

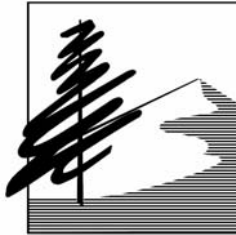
Habitat Management Plan for the Rancho La Costa Habitat Conservation Area

**A Dedicated Natural Open Space System Set Aside As Part
of the La Costa Villages and University Commons Developments
which includes the Nelson Property**

Prepared for:

City of Carlsbad
City of San Marcos
U.S. Fish and Wildlife Service
California Department of Fish and Game

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I. Introduction

A. Background

The Rancho La Costa Habitat Conservation Area (HCA) is an over 1,400 acre open space set aside by the Real Estate Collateral Management Company (RECMC), Brookfield Homes, and Scandia Development as mitigation for impacts to natural habitat as part of the Villages of La Costa and University Commons developments. The limits of the Preserve have been approved by the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Game (CDFG) with the primary goal of protecting habitat of the federally listed coastal California gnatcatcher, as well as other listed species, and numerous sensitive plant and wildlife species that are covered under the Fieldstone Habitat Conservation Plan (HCP), the City of San Marcos' MHCP Subarea Plan and Carlsbad's Habitat Management Plan (HMP).

B. Habitat Conservation Area History

The Rancho La Costa HCA resulted from over ten years of effort (Fieldstone HCP, University Commons EIR) that evolved into a unique planning process for a project specific plan, characterized by a consideration of range-wide conservation issues, open public participation and negotiations with conservation interests and federal, state and local agencies. The biological significance of the HCA comes from its location in relation to other important natural resource lands located nearby. The eastern portions of the Preserve form the western tip of the largest, contiguous stretch of coastal sage scrub and natural open space in northern San Diego County, and is the primary link between the City of Carlsbad's and San Marcos' natural communities and the larger regional ecosystem in the City of Escondido and San Diego County.

The Center for Natural Lands Management (Center) has been (or will be) deeded title to all parcels that make up the HCA and has received endowments to manage these parcels in perpetuity. Management commenced in January 2002 for about one half of the total property with management of the additional acreage commencing between January 2002 and December 2004. La Costa Villages off-site mitigation properties have yet to be deeded to the Center (as of January 2005).

Parcels that were deeded to the Center either fall in the City of Carlsbad or City of San Marcos jurisdictions and therefore, subsequent sub-area plans. If the properties were for "off-site" mitigation and were located in the County of San Diego, the conservation credit, and therefore management, is still under the purview of the Cities.

Historically, each parcel was named after the last owner who sold the parcel for mitigation, or the name of the development project (Table 1). For reference, off-site parcels set aside for these developments included Frank's peak, Pfau, Huff, Brouwer, Setter, Wilern, Winston, Alemire (Questhaven), Nelson, Choumass-Pappas, and Elfin Forest. On-site properties were named La Costa Oaks, Greens and Ridges, and University Commons "on-site" parcels.

Table 1. Parcels that make up the HCA.

Parcel Name	Development which contributed the parcel	Jurisdiction which the parcel is located and which sub-area plan is credited with its habitat ().
La Costa Oaks	La Costa Villages (RECMC)	Carlsbad (Carlsbad)
La Costa Ridges	La Costa Villages (RECMC)	Carlsbad (Carlsbad)
La Costa Greens	La Costa Villages (RECMC)	Carlsbad (Carlsbad)
Choumass-Pappas	La Costa Villages (RECMC)	County of San Diego (Carlsbad)
Alemire	La Costa Villages (RECMC)	County of San Diego (Carlsbad)
Winston	University Commons (Brookfield Homes)	San Marcos (San Marcos)
Huff	University Commons (Brookfield Homes)	San Marcos (San Marcos)
Brouwer	University Commons (Brookfield Homes)	San Marcos (San Marcos)
Setter	University Commons (Brookfield Homes)	County of San Diego (San Marcos)
U.C. on-site	University Commons (Brookfield Homes)	San Marcos (San Marcos)
Wilern	University Commons (Brookfield Homes)	San Marcos (San Marcos)
Frank's peak/pfau	University Commons (Brookfield Homes)	San Marcos (San Marcos)
Elfin Forest	University Commons (Scandia)	County of San Diego (San Marcos)
Nelson	National Fish and Wildlife Foundation Purchase	County of San Diego (Carlsbad)

