filtered through the ecological attributes identified in Table 2 and the results suggest that different management strategies are appropriate for the various Management Zones, based on habitat quality and diversity, stakeholder priorities, desired future conditions, and the opportunities and constraints discussed above. Thus each of the Management Zones will have a unique Management Prescription also listed in Table 2, which summarizes the overarching management prescriptions for each Management Zone.

C. Management Zone Prescriptions

Basic prescriptions for each Management Zone were developed by considering the existing constraints, threats, resources, and opportunities in each zone:

- YBI development principles;
- Actual and potential recreational use;
- Public input;
- Potential adverse impacts from restoration actions;
- Potential adverse impacts from delaying restoration actions;
- Existing habitat and species diversity, especially resources unique to the area;
- Potential for volunteer involvement;
- Actual and potential threat levels; and
- The cost effectiveness of the various potential habitat management actions.

The HMP is meant to be a living document and the prescriptions set forth in this Plan are not meant to preclude additional studies. In fact, future studies will be required in order to inform further detailed planning efforts. Such studies should include, among others, GIS mapping of important resources such as special-status plant populations, large oaks and toyon, nesting sites for raptors, and bat roosts; continued vegetation mapping refinement; and wildlife inventories. Site-specific plans are required to be developed (see the BMPs) at a level of detail simply beyond the scope of the Plan itself.

¹⁶ Based on species lists for most Map Units generated by Mike Wood, ESA was able to calculate three different measures of native plant species diversity for the different Map Units. Alpha diversity is simply the number of native species per Map Unit. These measures were calculated and then aggregated for each Management Zone. This enabled us to calculate two additional diversity measures for each Zone-- complementarity, which is an index indicating how unique each zone is with respect to the native plant species it supports, and gamma diversity, which is the total number of native plant species per zone. These diversity measures were then used to help validate the Management Zones, as well as to assign prescriptions and priorities.

¹⁷ ESA mapped habitat within the Coast Guard Lands and Caltrans ROW on YBI in order to inform the planning process regarding the biological resources on that part of the Island. However, these lands are not included in the Habitat Management Plan and no management recommendations will be made for them.

VI. Management Zone Prescriptions

Habitat Management Zones	Attributes and Threats										Habitat Management Zone : General Prescriptions				
	Attributes					Threats									
West Bluff North	●	●	●	●	●	●	●	●	●	●	●	●	●	Preservation and restoration emphasis; public access on interpretive trails; wildlife protection areas	
West Bluff South	●			●		●	●				●	●		Enhancement emphasis; restricted public access	
Southwest Slope	●							●	●		●	●	●	●	Enhancement emphasis; wildlife enhancement; public access
Clipper Cove West	●		●			●	●	●	●		●	●	●	●	Enhancement and preservation emphasis; full public access
Central Clipper Cove	●		●	●	●	●					●		●		Enhancement emphasis; restricted public access
Clipper Cove East	●	●	●	●		●	●				●	●	●	●	Enhancement emphasis; public access on interpretive trails; wildlife protection areas
New Bridge	●							●	●		●	●	●		Enhancement emphasis
Redevelopment Area	●		●					●	●		●	●	●	●	No HMP action proposed; recommendations to protect and preserve existing resources

Table 2: Habitat Management Zones: Attributes, Threats and General Prescriptions

^a The term *special-status* includes species listed as rare, threatened, or endangered by federal, state, or local agencies, as well as those listed by organizations with recognized expertise in the field and includes locally significant plants listed by the Yerba Buena Chapter of CNPS.

^b Indicates that there are/are not a diversity of different habitat types within a Management Zone.

^c Structurally diverse habitat types contain multiple vegetative layers, i.e., herbaceous shrub, and tree canopies. Within a Management Zone this could mean that habitat types are diverse internally, across different habitat types, or both.

^d Low vegetative diversity determined by presence of native species and habitat structure.



Management Zones Map

- Legend
- Management Zone Boundary
 - Limit of Grading for Site Improvements
 - Coast Guard and Caltrans Lands
 - 21 Map Unit
 - 21A Map Units within Redevelopment Area
 - California Annual Grassland
 - Valley Wildrye Grassland
 - Central Coast Riparian Scrub
 - Northern Coastal Scrub
 - California Buckeye Woodland
 - Coast Live Oak Woodland
 - Coast Live Oak Woodland/Eucalyptus
 - Eucalyptus Woodland
 - Ruderal/Landscaped
 - Existing Development

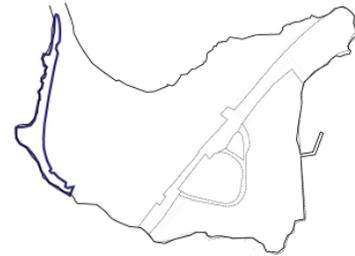
VI. Management Zone Prescriptions

C. Management Zone Prescriptions

West Bluff North

General Management Prescription

Preservation and restoration emphasis; public access on interpretive trail; wildlife protection area.



Map Unit Habitat Management Prescriptions

Map Unit 1: Management Prescription

Map Unit 1 occurs on the western bluffs of YBI and is dominated by a fairly large, dense stand of Valley wildrye grassland that grows on a terrace formerly disturbed by a wagon trail. This unit also supports seaside woolly sunflower and the only stands of seaside daisy found on the island. These grasslands are being threatened by several invasive species, primarily iceplant and sweet fennel, and the eucalyptus at the road edge. A priority action at this site should be the eradication of invasive species through the use of hand removal techniques to avoid excessive damage to the native grasslands. If hand removal does not prove effective then selective painting of resprouts with herbicide may be used. A trail is proposed along the western bluffs as part of the recreational component of the development plan. The trail should be routed adjacent to Treasure Island Road to minimize impacts to the relatively intact native habitat present throughout the Management Zone. Due to the steep slopes below, any trail should be constructed with a permeable bed to minimize the potential for concentrating runoff.

Map Unit 2: Management Prescription

Map Unit 2 lies between the road and the steeper slopes and cliffs of Map Unit 3. There are isolated mature eucalyptus along the road as well as iceplant, fennel, and non-native annual grasses. Enhance by removing eucalyptus, which are easily accessible from the road, iceplant, and fennel. Revegetate with coastal scrub species and creeping wildrye. Continue to route trail along road.

Map Unit 3: Management Prescription

Map Unit 3 is comprised primarily of steep slopes vegetated with relatively intact northern coastal scrub and little needs to be done here. Restore by removal of isolated eucalyptus and Monterey cypress along road, and French broom that is invading scrub vegetation from the upslope edge. Canary Island marguerite has begun to invade the steepest parts of the bluffs and should be removed wherever possible. Revegetate where necessary with coastal scrub and native perennial grasses. Protect tide pools at base of cliffs by eliminating existing social trail.

Map Unit 4: Management Prescription

Map Unit 4 supports a stand of central coast riparian scrub, made up of arroyo willow. The site is very steep and vegetation within the stand is impenetrable. Restore through removal of French broom that is invading the edges and overhanging eucalyptus. Verify the water source as it is suspected that this stand may have formed and may be supported artificially by leaky water/sewer lines. If this water source is confirmed, explore providing alternative water sources, from stormwater runoff, for example, as the aging infrastructure on YBI will be replaced.

Map Unit 5: Management Prescription

Map Unit 5 is dominated by northern coastal scrub that is relatively intact at its northern end but has been invaded by non-native grasses. This unit is too steep for access and the potential for restoration through removal of non-native grasses is low. Remove isolated eucalyptus adjacent to Treasure Island Road. Eradicate Australian fireweed that is just getting established on the north-facing slope. Preserve and protect Western gull nesting habitat below by fencing at top of slope. Fencing installation may not be feasible due to slope stability and vegetation considerations. If not, post with 'No access, sensitive wildlife area' and interpretive signage.

VI. Management Zone Prescriptions

Part of Map Unit 5 includes a landslide that occurred in 1994. Northern coastal scrub dominates here. The landslide area should be repaired, cleared of weeds, and revegetated with native coastal scrub species. Outside of the landslide zone, several populations of dune gilia have been recorded; these should be preserved and enhanced.

Map Unit 6: Management Prescription

The coast live oak woodland in Map Unit 6 is likely the most intact and diverse community within the HMP planning area. This should be a high priority for restoration and preservation efforts. Restoration will consist of removal of French broom, fennel, and acacia at the southern end and inland edge of the woodland and herbaceous weed control (primarily of veldt grass) within the woodland. Hand removal of invasive species will be required as this area supports a large population of fiesta flower, as well as stinging phacelia and Pacific pea. There is also a small population of the non-native invasive Australian fireweed in the coastal scrub on the bluffs just west of the woodland that is a high priority for hand removal in order to prevent further spread. Initial weed eradication and ongoing monitoring and maintenance would best be carried out as a stewardship project since a high level of expertise will be needed in such a sensitive area. Protect the woodland from informal trail building and provide an outstanding environmental education experience by designating a formal interpretive trail through the area if it can be done in a biologically sound manner. Otherwise continue to route trail along Treasure Island Road and restrict access into the woodland through site-appropriate fencing (e.g., wood split rail) and signage.

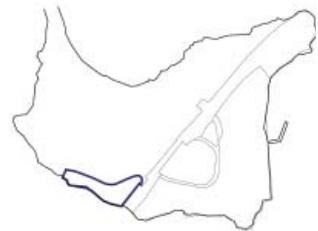
Map Unit 7: Management Prescription

Map Unit 7 is a highly disturbed site dominated by ruderal species that are currently mowed. This site should be a priority for weed removal efforts because it is adjacent to Map Unit 6 and is currently, and may be retained as, a potential access point for the 'elfin forest' located there. Enhancement of this Map Unit would serve to help protect the adjacent high quality woodlands of Map Unit 6 and can be achieved through the removal of French broom, sweet fennel, Australian fireweed, herbaceous weed control, and dense revegetation with coastal scrub species to form a shrub canopy capable of suppressing non-native species over time. Map Unit 7 would be a prime area to route a 'bluffside' trail through as it lies close to the road and is already highly disturbed. Siting a trail here would serve to protect the resources in Map Unit 6 by focusing pedestrian movement along the roadway.

West Bluff South

General Management Prescription

Enhancement emphasis; restricted public access due to steep slopes.



Map Unit Habitat Management Prescriptions

Map Unit 8: Management Prescription (lies partially within West Bluff North)

Northern coastal scrub dominates here. The area should be repaired, cleared of weeds, and revegetated with native coastal scrub species. Outside of the landslide zone, several populations of dune gilia have been recorded; these should be preserved and enhanced.

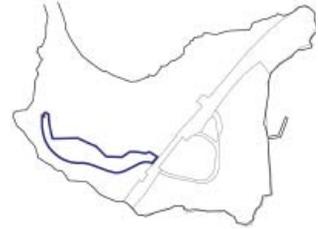
Map Unit 9: Management Prescription

Map Unit 9 is eucalyptus woodland with coastal scrub, annual grasses, and iceplant in the understory. Map and monitor dune gilia populations. Enhance occupied habitat for dune gilia and native scrub community by thinning eucalyptus to let in more light, clearing eucalyptus litter from the ground, and removing iceplant. Priority areas for enhancement should be those supporting dune gilia and stands of native scrub, then gradually expanding efforts outward from these areas. There is potential to establish a viewpoint with interpretive signage here at the west-bound on-ramp to the Bay Bridge.

Southwest Slope

General Management Prescription

Enhancement emphasis; wildlife enhancement; public access



Map Unit Habitat Management Prescriptions

Map Unit 13: Management Prescription

Map Unit 13 stretches from the Redevelopment Area Management Zone to the Southwest Slope Management Zone and is dominated by eucalyptus woodland with French broom and annual grasses dominant in the understory. There are occasional areas dominated by creeping wildrye—one of these at the west end of the Unit and supports soap plant, Pacific pea, and coyote brush. Habitat in this Map Unit should be enhanced through thinning of eucalyptus and removal of French broom and revegetation with a mosaic of coastal scrub, coast live oak woodland, and native grassland species. The upper slopes should particularly be managed, in part, for butterfly habitat. Begin with converting areas that are already fairly open and/or that support creeping wildrye grassland and work outwards over time. Removal of scattered pampas grass and iceplant should be a high priority action. Thinning would be particularly easy in the area downslope from Map Unit 16, where there are a number of trees that were cut relatively recently and have resprouted. Further east, downslope from Map Unit 14 there are a number of eucalyptus that were topped and should be removed to retain the open character of that Map Unit.

A recreational trail is planned through Map Unit 13 and should incorporate existing road cuts and paved roads wherever feasible. This Unit would be ideal for establishment of picnic areas and viewpoints as well. Selective removal and thinning of eucalyptus would open up views of San Francisco in addition to enhancing habitat for native species.

Map Unit 15: Management Prescription

Map Unit 15 consists of steep slopes rising above Treasure Island Road, dominated by French broom, eucalyptus, and iceplant, with some blackwood acacia. This will be the gateway to Treasure Island. In addition, the presence of invasive species upslope threatens the integrity of the coastal scrub community downslope in Map Units 5, 8 and 9. Enhance through eradication of all acacias and invasive shrubs, especially broom. Preserve existing toyon. Weed removal here will be challenging due to the steep slopes and may require a combination of hand removal techniques with follow up herbicide use. Revegetate with coastal scrub species to improve scenic value and expand this habitat type from the slopes below.

Map Unit 16: Management Prescription

Map Unit 16 has obviously been cleared in the past and is currently dominated by non-native grass and other ruderal species, such as wild mustard, fennel, iceplant, and smaller Monterey cypress. This area should be enhanced through the removal of invasive species and re-establishment of coast live oak woodland to provide an expansion of this community type in close proximity to other similar Units (Map Units 19, 21, 30A, 31A, 63A and 64A), providing connectivity for the wildlife that use these woodlands, while maintaining views and reducing fire hazard. The western end of this Unit supports a creeping wildrye grassland that should be preserved and enhanced as well. Thin small eucalyptus downslope from this area, leaving enough to provide a windbreak until oaks are established. Re-establish coastal scrub and native grassland in open areas.

Map Unit 18: Management Prescription

This is a relatively small patch of eucalyptus woodland that could be fairly easily eradicated if accessed from Treasure Island Road below. Removal of eucalyptus here would help preserve adjacent natural habitats and might improve views for residents above.

VI. Management Zone Prescriptions

Map Unit 19: Management Prescription

This is a coast live oak woodland with buckeye near the top of the slope above Treasure Island Road. As with all Map Units in proximity to developed areas, removal of ivy from oaks and other native vegetation should be a top priority. Eucalyptus on either side should be thinned, with any branches or trees overtopping oak canopies removed.

Map Unit 20: Management Prescription

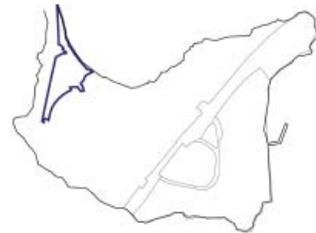
This is a small area of northern coastal scrub just upslope from Treasure Island Road and across from the oak woodland of Map Unit 6. Enhance through hand removal of herbaceous weeds, French broom, iceplant, and cotoneaster. This is an easily defensible site due to its small size and accessibility from the road. High native species diversity would be rapidly restored here with very little effort.

Clipper Cove West

General Management Prescription

Enhancement and preservation emphasis; full public access

Map Unit Habitat Management Prescriptions



Map Unit 21: Management Prescription

This is a small area of coast live oak woodland surrounded by eucalyptus on three sides and developed areas on the fourth. Enhance through removal of ivy from trees and vicinity and trimming or removing any overhanging eucalyptus branches or trees. Thin eucalyptus if needed to improve amount of light reaching the oaks.

Map Unit 22: Management Prescription

Map Unit 22 consists of eucalyptus woodland. Preserve existing fiesta flower population by mapping and monitoring all existing plants and routing the trail to avoid them. Enhance fiesta flower populations in this Map Unit and in other suitable places on YBI through the propagation and outplanting of the species in appropriate habitat. Enhance through eucalyptus thinning by removal of small eucalyptus trees and eucalyptus litter and removal of fennel, iceplant, and English ivy. Time mowing to avoid wildflowers. This is a former cemetery site with cultural educational potential (see prescription for Map Unit 23).

Map Units 22, 23, and 27 provide a gateway to the developed areas on YBI. Existing open areas should be expanded through removal of non-native trees and revegetated with coastal prairie or coastal scrub species to present a mosaic of the natural plant communities that occur on the Island. Over time, eucalyptus and Monterey pine and cypress should be removed and replaced with native trees and large shrubs such as coast live oak, buckeye, and toyon.

Map Unit 23: Management Prescription

Map Unit 23 is a stand of very old California buckeye trees, with perhaps the largest buckeye on YBI. Preserve and protect tree trunks and roots within the trees' driplines from irrigation. This is also an area of potential cultural interest as it is the entrance to a former cemetery site. Develop a path into the cemetery site and interpretive signage relating to the cemetery and the habitat values and functions of the California buckeye (i.e., it is a nectar plant for the pipevine swallowtail and other butterflies). Eradicate the ivy to prevent the need for ongoing removal from the buckeye trees.

Map Unit 24: Management Prescription

This area is currently a small park with turfgrass and picnic tables, with Monterey cypress and eucalyptus as an overstory. Maintain or replace the specimen trees in the area east of the picnic tables. Stairs lead from this area to the Clipper Cove beach below. Maintain as a park and ensure continued beach access. Perform regular hazard assessments of mature trees and remove as necessary to protect recreational users. Replace with native trees over time. The areas to either side of the entry, that are currently rocked, should be planted using a climate-appropriate plant palette.

Map Unit 25: Management Prescription

Map Unit 25 is a narrow strip of land between Treasure Island Road and the riprapped shoreline of the Clipper Cove Marina. Currently planted in iceplant and overrun with fennel and non-native grasses, this Map Unit lies at the gates of Treasure Island. Enhance through removal of fennel and iceplant and revegetate with coastal scrub species or another climate-appropriate plant palette. Existing population of blue dicks should be mapped and retained in place or relocated to other suitable habitat. Disturbing the bulbs by digging will rejuvenate the population by increasing the number of bulbs present.¹⁸ If non-native species are used in the revegetation plant palette, they should provide habitat values, such as fruit, nectar, or cover, for native wildlife.

Map Unit 26: Management Prescription

This is a narrow strip of high marsh along the upslope edge of Clipper Cove beach and the only representation of this community on the YBI. Species present include pickleweed, alkali heath, fleshy jaumea, silver bur ragweed, salt grass, grindelia, and other back beach and high marsh species. The site has been the focus of stewardship activities, resulting in removal of French broom and iceplant, which has allowed the natives here to re-establish on the beach. Preserve and protect this unique resource from recreational uses through fencing and/or interpretive signage. Enhance through continued monitoring and weed control, with a focus on perennial pepperweed.

Map Unit 27: Management Prescription

Map Unit 27 is dominated by coast live oak woodland, with toyon and blue elderberry on either side of the stairs leading down to the cove. Enhance through eradication of Monterey pines, butterfly bush, French broom, sticky eupatorium, and other ornamentals where feasible. Removal of pampas grass should be a high priority action here. Begin at Macalla Road and edge shared with Map Unit 24 and work inward as feasible. Enhance grassland on Macalla Road through seeding with coastal prairie species and schedule timing of mowing to favor native grasses and wildflowers. Many very large toyon occur along the north-facing slopes of YBI above Clipper Cove, beginning here and scattered through Map Units 29, 33, 43, and 46. These should be mapped and, at a minimum, preserved through ivy removal and removal of non-native trees that threaten the toyon through shading or have potential to damage them from limbs dropping or from tree fall.

Map Unit 28: Management Prescription

Central coast riparian scrub is dominant here. Enhance through designation and construction of a formal trail engineered to minimize erosion and the need for ongoing maintenance. Eradicate sticky eupatorium and other weeds that are present in the understory.

¹⁸ Many bulbiferous plants reproduce vegetatively by forming small bulblets that remain attached to the 'mother' bulb in the absence of disturbance. Bulblet growth, flowering, and reproduction are inhibited until the mother bulb dies or until some sort of disturbance is introduced. Digging serves to break the bulblets off the main bulb and also to spread them throughout an area, where each bulblet can now mature, flower, and reproduce.

VI. Management Zone Prescriptions

Central Clipper Cove

General Management Prescription

Enhancement emphasis; restricted public access

Map Unit Habitat Management Prescriptions

Map Unit 29: Management Prescription

Map Unit 29 is dominated by eucalyptus woodland, with poison oak prevalent in the understory. Remove eucalyptus along Macalla Road as they are easily accessible. Enhance through eradication and selective removal of eucalyptus competing with oak and toyon. Map large toyon and protect toyon and oak through ivy removal. Discourage informal trails through establishment of a formal trail at the top of the slope near Macalla Road. Consider establishment of a pedestrian viewpoint over Clipper Cove and Treasure Island here, along one of the old, existing terraces near the top of the old staircase.

Map Unit 33: Management Prescription

Map Unit 33 consists of coast live oak woodland and supports some very large specimens of toyon and dense stands of native swordfern. Enhance through removal of French broom, which should be a high priority action, and butterfly bush. Remove ivy from oaks where present and remove eucalyptus stand along Macalla Road at the top of this Unit.

Map Unit 34: Management Prescription

Map Unit 34 consists of relatively intact northern coastal scrub with a low threat of weed invasion, making management efforts here low priority, particularly if French broom is removed in Map Unit 33 upslope. Enhancement through weed eradication would be desirable here, especially because there are few weeds at present, but may not be cost-effective due to the steep terrain and deep, loose Colma Formation sand deposits, which make the Unit basically inaccessible.

Map Unit 35: Management Prescription

Map Unit 35 is comprised of central coast riparian scrub dominated by arroyo willow. The upslope edge is being invaded by Himalayan blackberry. Enhancement through weed eradication would be desirable but may not be cost-effective due to the difficult terrain and lack of access.

Clipper Cove East

General Management Prescription

Enhancement emphasis; full access on interpretive trails; wildlife protection areas

Map Unit Habitat Management Prescriptions

Map Unit 38: Management Prescription

Map Unit 38 consists of steep slopes covered with coast live oak woodland/ eucalyptus woodland. Much of this Unit is very difficult terrain where most enhancement efforts would be difficult and might do more harm than good. A portion of this Map Unit falls within an area subject to possible future development. In areas of this site not developed, top priority efforts should be removal of eucalyptus and ivy encroaching on oaks. Initial focus of tree removal should be the easily accessible eucalyptus along Macalla Road and North Gate Drive. Another top priority here is to address erosion resulting from drain outlets from Macalla Road and housing upslope which has created gullies running down the slope.



Map Unit 39: Management Prescription

This is a fairly small area of Valley wildrye grassland that will be difficult to defend due to its inaccessibility. Preserve and monitor, and if feasible, enhance through removal of surrounding eucalyptus that shade site. May be a good source of seed for revegetation projects elsewhere on YBI.

Map Unit 40: Management Prescription

Map Unit 40 is a small area of northern coastal scrub. Due to its inaccessibility, there is little that can be done here except to restore the area through selective weeding. Control of Canary Island marguerite should be a priority.

Map Unit 41: Management Prescription

Map Unit 41 consists of eucalyptus woodland. At a minimum remove invasive species from the understory and prune lower limbs to 10-15 feet above grade to reduce fire hazard. This Unit is easily accessible from North Gate Road and also from the SOQHD below and the eucalyptus could be eradicated fairly easily. Replace with California buckeye and oak woodland understory species.

Map Unit 42: Management Prescription

Map Unit 42 is coast live oak woodland/ eucalyptus woodland just up slope from the Senior Officers' Quarters Historic District. Enhance through selective thinning of ornamental trees and shrubs and clear understory of ivy. Priority focus should be removal of eucalyptus overhanging or otherwise threatening coast live oak and removal of ivy from oaks and other native shrubs. Revegetate with oak woodland understory species.