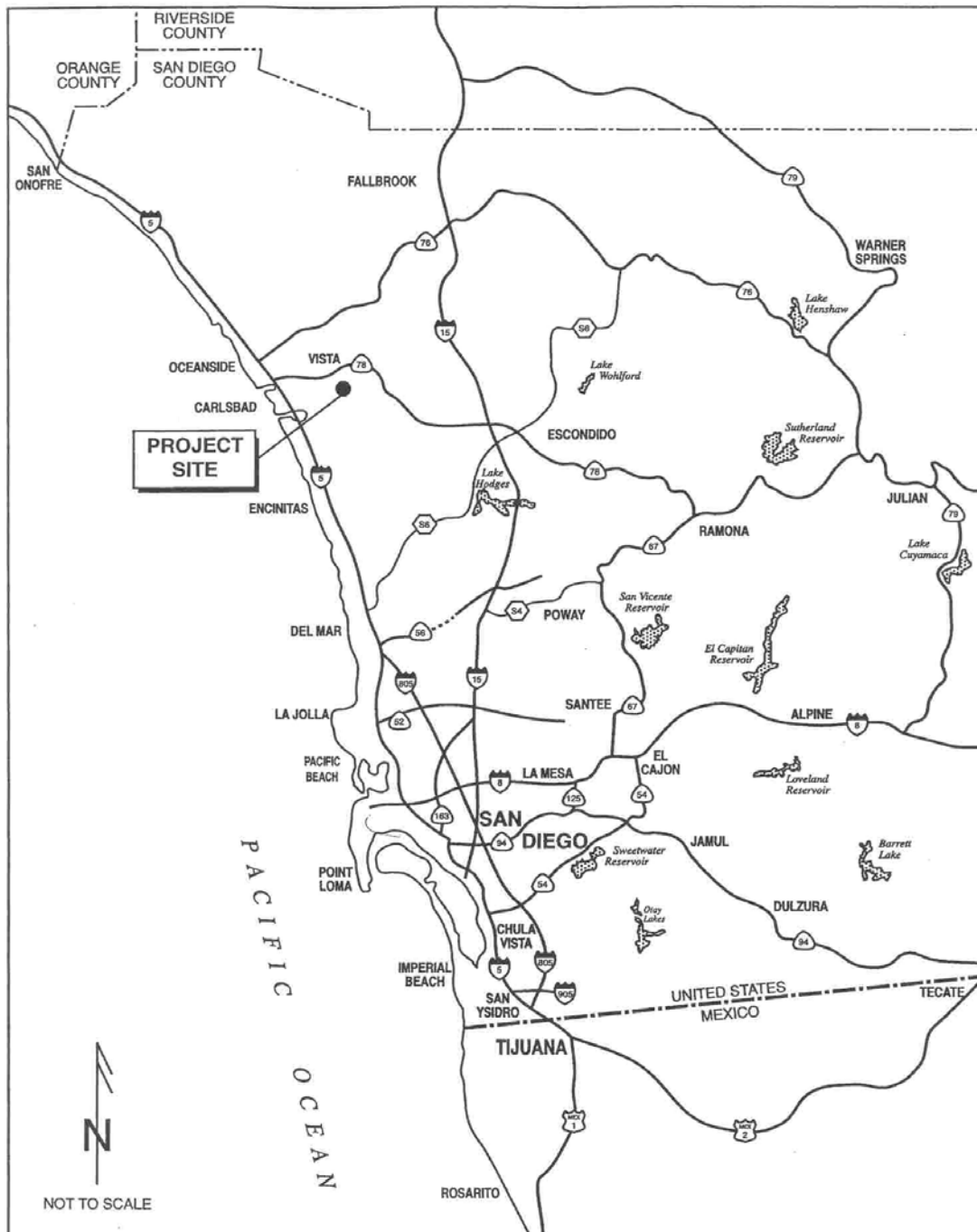
C. Purpose of this Management Plan

This document is to provide a comprehensive, cost-effective management plan that states the information, management and funding requirements necessary to ensure an ecologically sustainable conservation area. The plan will outline the HCA's resources and characteristics and will provide a brief overview of general tenets of conservation biology for natural areas management as it applies to this HCA. This plan is consistent with the North County MHCP Management and Monitoring Plan, the City of Carlsbad's HMP, the City of Carlsbad's Open Space Management Plan (TAIC, 2004), the City of San Marco's draft MHCP Subarea Plan and the previously approved Habitat Management Plan for the La Costa Preserve dated August 2001. This plan is intended to cover management activities from 2005 to 2010, at which time the management plan will be revised.