Map Unit 43: Management Prescription

Map Unit 43 consists of steep slopes below North Gate Drive, with eucalyptus lining the road and northern coastal scrub below. Remove eucalyptus along the road. Further weed eradication on lower slopes would be desirable but may not be cost-effective. If feasible, enhance coastal scrub through removal of Canary Island marguerite and red valerian. Development of recreational trail should be compatible with nesting habitat for western gull.

New Bridge

General Management Prescription

Enhancement emphasis.

Map Unit Habitat Management Prescriptions



Map Unit 45: Management Prescription

Bay Bridge construction has effectively eliminated much of Map Unit 45 for potential habitat management uses in the short-term. This area could be used for stockpiling woodchips resulting from tree-removal throughout YBI. In the long-term, if funding allows, this area could be revegetated in coastal, scrub, coastal prairie, or could be a site for created wetlands to treat stormwater runoff from developed areas.

Map Unit 46: Management Prescription

Map Unit 46 consists of steep slopes below North Gate Drive and to the north of the Bay Bridge, with eucalyptus lining the road and the top of the slope and northern coastal scrub below. Remove eucalyptus along the road. Further weed eradication on lower slopes would be desirable but may not be cost effective. If feasible, enhance coastal scrub through removal of Canary Island marguerite and red valerian. Work will not be able to proceed here until completion of the Bay Bridge construction and is therefore a low priority.

VI. Management Zone Prescriptions

Redevelopment Area

General Management Recommendations

Future development on YBI is proposed in proximity to areas of Existing Development, identified as Map Units 17A, 37A and 45A. However, site grading for new construction that includes infrastructure, stormwater management BMPs, roads, bikeways and park improvements, extends beyond the Existing Development footprint in some instances. The boundary of the anticipated extent of site disturbance is illustrated on the Management Zones Map and identified as Redevelopment Area Management Zone. In general, actions in these areas will be guided by other documents, such as the Design for Development Guidelines, the TI EIR, and HOA standards and guidelines for landscaping. Polygons within the Redevelopment Area can be subject to site modification. All polygons that are included within the area are identified with a Map Unit number and an 'A'. While these Map Units are prioritized for Redevelopment Plans, the general management recommendation is to protect and preserve existing resources and polygon specific management recommendations are presented below.



Map Units 17A, 37A, 45A: Management Recommendations

No HMP actions are being proposed for the areas that are included within the existing development Map Units, but the HMP does make recommendations for these Map Units for future consideration. Habitat in these areas consists overwhelmingly of landscaping made up primarily of non-native, horticultural species. Although there are small remnants of native vegetation, on road cuts, for example, and there are some large oaks and toyon, these areas are generally too small to be “managed” as habitat.

A high priority action will be to map and preserve, if feasible, native trees, shrubs, and herbaceous species throughout these areas. Protect existing native trees to the extent feasible during redevelopment. Any EIR-prescribed mitigations for this area will also need to be followed. Another high priority action will be to remove ivy from native trees and shrubs as well as where it is threatening populations of native herbaceous species. Other invasive species should be mapped and marked for removal. Planting palettes for future landscaping plantings should avoid use of invasive species and known SOD host plants. Planting palettes should include use of native and other species that provide habitat values (e.g., food, cover) for a variety of wildlife, including bees, dragonflies, butterflies, and other insects, as well as birds, particularly when located adjacent to natural areas. Wildlife friendly landscaping can provide pockets of habitat to help wildlife move through developed areas and connect with larger natural areas.

The Great Whites and historic landscaping in Map Unit 45A are to be retained as an historic district.

Map Unit 13A: Management Recommendations

Map Unit 13A consists of the upper slopes of the Southwest Slope Management Zone and is dominated by eucalyptus woodland with French broom and annual grasses dominant in the understory. There are occasional areas dominated by creeping wildrye—one of these at the west end of the Map Unit and supports soap plant, Pacific pea, and coyote brush. Areas of this Map Unit not developed can be enhanced through thinning of eucalyptus and removal of French broom and revegetation with a mosaic of coastal scrub, coast live oak woodland, and native grassland species. These upper slopes should particularly be managed, in part, for butterfly habitat. Begin with converting areas that are already fairly open and/or that support creeping wildrye grassland and work outwards over time. Removal of scattered pampas grass and iceplant should be a high priority action.

Map Unit 14A: Management Recommendations

Map Unit 14A consists of ruderal and landscape species, annual grasses and Monterey cypress, specifically. This a small,

discrete Unit and if undeveloped would be easily enhanced through removal of non-natives and re-establishment of coastal terrace prairie, creeping wildrye grassland, or coastal scrub species. Due to its upper slope location, this would be a good location for butterfly habitat creation. Due to its easy access, gentle slope, and discrete size, this Unit could serve as a pilot project and should therefore be a top priority for management activities.

Map Unit 15A: Management Recommendations

Map Unit 15A consists of steep slopes dominated by French broom, eucalyptus, and iceplant, with some blackwood acacia. Areas of this site not developed can be enhanced through eradication of all acacias and invasive shrubs, especially broom. Preserve existing toyon. Weed removal here will be challenging due to the steep slopes and may require a combination of hand removal techniques with follow up herbicide use. Revegetate with coastal scrub species to improve scenic value and expand this habitat type from the slopes below.

Map Unit 16A: Management Recommendations

Map Unit 16A has obviously been cleared in the past and is currently dominated by non-native grass and other ruderal species, such as wild mustard, fennel, iceplant, and smaller Monterey cypress. Areas of this site not developed can be enhanced through the removal of invasive species and re-establishment of coast live oak woodland to provide an expansion of this community type in close proximity to other similar Units (Map Units 19, 21, 30A, and 31A), providing connectivity for the wildlife that use these woodlands, while maintaining views and reducing fire hazard. The western end of this unit supports a creeping wildrye grassland that can be preserved and enhanced as well. Thin small eucalyptus downslope from this area, leaving enough to provide a windbreak until oaks are established. Re-establish coastal scrub and native grassland in open areas.

Map Unit 18A: Management Recommendations

This is a relatively small patch of eucalyptus woodland that could be fairly easily eradicated along with Map Unit 18, if accessed from Treasure Island Road below. Removal of eucalyptus here would help preserve adjacent natural habitats and might improve views for residents above.

Map Unit 22A: Management Recommendations

Map Unit 22A consists of eucalyptus woodland. In areas of this site not developed, the fiesta flower population should be preserved by mapping and monitoring all existing plants. Enhance fiesta flower populations in this Map Unit and in other suitable places on YBI through the propagation and outplanting of the species in appropriate habitat. Enhance through eucalyptus thinning by removal of small eucalyptus trees and eucalyptus litter and removal of fennel, iceplant, and English ivy. Time mowing to avoid wildflowers. This is a former cemetery site with cultural educational potential (see prescription for Map Unit 23).

Map Units 30A and 31A: Management Recommendations

These Map Units are two small areas of coast live oak woodland that support Dutchman's pipevine and blue elderberry. They are also invaded by fennel and English ivy. Stewardship efforts have taken place here in the past, with ivy removed from many of the oaks. Because they are easily accessible these areas should be a continued focus for stewardship and, once weeds are under control, for a pilot revegetation project re-establishing oak woodland understory. In areas of these sites not developed, enhance understory through weed removal. Protect remaining Dutchman's pipevine and manage for pipevine swallowtail butterfly by planting nectar plants nearby.

Map Unit 32A: Management Recommendations

Map Unit 32A includes the landscaped grounds of several houses as well as a landscaped park with a playground and turf grass and is dominated by ornamental trees, such as Lombardy poplar and acacia, eucalyptus and coast live oak. This Map Unit falls within an area subject to possible future development, including improved park land. If

VI. Management Zone Prescriptions

any of this area is to be retained as is, then all acacia should be removed and ivy should be removed from the oaks. Ivy should be replaced with non-invasive groundcover. Eucalyptus should be assessed for hazard potential, removed over time as appropriate, and replaced by native or other landscape appropriate trees and/or shrubs.

Map Unit 33A and 38A: Management Recommendations

While portions of these Map Units have the habitat attributes of Map Units 33 and 38, much of this area includes the landscape grounds of Building 62 and may be redeveloped in the future.

Map Unit 36A: Management Recommendations

Map Unit 36A consists of a mosaic of coast live oak woodland/ eucalyptus woodland, with Monterey pine and cypress scattered throughout. The understory here is dominated by ivy but there are also many young toyon and mature California hazelnut and blue elderberry trees persisting here as well. Native trees and shrubs should be preserved in this map unit whenever possible. If they cannot be preserved then consideration should be given to translocating them to areas that will remain as open space. In areas of this site not developed, enhance habitat through selective thinning of ornamental trees and shrubs, and clearing ivy from the understory, starting with ivy that is in and around oaks and native shrubs. Prioritize non-native tree removal based on level of threat to existing coast live oak, toyon, and public safety. There is at least one population of maidenhair vine present here as well that should be a top priority for removal.

Map Unit 42A: Management Recommendations

Map Unit 42A is coast live oak woodland/ eucalyptus woodland just up slope from the Great Whites historic gardens and Officer's quarters. In areas of the site not developed, enhance through selective thinning of ornamental trees and shrubs and clear understory of ivy. Priority focus should be removal of eucalyptus overhanging or otherwise threatening coast live oak and removal of ivy from oaks and other native shrubs. Revegetate with oak woodland understory species.

Map Unit 44A: Management Recommendations

This eucalyptus woodland can be retained as part of the Senior Officers' Quarters Historic District. Regular hazard assessments for the eucalyptus should be performed here according to the BMPs in Section III and trees should be removed as appropriate to protect the historic resources.

Map Units 63A and 64A: Management Recommendations

These are two small areas of coast live oak woodland, invaded by English ivy. Because they are easily accessible these areas should be a focus for stewardship. In areas of these sites not developed, enhance the understory through weed removal. Map Unit 64A will fall within improved park land. If any of this habitat is retained then all ivy should be removed from the oaks and surrounding ground and new planting should consist of non-invasive species.

Caltrans Right of Way

General Management Recommendations

Management Prescriptions within the Caltrans right of way (ROW) cannot be made by the Habitat Management Plan. However, many of the Map Units that fall within the Caltrans ROW have geographic and ecological relationships to adjacent associated Map Units. Polygons within the Caltrans ROW can be subject to site modification. All polygons that are included within the area are identified with a Map Unit number and an 'C'. While these Map Units are subject to Caltrans development plans, the general management recommendation is to protect and preserve existing resources. Map Unit specific management recommendations are presented below.

Map Units 9C, 13C, 36C, 41C, 42C: Management Recommendations

If allowed by Caltrans in the future, management recommendations for these areas should follow the adjacent Map Unit Prescriptions listed above. For example, Map Unit 41C will follow the prescription for Map Unit 41.

Map Unit 47C: Management Recommendations

Map Unit 47 consists of highly disturbed northern coastal scrub with limited enhancement possibilities. Part of this Unit will be shaded by the new Bay Bridge and work will not be possible here until completion of bridge construction. At that time enhance through removal of red valerian and other weeds.

Part II : Implementation Plan

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I. Overview of Part II: Implementation Plan

Part I of the Habitat Management Plan for Yerba Buena Island laid out habitat management concepts and the principles of the larger Treasure Island development as a whole, from which the goals and objectives of the Habitat Management Plan were drawn. Additional sections explored the existing conditions on the Island and public expectations, and considered the least disruptive approaches (Best Management Practices) to restoring natural habitats. Lastly, the area was divided into “Management Zones,” within which each “Map Unit” was assigned a prescription – a series of recommended actions – to attain a desired future condition and meet the goals and objectives of the Plan.

HMP Part II takes the process several steps further, to make the actual implementation of the Plan an orderly and logical process, and to describe how improved habitat condition can be sustained indefinitely.

Section II, *Approach to Implementation*, describes TIDA’s intended approach to implementing the HMP over time.

Section III, *Management Plan Priorities* provides direction on which prescriptions should be carried out first, and why, and also suggests optional projects not identified in the Plan or priority lists, which might be appropriate at some future time.

Lastly, Section IV, *Long-term Monitoring and Maintenance*, outlines a process for periodically assessing the success of management actions in a manner that is replicable and quantifiable, as well as approaches to rectifying problems identified during the first five years of HMP implementation.

II. Approach to Implementation

The HMP presented in Part I describes a long term vision and goals for the natural habitat areas of YBI. Part 1 also articulates a set of strategies recommendations and best management practices, together a “framework” for achieving those goals. The entity responsible for implementing the HMP, and setting the pace and priorities along the way, is TIDA, who is the long-term owner of the habitat management areas and future trustee of the areas that will be brought into the Trust. The underlying assumption of the HMP is that TIDA will implement these recommendations over a long period of time, as funding and resources are sought and become available.

This HMP is proposed as part of the Treasure Island / Yerba Buena Island Redevelopment Plan, so no implementation of the HMP can occur until it is approved. In the interim, it is recommended that TIDA work with non-profit organizations and volunteers, using any grant funding, fine revenues or donations, to continue the implementation of the highest-priority recommendations that can be carried out by volunteers or for which adequate funding is in place. No stewardship projects shall be permitted unless consistent with the HMP. If the Redevelopment Plan is approved, the post approval HMP implementation would occur in two phases, one in the short term and the second over the long term.

The initial development phase would include specific habitat management efforts carried out by TICD, as part of the master development of the Island. This would likely include efforts associated with site preparation and infrastructure improvements in areas adjacent to the proposed development parcels and/or public rights-of-way. In addition, the Redevelopment budget for the Redevelopment Plan includes funding that could be used, at the discretion of TIDA, either to complete additional habitat management projects on YBI, and/or as seed money to found a parks and open space conservancy organization that would, in part, help to coordinate and manage the implementation of the HMP over the long term. Ideally, the initial funding would also allow for the most pressing restoration, enhancement and preservation efforts to be implemented by a professional restoration contractor, as identified in Section III, Management Plan Priorities. Regardless of which entity implements individual projects, all HMP efforts should be coordinated closely with development activities and phasing to ensure people on the island are not working at cross purposes, and that money used for HMP implementation is used as effectively and efficiently as possible.

The second phase would include the gradual implementation of the remaining recommended priority actions over time. While priorities may change over time, Section III of this Part II sets forth proposed criteria for prioritizing habitat management actions and identifies initial priorities. The pace for phase 2 implementation efforts will be set by the availability of funding, the urgency of individual projects, and timing/phasing of development projects (including work by Caltrans) that might interfere with longer-term HMP efforts. TIDA will be responsible for securing and allocating ongoing resources associated with overseeing the implementation.

Although ultimate responsibility for overseeing the implementation of the HMP rests with TIDA, TIDA may during the life of the Redevelopment project, choose to establish a parks and open space conservancy organization, which in turn could establish advisory groups and/or stewardship programs that would coordinate with TIDA on HMP implementation. Such an organization could help to coordinate both professional efforts and volunteer activities, secure and effectively guide funding for implementation of the Plan. Any money, and other appropriate resources and activities invested in implementation of the plan should be leveraged by the management entity and stewardship groups as a catalyst for additional and ongoing implementation of Habitat Management Plan prescriptions.

III. Management Plan Priorities

This Section of Part II of the HMP identifies criteria for prioritizing specific prescriptions for Management Zones and Map Units. The criteria consider both biological resources and managerial considerations and are derived from existing ecological conditions on YBI, as well as the management goals, objectives, and recommended management actions set forth in Part I of this document.

Through the identification of criteria with which to assess the various prescriptions and actions proposed in the HMP, this section also provides a framework for prioritizing future work within the various Habitat Management Zones and Map Units as opportunities, resources and funding become available. Finally, several top-priority actions that are considered particularly important from an ecological standpoint are identified and preliminary overall priorities are assigned to Management Zones and Map Units.

Both Part I of this HMP and this Part II (Implementation Plan) are intended to be living documents and it is expected that criteria will continue to be added or refined and that priorities will change over time. Section V of Part II, *Long-Term Monitoring and Maintenance*, provides a discussion of how the outputs and analysis of various monitoring and maintenance programs will provide the basis for an adaptive management strategy. Specific timelines, work plans and budgets will need to be developed as priorities change in the future, and are thus beyond the scope of this Plan.

A. Prioritization Framework

Prioritization defines the order in which actions and projects will be implemented. It is an important step in guiding any action or management plan, identifying necessary resources, and defining the need for potential partners. Approaches to prioritizing projects often include a quantitative or semi-quantitative ranking protocol for each potential site, or in this case, possibly for each Management Zone or Map Unit, based on established selection parameters. However, in the interest of flexibility, the approach we use here is to simply categorize actions and management prescriptions for the various habitat units as low, medium, or high priority based primarily on a qualitative synthesis of existing habitat values and implementation feasibility.

The first step in establishing a prioritization strategy is the selection of appropriate criteria, which can then used as a filter to prioritize a set of management actions, the order in which habitat management areas are treated, or specific projects within the Map Units. Overarching criteria categories for YBI include:

- *Environmental benefits:* Ecologically-based criteria include increased habitat diversity, increased habitat complexity, provision of habitat for wildlife, and increases in habitat for special-status species. These are benefits that might improve the overall function of natural areas on YBI.
- *Public support:* Community acceptance criteria measures whether a project can be implemented or maintained by volunteers, will align with community goals, or will provide educational opportunities.
- *Implementation feasibility:* These criteria provide a measure of the practicality of the project. Feasibility considerations include implementation costs, availability of potential funding, number of stakeholders, ease of access, ease of maintenance, potential conflicts with redevelopment goals or the goals of other HMP actions. These considerations are crucial in determining whether a project can be undertaken.

B. Prioritization Criteria

The recommended prioritization criteria presented below are based on the goals and strategies of the HMP, existing ecological conditions on YBI, and the known threats to ecological integrity present throughout YBI. Also considered are public involvement and safety concerns and project feasibility. As noted above, these are preliminary and based on the best available information on YBI's existing natural resources. The prioritization process is often conducted by a group of interested stakeholders from the community and resource experts who develop a list of criteria that all agree are important to a project or plan's goals and objectives. Stakeholder involvement can assist in developing public support and can also assist in identifying potential project partners. Monitoring data should be used to determine implementation success and adaptive management should provide the basis for modifying existing criteria and selecting new criteria as needed.

III. Management Plan Priorities

Existing Conditions:

- *Special-status plants present* - The presence of special-status plants is considered beneficial and is generally indicative of a relatively intact plant community.
- *Special-status wildlife present* - The presence of special-status wildlife is considered beneficial and is often an indicator that an ecosystem is relatively intact.
- *Level of habitat type/habitat structural diversity* - Areas with a diversity of habitat types and habitat structure support a greater diversity of species.
- *Native species (both plants and wildlife) diversity* - Native species diversity is an indicator of a relatively healthy system.
- *Invasive species present and/or dominant* - The presence, and especially the dominance, of invasives often interferes with ecosystem processes and functions by displacing native species.
- *Dominance of native vs non-native vegetation* - Dominance of native vegetation indicates a healthy plant community.
- *Levels of habitat fragmentation* - Greater levels of habitat fragmentation tend to result in lower levels of biodiversity as species' movement and dispersal are often inhibited by roads, fencing, and other types of development.

Preservation/Restoration/Enhancement Potential:

- *Action/prescription preserves existing sensitive resources*
- *Action/prescription creates and expands existing habitat types*
- *Action/prescription enhances wildlife habitat values*
- *Action/prescription improves habitat connectivity*
- *Action/prescription reduces existing threats to sensitive resources (e.g., invasive plant removal, social trail removal)*
- *Action/prescription controls/eliminates erosion sources*
- *Action/prescription increases potential for self sustaining system*

Public Involvement and Support Criteria:

- *Prior/existing stewardship activities carried out*
- *Action/prescription increases opportunities for public involvement*
- *Action/prescription improves recreational experience and opportunities (e.g., creating viewsheds, interpretive opportunities, trail and circulation improvements, picnic areas)*
- *Action/prescription increases user/occupant safety (e.g., hazard tree removal, reduced fire risk, improved trail conditions)*

Implementation Feasibility Criteria:

- *Degree of degradation/habitat conversion* - less degraded environments and sites with more intact habitat will be a priority for preservation, enhancement and restoration.

- *Site accessibility - easy accessibility to the site affords easier and affordable HMP prescription and recommendation implementation and is considered beneficial.*
- *Follow-up monitoring and maintenance level of effort - ease of operations and maintenance monitoring will inform prioritization. For example, the less complex HMP prescription implemented on a more accessible site would elevate the implementation priority status of the site.*
- *Implementation costs - a benefit to cost ratio will inform implementation priority status.*
- *Potential for partnerships/funding (e.g., joint projects with non-profits, grant funding, etc.) - more potential for funding, resource sharing and partner opportunities would elevate the implementation priority status of the site.*
- *Potential for conflict with redevelopment goals or the goals of other HMP actions/prescriptions - less potential for conflict with redevelopment goals increases implementation priority status of the site.*
- *Complements redevelopment goals (e.g., invasive species management and revegetation of 'gateway' areas along Treasure Island Drive) - In general, more potential for complementing redevelopment goals increases implementation priority status of the site.*

C. Recommended Priority Actions

The following actions are prescribed across Management Zones and Map Units and should be considered high priority for implementation regardless of the overall priorities assigned to individual Zones or Map Units.

- *GIS mapping of special-status plant populations, large toyon, oaks, and buckeye, unusual communities, and invasive plant species to increase baseline knowledge of YBI's natural resources. Mapping and continued inventory will continue to provide valuable information that can be applied towards future prioritization efforts.*
- *Removal of ivy from oaks, toyon, and other native trees and shrubs throughout YBI.*
- *Removal of non-native species that are directly competing with special-status plants or high value habitat, or that left unaddressed, would invade adjacent high value habitat.*
- *Eradication of newly establishing invasive species (those confined to one or several locations and/or that occur in small populations).*
- *Removal of informal trails and establishment of clearly delineated trails with fencing to allow but control access to the Island's landscape.*

III. Management Plan Priorities

D. Preliminary Management Zone Prioritization

As described in Section IV of the HMP, each Management Zone has an overarching management prescription that captures the general intention for that zone. A preliminary prioritization for each Management Zone is presented here and is based on a consideration of the criteria established in the previous section relative to the general management prescriptions and Map Unit prescriptions within each zone.

West Bluff North: High Priority

Most of this Zone contains relatively intact communities with high native diversity. Map Unit 1 is in a 'gateway location'. Threats are relatively low and consist of generally small populations of invasive species and limited extent social trails. Access is relatively easy for all proposed actions. Non-native trees are widely scattered and located adjacent to the road, and could be removed easily.

West Bluff South: Low Priority

The parts of this Zone that are most easily accessible are heavily invaded by eucalyptus, broom, and other invasive species. Cost to eradicate and control will be relatively high and slopes are steep. Although the overall priority is low here, an important high priority action will be to map and monitor the dune gilia populations present in Map Unit 9. Priority areas for enhancement in this Map Unit should be centered on the dune gilia populations. Once these areas are cleared of invasive plants, enhancement areas should move outwards over time as funding is available.

Southwest Slope: High Priority

Much of the Southwest Slope is heavily invaded by eucalyptus, French broom, ivy, and other invasives and will require a great deal of effort and money to implement, which might suggest only a moderate priority. Although there is great potential here for habitat enhancement, such efforts will likely need to be phased and implemented over a long-term time frame. This Zone will be easily accessible from redevelopment areas and is proposed for recreational trails and, perhaps, establishment of picnic areas and viewpoints. Additionally, the lower slopes are directly above Treasure Island Drive and form part of the gateway to the island. These factors, in addition to the potential for establishment of a mosaic of native communities, including high quality butterfly habitat on the upper slopes, raise the priority level of this Management Zone based on ecological, as well as social and redevelopment criteria.

Clipper Cove West: High Priority

Clipper Cove West is designated high priority for the following reasons: several Map Units support special-status plants and/or unique communities; much of this Zone is easily accessible; previous stewardship efforts have been carried out here so there is likely already a high level of public support for continuing enhancement efforts; there is already high recreational use at the beach and a picnic area available; there are several good educational and interpretive opportunities here; and, finally, several Map Units are part of the 'gateway' to Treasure Island as well as to redeveloped areas on YBI.

Central Clipper Cove: Low Priority

Much of this Management Zone is difficult to access and, although weed removal would be desirable in the lower Map Units, they are relatively free of invasives and basically inaccessible. Enhancement efforts should focus on the upper slopes, where removal of eucalyptus along Macalla Road would be relatively easy. High priority actions identified in the previous section should be carried out here, with a particular emphasis on mapping and protecting the large toyon that occur along the slope in this Zone.

Clipper Cove East: Low Priority

Similar to Central Clipper Cove, the Map Units in this Zone above Clipper Cove are very steep and there is little work that can be done here due to their inaccessibility. Mapping and preservation of the wildrye grassland that comprise Map Unit 39, mapping and protection of large oaks through ivy removal, and mapping and protection of western gull nesting habitat in Map Unit 43 should be high priority actions in this zone.

New Bridge: Low Priority

Work will not be able to proceed in the New Bridge Management Zone until Bay Bridge construction is completed. Therefore, this Zone has been assigned a low priority.

Redevelopment Area:

Although no HMP prescriptions are proposed for these areas, it is recommended that the Priority Actions recommended above be implemented here. It is particularly important to map and protect existing sensitive resources in these areas prior to redevelopment. The Design for Development will control and provide standards and guidelines for site assessment and protection of existing trees and vegetation when feasible.

E. Preliminary Map Unit Prioritization

Although the Management Zones were formed by aggregating Map Units with similar ecological characteristics and experiencing similar threat types and levels, this does not mean that all Map Units within a given zone will have the same priority level for prescription implementation as the overarching Zone priority. However, Map Unit priorities should be ranked according to the Zone priority. In other words, high priority Map Units belonging to a high priority Zone would be ranked higher than high priority Map Units belonging to a moderate priority Zone, and so on.

In general, the highest priority Map Units will be those that support special-status species or preserve sensitive or unique communities, and particularly those that are easily accessible and/or would require lower levels of funding to complete the management prescription. Map Units designated as high priority for prescription implementation include the following: 1, 4, 6, 7, 15, 16, 19, 20, 21, 23, 24, 25, and 26.

Moderate priority Map Units will be those that may support remnants of native communities and require enhancement, primarily through removal of non-native vegetation. These Map Units also tend to be well situated for recreational uses under the Redevelopment Plan and are generally easily accessible. Map Units designated as moderate priority for prescription implementation include the following: 2, 13, 18, 22, 27, 28, 29, 33, 41, and 42.

Low priority Map Units include those that may be severely compromised by invasive plant species, are difficult to access, are not currently available for enhancement, and would likely have a poor cost-benefit ratio. Map Units designated as low priority for prescription implementation include the following: 8, 34, 35, 38, 39, 40, 43, and 46.

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IV. Long-term Monitoring and Maintenance

The components of the monitoring and maintenance plan are discussed below in general terms. As mentioned in Part I, Section VI, *Management Zone Prescriptions*, detailed site specific plans (e.g. restoration planting quantities, placement, and irrigation design) are beyond the scope of this document, which means that the methods and frequency of monitoring and maintenance will likely vary between sites based on site specific characteristics that are not identified here. Monitoring and maintenance are also, in essence, meant to inform the ongoing planning and implementation of the HMP and to support a process of adaptive management that allows management to change aspects of implementation, monitoring, and maintenance in ways that will allow the project to be more successful.

A. Roles and Responsibilities

A restoration specialist, as described in Part I, Section V, *Best Management Practices*, should be responsible for overseeing the implementation of management actions as well as long-term monitoring and maintenance of the various actions. The restoration specialist will work in coordination with TIDA and the Treasure Island Community Development LLC to implement management actions and conduct monitoring and maintenance according to this Plan and their professional expertise.

B. Success Criteria

Four categories comprise the majority of the actions proposed in this HMP. They are: eucalyptus removal, invasive species removal, and restoration planting of herbaceous perennial (valley ryegrass grassland, and coastal terrace prairie), and woody perennial (coast live oak woodland, and coastal scrub) vegetation communities. Success criteria are provided individually for each of these four groups because of the distinct characteristics of each type of management action.

Eucalyptus Removal

Eucalyptus removal is proposed for Map Units 2, 3, 4, 5, 9, 13, 18, 19, 21, 22, 29, 38, 36A, 41, 42, 43, and 46. A strategy for removal is presented in Part I, Section V, *Best Management Practices*, and focuses on selective thinning of trees and lower branches and reduction of litter. Eucalyptus removal will be deemed successful if:

Year 1¹ - total number of trees that have been removed or selectively thinned show less than 10 percent overall resprouting.

Years 2 through 10- trees that have been removed or selectively thinned show less than 15 percent overall resprouting, and litter cover has not appreciated greatly.

Invasive Species Removal

Removal of invasive species is proposed for nearly all Map Units, with very few exceptions. Removal methods will vary from site to site based on the species being removed, site conditions, and the characteristics of the population. The restoration specialist will determine the removal methods as well as the monitoring schedule and combination of monitoring methods. However, the invasive species removal actions will be deemed successful if:

Year 1- post-treatment percent cover of target species is less than 5 percent (living material).

Years 2 through 5- total cover of target species is less than 10 percent. Native plant species should be increasing incrementally each year; if not, restoration planting or additional action should be recommended.

¹ Year 1 refers to monitoring that occurs approximately 12 months following completion of the management action.

IV. Long-term Monitoring and Maintenance

Coastal Terrace Prairie and Valley Ryegrass Restoration Planting

Restoration of coastal terrace prairie and/or valley ryegrass grassland habitats are proposed for Map Units 2, 14A, 22, 23, 27. Coastal terrace prairie is a community dominated by perennial grasses and native herbaceous species that was historically present on YBI, but is almost entirely absent at the current time. Valley ryegrass grassland has persisted in several areas, but was likely much more dominant before the large conversion of much of the Island to eucalyptus. Individual site planting plans have not yet been developed, but the success criteria below can be used regardless of specific site characteristics for the successful establishment of coastal terrace prairie and valley ryegrass grassland. Restoration will be deemed successful if the success criteria below are met:

Years 1 through 5- at least 80 percent survival of all plants installed.

Years 1 through 5- less than 25 percent relative cover² of invasive species.

Years 1 through 5- a minimum of five percent increase in total percent cover of installed plants each year.

Year 5- at least 75 percent relative cover and 40 percent total cover of installed plants.

Coastal Scrub and Coast Live Oak Woodland Restoration Planting

Restoration of coastal scrub habitat is proposed for Map Units 2, 3, 7, 8, 14A, 15, and 25, and restoration of coast live oak woodland is proposed for Map Unit 16 (and over time for 3, and 31). Both of these community types are present on the Island. Restoration of these communities will be deemed successful if the following criteria are met:

Years 1 through 5- at least 80 percent survival of all plants installed.

Years 1 through 5- less than 25 percent relative cover of invasive species.

Years 1 through 5- a minimum of 10 percent increase in relative percent cover of installed plants each year.

Year 5- at least 75 percent relative cover of installed plants.

² Relative cover represents the cover of a particular species with respect to the cumulative vegetation cover. For example, if the total vegetation cover is 35 percent and the total cover of valley ryegrass is 7 percent, the relative cover of valley ryegrass is 20 percent (7/35). Looking at relative cover instead of total cover of each species provides a more specific understanding of the plant community species composition and relative dominance within the plant community.

C. Methods

Eucalyptus Removal

Monitoring the successful removal of eucalyptus trees will require careful tracking and marking of trees during removal activities. This will allow the monitor to visit the site regularly once treatment has been completed and make observations about the condition of each treated individual and evaluate the overall percent of individuals that have resprouted. Monitoring should be conducted once in the spring and once in the fall for the first year, once a year (spring or summer) for years 2-5, and on a biennial basis for years 6-10. The monitor should make a careful count of treated trees that are observed to be resprouting, as well as observations of eucalyptus litter accumulation, and general site conditions. Photopoints can also be established (especially if the site is difficult to access) to show qualitative documentation of changes in site conditions. Photomonitoring is described in the next section.

Invasive Species Removal and Native Plant Community Restoration

Many of the same methods can be used to monitor invasive species removal and restoration planting projects since the success criteria for this variety of projects utilize measures of percent cover, survivorship, and site conditions to determine success. Below the steps for carrying out measurement methods are provided. For all invasive species removal and restoration planting management actions, baseline monitoring should be conducted at the commencement and as soon as possible following completion of the management action to establish a baseline “existing conditions.”

Percent Cover

One of the simplest methods for monitoring smaller scale vegetation change is through the use of line transects. This method is widely applicable to vegetation enhancement, habitat restoration, and weed removal projects, and measures percent cover of vegetation. Transects should be established at the time of planting or weed removal or shortly thereafter. A sufficient number of transects to adequately assess performance of vegetation should be established within revegetation or weed removal areas, with a minimum of one transect per 2,500 square feet of area. The same transects should be used throughout the monitoring period.

There are two types of commonly used line transects: the line-intercept and the point-intercept. The line-intercept is used mostly for woody perennial vegetation that has a large canopy at maturity and measures the distance that the crown of each plant, projected downwards vertically, intercepts the measuring tape. All distances for each individual species should then be added together. The percent cover for a species is the cumulative length of intercepts for each species divided by the length of the transect, or tape measure, multiplied by 100. The point-intercept method simply utilizes the same measuring tape laid on the ground and the monitor uses a pin flag to make observations at prescribed intervals by “dropping” the pin flag. Species names of all plants touching the pin are recorded at each point. If there is no vegetation touching the pin after it is dropped; “bare” is recorded. This method is more useful in grassland communities where it is not practical to use the line-intercept method. The total percent cover for a species or functional group (such as native or exotic) is calculated by dividing the number of times the pin encounters that species by the total number of times the pin is dropped.

Survivorship

For planting projects, counting the number of plants within the planting area provides a simple method for measuring survivorship. The count can be repeated during each monitoring event to determine how many of the initially planted species have survived.

Overall site assessment

A site assessment is a simple way to make observations of site conditions. A large variety of conditions can be assessed including: habitat characteristics (e.g. increase/decrease/new occurrence of invasive species infestations, general health and productivity of vegetation communities), observation of wildlife species, human disturbances, trash, and natural disturbances (tree fall, wind damage, drought), which may all have an impact on the success of the management action. Observations should be recorded in a field notebook or standardized data form in the same manner during each site visit.

IV. Long-term Monitoring and Maintenance

Monitor wildlife/habitat relationships

Increased wildlife use can be a good measure of habitat quality, indicating development of habitat values that support wildlife reproduction, foraging, cover, etc., although it is not always a simple task to correlate one with the other in a statistically valid way. Nonetheless, this type of monitoring can be useful in establishing trends that suggest a habitat improvement project is succeeding or failing. As an example, the pipevine swallowtail butterfly population on YBI could be monitored over time to see if enhancement of pipevine populations on the Island appear to be resulting in increases in the butterflies that depend on this plant. In general, as habitat health, and structural and compositional diversity increase, we would expect to see a corresponding increase in bird species richness and numbers of individuals. This could easily be monitored through point counts, with points placed in and adjacent to enhanced areas and monitored over time as treated areas develop.

Photodocumentation

Photodocumentation is a simple way to provide a qualitative assessment of overall site conditions, including vegetative dominance and structure, as well as changes in vegetative composition and cover over time. Photodocumentation is useful in documenting management projects of all sizes. For any specific project, permanent photopoints should be established at project start with identical color photographic scenes taken at completion and as a part of on-going monitoring.

D. Analysis of Results

Data should be collected in the field according to the methods described above. This includes both quantitative and qualitative data that will be entered into a database, typed up, or otherwise saved in a place that can be easily retrieved for summarizing results and for comparison during the next monitoring event. To evaluate whether project goals and objectives are being met, it is necessary to compare the monitoring data and results to the success criteria and make conclusions about how the goals are or are not being achieved.

E. Maintenance and Adaptive Management

Continued maintenance and adaptive management are the activities that ensure success of management actions in the long term. Adaptive management begins when the data from site monitoring (percent cover, survivorship, and overall site conditions) is compared to the success criteria. This comparison leads to conclusions about the effectiveness of the implementation methods. At this stage, the restoration specialist can make recommendations to continue with the chosen prescription or to make modifications. Adaptive management will involve an analysis of methods or elements that are preventing the project from achieving the success criteria so that alternative methods can be identified. This may include: increasing maintenance or changing the maintenance schedule, changing treatment methods and/or including additional methods, or recommending supplemental management such as restoration planting, among many other possibilities.

Eucalyptus Removal

Areas where eucalyptus has been removed or treated will likely require continued treatment including cutting and herbicide application as well as removal of accumulated litter and branches. The results of monitoring combined with a review of treatment methods should provide an informative analysis of how well treatment methods have worked and how continued maintenance should be directed so that success criteria continue to be met.

Invasive Species Removal

Similar to eucalyptus removal, invasive species treatments and removal methods may need to be implemented to a lesser degree throughout the initial five year maintenance period. Very few invasive species removal techniques are 100 percent effective every time; on-going maintenance is essentially guaranteed. This maintenance will consist of continuing to carry out the same removal methods that were used in the initial removal project (unless these methods are determined to be ineffective), and potentially treating other invasive species that invade following initial treatment.

Restoration Planting (Coast Live Oak Woodland, Coastal Scrub, Valley Ryegrass Grassland, and Coastal Prairie)

Maintenance of restoration planting areas is generally uniform regardless of the type of restoration planting because it should include the following elements: maintain mulch for weed suppression around the base of each planting, ensure the functionality of the irrigation system, install erosion control measures, and remove invasive plant species that outcompete or shade out restoration plants. These elements are extremely important for maintaining a healthy establishment of the restored plant community. Other maintenance measures may be necessary on YBI depending on site location and accessibility (e.g., maintenance of site closure signs or fencing to prevent unintended human disturbances).

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APPENDIX A

Yerba Buena Island Flora, M. Wood, April
2009



Preliminary Checklist Of The Flora Of Yerba Buena Island, San Francisco County

Sort By : Family

Scientific Name	Common Name	Note
Aizoaceae - Fig-Marigold Family		
<i>Aptenia cordifolia</i>	ice-plant	
<i>Carpobrotus edulis</i>	Hottentot fig	3 (high)
<i>Conicosia pugioniformis</i>	narrowleaf iceplant	3 (limited)
<i>Tetragonia tetragoniodes</i>	New Zealand spinach	
Anacardiaceae - Sumac Family		
<i>Schinus terebinthifolius</i>	Brazilian peppertree	3 (limited)
<i>Toxicodendron diversilobum</i>	poison oak	1
Apiaceae - Carrot Family		
<i>Anthriscus caucalis</i>	bur-chervil	
<i>Apium graveolens</i>	celery	
<i>Conium maculatum</i>	poison-hemlock	3 (moderate)
<i>Foeniculum vulgare</i>	sweet fennel	3 (high)
<i>Sanicula crassicaulis</i>	Pacific sanicle	1
<i>Scandix pecten-veneris</i>	shepherd's needle	
Apocynaceae - Dogbane Family		
<i>Vinca major</i>	big periwinkle	3 (moderate)
Araceae - Arum Family		
<i>Zantedeschia aethiopica</i>	calla lily	3 (limited)
Araliaceae - Ginseng Family		
<i>Hedera canariensis</i>	Algerian ivy	3 (high)
<i>Hedera helix</i>	English ivy	3 (high)
Arecaceae - Palm Family		
<i>Phoenix canariensis</i>	Canary Island palm	3 (limited)

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Scientific Name	Common Name	Note
<i>Washingtonia robusta</i>	Mexican fan palm	3 (moderate)
Aristolochiaceae - Pipevine Family		
<i>Aristolochia californica</i>	Dutchman's pipevine	2
Asteraceae - Sunflower Family		
<i>Achillea millefolium</i>	yarrow	1
<i>Ageratina adenophora</i>	sticky eupatorium	3 (moderate)
<i>Agoseris grandiflora</i>	California dandelion	1
<i>Ambrosia chamissonis</i>	beach-bur	1
<i>Anaphalis margaritacea</i>	pearly everlasting	1
<i>Anthemis cotula</i>	dog mayweed	
<i>Arctotheca calendula</i>	capeweed	3 (moderate)
<i>Argyranthemum foeniculaceum</i>	Canary Island marguerite	
<i>Artemisia californica</i>	California sagebrush	1
<i>Baccharis pilularis</i>	coyote brush	1
<i>Bellis perennis</i>	English daisy	
<i>Carduus pycnocephalus</i>	Italian thistle	3 (moderate)
<i>Centaurea solstitialis</i>	yellow starthistle	3 (high)
<i>Chamomilla suaveolens</i>	pineapple weed	
<i>Chrysanthemum coronarium</i>	crown daisy	3 (moderate)
<i>Cirsium occidentale</i> var. <i>occidentale</i>	cobwebby thistle	2
<i>Cirsium vulgare</i>	bull thistle	3 (moderate)
<i>Conyza canadensis</i>	horseweed	1
<i>Cotula australis</i>	Australian brass-buttons	

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Scientific Name	Common Name	Note
<i>Cotula coronopifolia</i>	brassbuttons	3 (limited)
<i>Crepis bursifolia</i>	Italian hawksbeard	
<i>Delairia odorata</i>	Cape ivy	3 (high)
<i>Erechtites glomerata</i>	Australasian fireweed	3 (moderate)
<i>Erechtites minima</i>	Australian fireweed	3 (moderate)
<i>Ericameria ericoides</i>	mock heather	1
<i>Erigeron glaucus</i>	seaside daisy	1
<i>Eriophyllum staechadifolium</i>	seaside woolly sunflower	1
<i>Felicia amelloides</i>	blue marguerite	
<i>Gnaphalium bicolor</i>	bicolor cudweed	1
<i>Gnaphalium californicum</i>	California everlasting	1
<i>Gnaphalium canescens</i> ssp. <i>beneolens</i>	fragrant everlasting	1
<i>Gnaphalium luteo-album</i>	cudweed	
<i>Gnaphalium stramineum</i>	cotton-batting plant	1
<i>Grindelia stricta</i>	coastal gumplant	1
<i>Hypochaeris glabra</i>	smooth cat's-ear	3 (limited)
<i>Jaumea carnosa</i>	jaumea	1
<i>Lactuca serriola</i>	prickly lettuce	
<i>Logfia gallica</i>	narrow-leaf filago	
<i>Osteospermum fruticosum</i>	African daisy	
<i>Picris echioides</i>	bristly ox-tongue	3 (limited)
<i>Senecio hybridus</i>	cineraria	
<i>Senecio vulgaris</i>	common groundsel	

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Sort By : Family

Scientific Name	Common Name	Note
<i>Silybum marianum</i>	milkthistle	3 (limited)
<i>Soliva sessilis</i>	common soliva	
<i>Sonchus asper</i> ssp. <i>asper</i>	prickly sowthistle	
<i>Sonchus oleraceus</i>	common sowthistle	
<i>Stephanomeria virgata</i> ssp. <i>pleurocarpa</i>	tall stephanomeria	1
<i>Taraxacum officinale</i>	common dandelion	
Betulaceae - Birch Family		
<i>Alnus cordata</i>	Italian alder	
<i>Corylus cornuta</i> var. <i>californica</i>	California hazelnut	2
Brassicaceae - Mustard Family		
<i>Brassica nigra</i>	black mustard	3 (moderate)
<i>Cakile maritima</i>	sea rocket	3 (limited)
<i>Capsella bursa-pastoris</i>	shepard's purse	
<i>Cardamine oligosperma</i>	bitter-cress	1
<i>Coronopus didymus</i>	lesser wart-cress	
<i>Hirschfeldia incana</i>	shortpod mustard	3 (moderate)
<i>Lepidium latifolium</i>	perennial pepperweed	3 (high)
<i>Lepidium nitidum</i> var. <i>nitidum</i>	shining pepper-grass	1
<i>Lobularia maritima</i>	sweet alyssum	3 (limited)
<i>Raphanus sativus</i>	wild radish	3 (limited)
<i>Sisymbrium orientale</i>	Indian hedgemustard	
Buddlejaceae - Buddleja Family		
<i>Buddleja davidii</i>	butterfly bush	

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Scientific Name	Common Name	Note
Caprifoliaceae - Honeysuckle Family		
<i>Lonicera japonica</i>	Japanese honeysuckle	
<i>Sambucus mexicana</i>	blue elderberry	1
<i>Symphoricarpos albus</i> var. <i>laevigatus</i>	common snowberry	1
Caryophyllaceae - Pink Family		
<i>Cardionema ramosissimum</i>	sand mat	1
<i>Cerastium glomeratum</i>	mouse-ear chickweed	
<i>Silene gallica</i>	common catchfly	
<i>Spergularia bocconeii</i>	Boccon's sand-spurrey	
<i>Spergularia macrotheca</i> var. <i>macrotheca</i>	large flowered sand-spurrey	1
<i>Stellaria media</i>	common chickweed	
Chenopodiaceae - Goosefoot Family		
<i>Atriplex triangularis</i>	spearscale	1
<i>Chenopodium album</i>	lamb's quarters	
<i>Chenopodium californicum</i>	California goosefoot	1
<i>Salicornia virginica</i>	pickleweed	1
Commelinaceae - Spiderwort Family		
<i>Tradescantia fluminensis</i>	spiderwort	
Convolvulaceae - Morning-glory Family		
<i>Calystegia purpurata</i> ssp. <i>purpurata</i>	purple western morning-glory	1
Crassulaceae - Stonecrop Family		
<i>Aeonium haworthii</i>	stone crop	
<i>Crassula argentea</i>	jade plant	
<i>Crassula connata</i>	pygmyweed	1

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Scientific Name	Common Name	Note
<i>Dudleya farinosa</i>	powdery dudleya	1
<i>Sedum dendroideum</i>	stonecrop	
Cucurbitaceae - Gourd Family		
<i>Marah fabaceus</i>	California man-root	1
Cupressaceae - Cypress Family		
<i>Chamaecyparis lawsonii</i>	Lawson cypress	
<i>Chamaecyparis pisifera</i>	Sawara false cypress	
<i>Cupressus arizonica</i>	Arizona cypress	
<i>Cupressus macrocarpa</i>	Monterey cypress	4
Cyperaceae - Sedge Family		
<i>Carex barbarae</i>	Santa Barbara sedge	1
<i>Cyperus eragrostis</i>	umbrella sedge	1
Dennstaedtiaceae - Bracken Fern Family		
<i>Pteridium aquilinum</i> var. <i>pubescens</i>	western brackenfern	1
Dryopteridaceae - Wood Fern Family		
<i>Crytomium falcatum</i>	holly fern	
<i>Dryopteris arguta</i>	wood fern	1
<i>Polystichum munitum</i>	western sword fern	1
Equisetaceae - Horsetail Family		
<i>Equisetum telmateia</i> ssp. <i>braunii</i>	giant horsetail	1
Euphorbiaceae - Spurge Family		
<i>Chamaesyce maculata</i>	spotted spurge	
<i>Euphorbia peplus</i>	petty spurge	

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Scientific Name	Common Name	Note
Fabaceae - Legume Family		
<i>Acacia baileyana</i>	Cootamundra wattle	
<i>Acacia decurrens</i>	green wattle	
<i>Acacia melanoxylon</i>	blackwood acacia	3 (limited)
<i>Acmispon wrangelianus</i>	Chile trefoil	1
<i>Albizia lophantha</i>	plume acacia	
<i>Bauhinia variegata</i>	purple orchid tree	
<i>Ceratonia siliqua</i>	carob	
<i>Cercis occidentalis</i>	western redbud	1
<i>Cytisus scoparius</i>	Scotch broom	3 (high)
<i>Genista monspessulana</i>	French broom	3 (high)
<i>Lathyrus tingitanus</i>	Tangier pea	
<i>Lathyrus vestitus</i> var. <i>vestitus</i>	common Pacific pea	1
<i>Lotus corniculatus</i>	broadleaf bird's-foot trefoil	
<i>Lotus scoparius</i>	California broom	1
<i>Lotus strigosus</i>	strigose treefoil	1
<i>Lupinus arboreus</i>	yellow bush lupine	1
<i>Lupinus bicolor</i>	dove lupine	1
<i>Lupinus microcarpus</i> var. <i>microcarpus</i>	chick lupine	1
<i>Lupinus nanus</i>	Douglas' lupine	1
<i>Medicago polymorpha</i>	burclover	3 (limited)
<i>Medicago sativa</i>	alfalfa	
<i>Melilotus albus</i>	white sweetclover	

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Scientific Name	Common Name	Note
<i>Melilotus officinalis</i>	yellow sweetclover	
<i>Trifolium gracilentum</i> var. <i>gracilentum</i>	pinpoint clover	1
<i>Trifolium hirtum</i>	rose clover	3 (moderate)
<i>Trifolium willdenovii</i>	tomcat clover	1
<i>Vicia americana</i> var. <i>americana</i>	American vetch	1
<i>Vicia benghalensis</i>	purple vetch	
<i>Vicia sativa</i> ssp. <i>nigra</i>	common vetch	
<i>Vicia sativa</i> ssp. <i>sativa</i>	common vetch	
<i>Vicia villosa</i> ssp. <i>villosa</i>	hairy vetch	
Fagaceae - Oak Family		
<i>Quercus agrifolia</i>	coast live oak	1
Geraniaceae - Geranium Family		
<i>Erodium botrys</i>	long-beaked storksbill	
<i>Erodium cicutarium</i>	red-stemmed filaree	3 (limited)
<i>Erodium moschatum</i>	white-stemmed filaree	
<i>Geranium dissectum</i>	cut-leaved geranium	3 (moderate)
<i>Geranium molle</i>	dove's-foot geranium	
<i>Pelargonium peltatum</i>	ivy geranium	
Grossulariaceae - Gooseberry Family		
<i>Ribes sanguineum</i> var. <i>glutinosum</i>	red-flowering currant	1
Hippocastanaceae - Buckeye Family		
<i>Aesculus californica</i>	California buckeye	2
Hydrophyllaceae - Waterleaf Family		
<i>Nemophila maculata</i>	five-spot	1

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Scientific Name	Common Name	Note
<i>Phacelia distans</i>	common phacelia	1
<i>Phacelia malvifolia</i>	stinging phacelia	1
<i>Pholistoma auritum</i> var. <i>auritum</i>	fiestaflower	2
Iridaceae - Iris Family		
<i>Chasmanthe aethiopica</i>	chasmanthe	
<i>Iris x hybrid</i>	bearded iris	
<i>Iris xiphium</i>	Dutch iris	
<i>Sisyrinchium bellum</i>	blue-eyed grass	1
Juncaceae - Rush Family		
<i>Juncus balticus</i>	wire rush	1
<i>Juncus bufonius</i> var. <i>bufonius</i>	toad rush	1
<i>Juncus bufonius</i> var. <i>congestus</i>	congested toad rush	1
<i>Juncus effusus</i> var. <i>pacificus</i>	Pacific bog rush	1
<i>Juncus patens</i>	spreading rush	1
<i>Luzula comosa</i>	Pacific wood rush	1
Lamiaceae - Mint Family		
<i>Monardella villosa</i> ssp. <i>franciscana</i>	coyote mint	1
<i>Salvia leucantha</i>	Mexican bush sage	
<i>Stachys ajugoides</i> var. <i>rigida</i>	rigid hedge nettle	1
Liliaceae - Lily Family		
<i>Agapanthus africanus</i>	lily-of-the-Nile	
<i>Agave americana</i>	century plant	
<i>Allium triquetrum</i>	white-flowered onion	

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Preliminary Checklist Of The Flora Of Yerba Buena Island, San Francisco County

Sort By : Family

Scientific Name	Common Name	Note
<i>Aloe saponaria</i>	aloe	
<i>Amaryllis belladonna</i>	naked lady	
<i>Chlorogalum pomeridianum</i> var. <i>divaricatum</i>	spreading soaproot	1
<i>Dichelostemma capitatum</i> ssp. <i>capitatum</i>	blue dicks	1
<i>Narcissus pseudonarcissus</i>	common daffodil	
<i>Triteleia laxa</i>	lthuriel's spear	1
Linaceae - Flax Family		
<i>Linum bienne</i>	narrow-leaved flax	
Malvaceae - Mallow Family		
<i>Abutilon striatum</i>	Indian mallow	
<i>Lavatera assurgentiflora</i>	malva rosa	4
<i>Malva nicaeensis</i>	bull mallow	
<i>Malva parviflora</i>	cheeseweed	
<i>Malva sylvestris</i>	high mallow	
Moraceae - Mulberry Family		
<i>Ficus pumila</i>	creeping fig	
Myoporaceae - Myoporaceae Family		
<i>Myoporum laetum</i>	myoporaceae	3 (moderate)
Myrtaceae - Myrtle Family		
<i>Eucalyptus camaldulensis</i>	river red gum	3 (limited)
<i>Eucalyptus ficifolia</i>	scarlet flowering gum	
<i>Eucalyptus globulus</i>	Tasmanian blue gum	3 (moderate)
<i>Eucalyptus leucoxylon</i>	white ironbark	
<i>Eucalyptus sideroxylon</i>	red ironbark	

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Sort By : Family

Scientific Name	Common Name	Note
<i>Leptospermum laevigatum</i>	Australian tea tree	
<i>Melaleuca decussata</i>	lilac melaleuca	
<i>Metrosideros excelsus</i>	New Zealand Christmas tree	
Oleaceae - Olive Family		
<i>Ligustrum japonicum</i>	waxleaf privet	
<i>Ligustrum lucidum</i>	glossy privet	
<i>Ligustrum ovalifolium</i>	California privet	
Onagraceae - Evening Primrose Family		
<i>Camissonia ovata</i>	sun cups	1
<i>Clarkia amoena</i>	farewell-to-spring	1
<i>Clarkia unguiculata</i>	elegant clarkia	1
<i>Epilobium brachycarpum</i>	tall willowherb	1
<i>Epilobium ciliatum</i> ssp. <i>ciliatum</i>	northern willowherb	1
<i>Oenothera elata</i> ssp. <i>hookeri</i>	Hooker's evening-primrose	1
Oxalidaceae - Oxalis Family		
<i>Oxalis pes-caprae</i>	Bermuda buttercup	3 (moderate)
<i>Oxalis rubra</i>	windobox oxalis	
Papaveraceae - Poppy Family		
<i>Eschscholzia californica</i>	California poppy	1
<i>Fumaria parviflora</i>	small-flowered fumitory	
Pinaceae - Pine Family		
<i>Pinus canariensis</i>	Canary Island pine	
<i>Pinus halepensis</i>	Aleppo pine	
<i>Pinus pinea</i>	Italian stone pine	

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Sort By : Family

Scientific Name	Common Name	Note
<i>Pinus ponderosa</i>	ponderosa pine	4
<i>Pinus radiata</i>	Monterey pine	4
Pittosporaceae - Pittosporum Family		
<i>Pittosporum crassifolium</i>	thick-leaved pittosporum	
<i>Pittosporum eugenioides</i>	tarata	
<i>Pittosporum tenuifolium</i>	pittosporum	
Plantaginaceae - Plantain Family		
<i>Plantago coronopus</i>	cut-leaved plantain	
<i>Plantago erecta</i>	California plantain	1
<i>Plantago lanceolata</i>	English plantain	3 (limited)
Poaceae - Grass Family		
<i>Agrostis capillaris</i>	colonial bent grass	
<i>Agrostis pallens</i>	leafy bent grass	1
<i>Avena barbata</i>	slender wild oats	3 (moderate)
<i>Avena fatua</i>	wild oats	3 (moderate)
<i>Briza maxima</i>	big quaking grass	3 (limited)
<i>Briza minor</i>	little quaking grass	
<i>Bromus carinatus</i> var. <i>carinatus</i>	California brome	1
<i>Bromus diandrus</i>	ripgut brome	3 (moderate)
<i>Bromus hordeaceus</i>	soft chess	3 (limited)
<i>Bromus madritensis</i> ssp. <i>rubens</i>	red brome	3 (high)
<i>Cortaderia selloana</i>	pampas grass	3 (high)
<i>Cynodon dactylon</i>	Bermudagrass	3 (moderate)

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Sort By : Family

Scientific Name	Common Name	Note
<i>Cynosurus echinatus</i>	hedgehog dogtail	3 (moderate)
<i>Dactylis glomerata</i>	orchardgrass	3 (limited)
<i>Distichlis spicata</i>	saltgrass	1
<i>Ehrharta erecta</i>	erect veldtgrass	3 (moderate)
<i>Elymus glaucus</i> ssp. <i>glaucus</i>	blue wildrye	1
<i>Festuca arundinacea</i>	tall fescue	3 (moderate)
<i>Festuca rubra</i>	red fescue	1
<i>Gastridium ventricosum</i>	nit grass	
<i>Holcus lanatus</i>	common velvet-grass	3 (moderate)
<i>Hordeum marinum</i> ssp. <i>gussoneanum</i>	Mediterranean barley	3 (moderate)
<i>Hordeum murinum</i> ssp. <i>glaucum</i>	hare barley	3 (moderate)
<i>Hordeum murinum</i> ssp. <i>leporinum</i>	foxtail barley	3 (moderate)
<i>Leptochloa fascicularis</i>	bearded sprangletop	1
<i>Leymus condensatus</i>	giant wildrye	1
<i>Leymus triticoides</i>	creeping wildrye	1
<i>Leymus x vancouverensis</i>	Vancouver's ryegrass	2
<i>Lolium multiflorum</i>	Italian ryegrass	3 (moderate)
<i>Lolium perenne</i>	perennial ryegrass	
<i>Melica imperfecta</i>	Coast Range melic	1
<i>Nassella lepida</i>	foothill needlegrass	1
<i>Nassella pulchra</i>	purple needlegrass	1
<i>Parapholis incurva</i>	sickle grass	
<i>Pennisetum clandestinum</i>	kikuyugrass	3 (limited)

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Sort By : Family

Scientific Name	Common Name	Note
<i>Phalaris aquatica</i>	hardinggrass	3 (moderate)
<i>Phalaris minor</i>	littleseed canarygrass	
<i>Poa annua</i>	annual bluegrass	
<i>Poa secunda</i> ssp. <i>secunda</i>	one-sided bluegrass	1
<i>Polypogon monspeliensis</i>	annual rabbitsfoot grass	3 (moderate)
<i>Vulpia bromoides</i>	six-weeks fescue	
<i>Vulpia myuros</i> var. <i>hirsuta</i>	western six-weeks fescue	3 (moderate)
Polemoniaceae - Phlox Family		
<i>Gilia capitata</i> ssp. <i>chamissonis</i>	dune gilia	2 (CNPS 1b.1)
Polygonaceae - Buckwheat Family		
<i>Eriogonum fasciculatum</i>	flat-top buckwheat	1
<i>Eriogonum latifolium</i>	coast buckwheat	1
<i>Muehlenbeckia complexa</i>	maidenhair vine	
<i>Polygonum arenastrum</i>	common knotweed	
<i>Rumex acetosella</i>	sheep sorrel	3 (moderate)
<i>Rumex crispus</i>	curly dock	3 (limited)
<i>Rumex pulcher</i>	fiddle dock	
Polypodiaceae - Polypody Family		
<i>Polypodium californicum</i>	California polypody	1
Portulacaceae - Purslane Family		
<i>Claytonia exigua</i> ssp. <i>exigua</i>	serpentine spring beauty	2
<i>Claytonia perfoliata</i> ssp. <i>perfoliata</i>	miner's lettuce	1
Primulaceae - Primrose Family		
<i>Anagallis arvensis</i>	scarlet pimpernel	

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Sort By : Family

Scientific Name	Common Name	Note
Proteaceae - Protea Family		
<i>Hakea suaveolens</i>	sweet hakea	
Pteridaceae - Fern Family		
<i>Adiantum jordanii</i>	maidenhair fern	2
<i>Pellaea andromedifolia</i>	coffee fern	2
<i>Pentagramma triangularis</i> ssp. <i>triangularis</i>	goldback fern	1
Ranunculaceae - Buttercup Family		
<i>Ranunculus californicus</i>	California buttercup	1
<i>Ranunculus muricatus</i>	spiny buttercup	
Rhamnaceae - Buckthorn Family		
<i>Ceanothus dentatus</i>	dwarf ceanothus	1
<i>Ceanothus foliosus</i> var. <i>medius</i>	La Cuesta ceanothus	1
<i>Ceanothus thyrsiflorus</i>	blue blossom	1
Rosaceae - Rose Family		
<i>Cotoneaster franchetii</i>	orange cotoneaster	3 (moderate)
<i>Cotoneaster lacteus</i>	Parney's cotoneaster	3 (moderate)
<i>Cotoneaster pannosa</i>	silverleaf cotoneaster	3 (moderate)
<i>Eriobotrya japonica</i>	loquat	
<i>Heteromeles arbutifolia</i>	toyon	1
<i>Malus sylvestris</i>	apple	
<i>Oemleria cerasiformis</i>	oso berry	1
<i>Prunus ilicifolia</i>	hollyleaf cherry	4
<i>Pyracantha angustifolia</i>	common firethorn	3 (limited)
<i>Rhaphiolepis indica</i>	Indian hawthorn	

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Sort By : Family

Scientific Name	Common Name	Note
<i>Rosa gymnocarpa</i>	wood rose	2
<i>Rubus discolor</i>	Himalayan blackberry	3 (high)
<i>Rubus ursinus</i>	California blackberry	1
Rubiaceae - Madder Family		
<i>Coprosma repens</i>	mirror plant	
<i>Galium aparine</i>	goose grass	1
<i>Sherardia arvensis</i>	field madder	
Salicaceae - Willow Family		
<i>Populus nigra</i>	Lombardy poplar	
<i>Populus tremuloides</i>	quaking aspen	4
<i>Salix laevigata</i>	red willow	1
<i>Salix lasiolepis</i>	arroyo willow	1
Saxifragaceae - Saxifrage Family		
<i>Escallonia rubra</i>	redclaws	
Scrophulariaceae - Figwort Family		
<i>Hebe speciosa</i>	showy hebe	
<i>Mimulus aurantiacus</i>	sticky monkeyflower	1
<i>Mimulus guttatus</i>	common large monkey-flower	1
<i>Scrophularia californica</i>	California figwort	1
<i>Triphysaria pusilla</i>	dwarf owl's-clover	1
<i>Veronica persica</i>	Persian speedwell	
Solanaceae - Nightshade Family		
<i>Solanum furcatum</i>	forked nightshade	
<i>Solanum nigrum</i>	black nightshade	

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Sort By : Family

Scientific Name	Common Name	Note
Taxaceae - Yew Family		
<i>Taxus baccata</i>	English yew	
Taxodiaceae - Bald Cypress Family		
<i>Sequoia sempervirens</i>	coast redwood	1
Tropaeolaceae - Nasturtium Family		
<i>Tropaeolum majus</i>	garden nasturtium	
Ulmaceae - Elm Family		
<i>Ulmus pumila</i>	Siberian elm	
Valerianaceae - Valerian Family		
<i>Centranthus ruber</i>	red valerian	

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APPENDIX B

List of Wildlife Referenced in the Yerba Buena Island HMP

LIST OF WILDLIFE REFERENCED IN THE YERBA BUENA ISLAND HMP

Common Name	Scientific name
<i>Invertebrates</i>	
Aquatic Invertebrates	
Coastal mussel	<i>Mytilus edulis</i>
Bay mussel	<i>Mytilus trossulus</i>
California oyster	<i>Ostrea lurida</i>
Dungeness crab	<i>Cancer magister</i>
Terrestrial Invertebrates	
Acmon blue	<i>Plebejus acmon</i>
Anise swallowtail	<i>Papilio zelicaon</i>
Echo blue	<i>Celastrina ladon echo</i>
Green hairstreak	<i>Callophrys dumetorum</i>
Mylitta crescent	<i>Phyciodes mylitta</i>
Orange tortrix	<i>Argyrotaenia franciscana</i>
Painted lady	<i>Vanessa cardui</i>
Pipevine swallowtail	<i>Battus philenor hirsute</i>
Rural skipper	<i>Ochlodes Agricola</i>
Sandhill skipper	<i>Polites sabuleti sabuleti</i>
Umber skipper	<i>Poanes melane</i>
Woodland skipper	<i>Ochlodes sylvanoides</i>
<i>Fish</i>	
California coast coho salmon	<i>Oncorhynchus kisutch</i>
Central California Coast steelhead	<i>Oncorhynchus mykiss</i>
Chinook salmon	<i>Oncorhynchus tshawytscha</i>
Halibut	<i>Paralichthys californicus</i>
Jack mackerel	<i>Trachurus symmetricus</i>
North American green sturgeon	<i>Acipenser medirostris</i>
Northern anchovy	<i>Engraulis mordax</i>
Pacific herring	<i>Clupea pallasii</i>
Pacific sardine	<i>Sardinops sagax caerulea</i>

LIST OF WILDLIFE REFERENCED IN THE YERBA BUENA ISLAND HMP

Common Name	Scientific Name
<i>Amphibians and Reptiles</i>	
Alligator lizard	<i>Elgaria coerulea</i>
California slender salamander	<i>Batrachoseps attenuatus</i>
Garter snake	<i>Thamnophis sirtalis</i>
Gopher snake	<i>Pituophis melanoleucus</i>
Western fence lizard	<i>Sceloporus occidentalis</i>
<i>Birds</i>	
Allen's hummingbird	<i>Selasphorus sasin</i>
American avocet	<i>Recurvirostra americana</i>
American coot	<i>Fulica americana</i>
American crow	<i>Corvus brachyrhynchos</i>
American goldfinch	<i>Carduelis tristis</i>
American kestrel	<i>Falco sparverius</i>
American robin	<i>Turdus migratorius</i>
American wigeon	<i>Anas americana</i>
Anna's hummingbird	<i>Calypte anna</i>
Barn swallow	<i>Hirundo rustica</i>
Black-bellied plover	<i>Pluvialis squatarola</i>
Black brandt	<i>Branta bernicla nigricans</i>
Black oystercatcher	<i>Haematopus bachmani</i>
Black phoebe	<i>Sayornis nigricans</i>
Black-crowned night-heron	<i>Nycticorax nycticorax</i>
Black-headed grosbeak	<i>Pheucticus melanocephalus</i>
Black-necked stilt	<i>Himantopus mexicanus</i>
Bonaparte's gull	<i>Chroicocephalus philadelphia</i>
Brandt's cormorant	<i>Phalacrocorax penicillatus</i>
Brewer's blackbird	<i>Euphagus cyanocephalus</i>
Brown creeper	<i>Certhia americana</i>
Brown-headed cowbird	<i>Molothrus ater</i>
Bufflehead	<i>Bucephala albeola</i>
Bullock's oriole	<i>Icterus bullockii</i>
Bushtit	<i>Psaltriparus minimus</i>
California gull	<i>Larus californicus</i>
California towhee	<i>Pipilo fuscus</i>
Canada goose	<i>Branta canadensis</i>
Caspian tern	<i>Sterna caspia</i>

LIST OF WILDLIFE REFERENCED IN THE YERBA BUENA ISLAND HMP

Common Name	Scientific Name
<i>Birds (continued)</i>	
Cedar waxwing	<i>Bombycilla cedrorum</i>
Chestnut-backed chickadee	<i>Poecile rufescens</i>
Cliff swallow	<i>Hirundo pyrrhonota</i>
Common goldeneye	<i>Bucephala clangula</i>
Common loon	<i>Gavia immer</i>
Common raven	<i>Corvus corax</i>
Dark-eyed junco	<i>Junco hyemalis</i>
Double-crested cormorant	<i>Phalacrocorax auritus</i>
Downy woodpecker	<i>Picoides pubescens</i>
Eared grebe	<i>Podiceps nigricollis</i>
European starling	<i>Sturnus vulgaris</i>
Forster's tern	<i>Sterna forsteri</i>
Fox sparrow	<i>Passerella iliaca</i>
Gadwall	<i>Anas strepera</i>
Glaucous-winged gull	<i>Larus glaucescens</i>
Golden-crowned sparrow	<i>Zonotrichia atricapilla</i>
Greater scaup	<i>Aythya marila</i>
Hermit thrush	<i>Catharus guttatus</i>
Herring gull	<i>Larus argentatus</i>
Horned grebe	<i>Podiceps auritus</i>
House finch	<i>Carpodacus mexicanus</i>
House sparrow	<i>Passer domesticus</i>
Hutton's vireo	<i>Vireo huttoni</i>
Killdeer	<i>Charadrius vociferus</i>
Least sandpiper	<i>Calidris minutilla</i>
Lesser goldfinch	<i>Carduelis psaltria</i>
Mallard	<i>Anas platyrhynchos</i>
Mew gull	<i>Larus canus</i>
Mourning dove	<i>Zenaida macroura</i>
Northern flicker	<i>Colaptes aurata</i>
Northern mockingbird	<i>Mimus polyglottos</i>
Orange-crowned warbler	<i>Vermivora celata</i>
Pacific loon	<i>Gavia pacifica</i>
Palm warbler	
Pelagic cormorant	<i>Phalacrocorax pelagicus</i>
Peregrine falcon	<i>Falco peregrinus</i>

LIST OF WILDLIFE REFERENCED IN THE YERBA BUENA ISLAND HMP

Common Name	Scientific Name
<i>Birds (continued)</i>	
Pied-billed grebe	<i>Podylimbus podiceps</i>
Pine siskin	<i>Carduelis pinus</i>
Red-breasted merganser	<i>Mergus serrator</i>
Red-breasted nuthatch	<i>Sitta canadensis</i>
Red-shouldered hawk	<i>Buteo lineatus</i>
Red-tailed hawk	<i>Buteo jamaicensis</i>
Red-throated loon	<i>Gavia stellata</i>
Red-winged blackbird	<i>Agelaius phoeniceus</i>
Ring-billed gull	<i>Larus delawarensis</i>
Rock pigeon	<i>Columba livia</i>
Ruby-crowned kinglet	<i>Regulus calendula</i>
Ruddy duck	<i>Oxyura jamaicensis</i>
Sanderling	<i>Calidris alba</i>
Say's phoebe	<i>Sayornis saya</i>
Sharp-shinned hawk	<i>Accipiter striatus</i>
Song sparrow	<i>Melospiza melodia</i>
Spotted sandpiper	<i>Actitis macularia</i>
Spotted towhee	<i>Pipilo maculatus</i>
Steller's jay	<i>Cyanocitta stelleri</i>
Surf scoter	<i>Melanitta perspicillata</i>
Townsend's warbler	<i>Dendroica townsendi</i>
Turkey vulture	<i>Cathartes aura</i>
Varied thrush	<i>Ixoreus naevius</i>
Wandering tattler	<i>Tringa incana</i>
Western grebe	<i>Aechmophorus occidentalis</i>
Western gull	<i>Larus occidentalis</i>
Western meadowlark	<i>Sturnella vulgaris</i>
California scrub-jay	<i>Aphelocoma californica</i>
Western tanager	<i>Piranga ludoviciana</i>
White-crowned sparrow	<i>Zonotrichia leucophrys</i>
White-throated sparrow	<i>Zonotrichia albicollis</i>
Wilson's warbler	<i>Wilsonia pusilla</i>
Yellow-rumped warbler	<i>Dendroica coronata</i>

LIST OF WILDLIFE REFERENCED IN THE YERBA BUENA ISLAND HMP

Common Name**Scientific Name**

Mammals

California mule deer	<i>Odocoileus hemionus californicus</i>
California ground squirrel	<i>Spermophilus beecheyi</i>
Feral (domestic) cat	<i>Felis catus</i>
Harbor seal	<i>Phoca vitulina richardsi</i>
House mouse	<i>Mus musculus</i>
Mexican-free tailed bat	<i>Tadarida brasiliensis</i>
Norway rat	<i>Rattus norvegicus</i>
Pocket gopher	<i>Thomomys bottae</i>
Raccoon	<i>Procyon lotor</i>