II. Reserve Site Characteristics

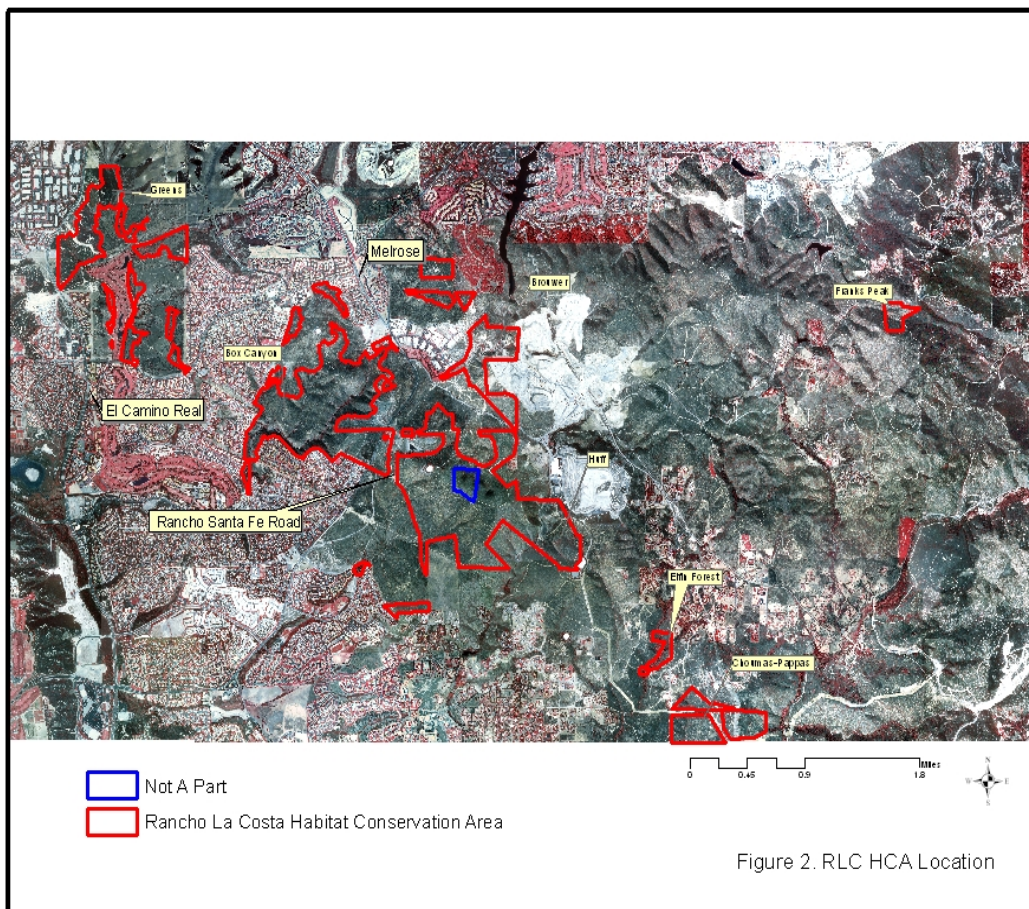
A. HCA boundaries and adjacent land

The HCA is located approximately 2 miles inland from the Pacific Ocean and spans from El Camino Real to Elfin Forest (Figures 1 and 2). The HCA has over 25 parcels and does not form one contiguous unit, but is separated by roads, highways, housing and commercial developments, golf courses and other natural areas. Adjacent natural open space exists to the south and east of the Huff parcel, which leads to Elfin Forest and north and north east of the Brouwer parcel (San Elijo Hills).



Regional Location Map

Figure 1



B. Physical Description

The site's topography varies dramatically between sub-sections. The La Costa Greens section has moderately sloped areas while the La Costa Oaks and Ridge section has moderate slopes and the very steep Box Canyon riparian area, which falls nearly vertical in some areas. Elevation ranges from 300 to 1,100 feet above sea level.

III. Habitat and Species Description

A. Vegetation Communities and Plant Species

The vegetation communities found at the HCA are predominantly Diegan coastal sage scrub (dominated by black sage) and southern mixed and maritime chaparral (Figures 3 and 4). Other communities include native and non-native grasslands, sycamore/willow woodland and disturbed areas. Vegetation community types and acreages are detailed in Table 2.

The HCA protects four federally and/or state listed plant species which include 1000 San Diego thornmint (*Acanthomintha ilicifolia*), 854 Del Mar manzanita (*Arctostaphylos glandulosa* ssp. *crassifolia*), 5,800 individual thread-leaved brodiaea (*Brodiaea filifolia*) and 200 of the state listed threatened Orcutt's hazardia (*Hazardia orcuttii*) (Figures 3 and 4). This data is based on both historical and current survey data for the HCA. San Diego thornmint were not found during the permitting process, but were observed by the Center in 2003. Orcutt's hazardia were also not originally part of the HCA. In 2004, the Center planted the 200 Orcutt's hazardia on the "Greens" property as part of its management of this species at its Manchester Habitat Conservation Area in the City of Encinitas.

Numerous other sensitive plants have been identified at the HCA and include summer holly (*Comarostaphylis diversifolia*), California adolphia (*Adolphia californica*), wart-stemmed ceanothus (*Ceanothus verrucosus*) and sticky-leaved live-forever (*Dudleya viscida*) (Appendix B and Figures 3 and 4). A complete list of plant species observed is provided in Appendix B (2003 survey). A total of 330 plant species, of which 252 (76%) are native to the area, reside in the HCA.

B. Animal Species

The HCA supports a diverse assemblage of animal species (Appendix C). The Preserve has two listed threatened or endangered animal species, the coastal California gnatcatcher (*Poliophtila californica californica*) and least Bell's vireo (*Vireo bellii pusillus*). The HCA protects between 20-25 pair (or single males) of gnatcatchers and 1 vireo territory based on both historical and current survey data of the HCA. Least Bell's vireo was not observed during the permitting process, but one territorial male was observed in 2003 by the Center (on the Brouwer parcel).

A number of other sensitive wildlife have been identified on the Preserve or have potential to occur (see Appendix A). Species observed include southern California rufous-crowned sparrow (*Aimphila ruficeps cansescens*), spade-foot toad (*Scaphiopus hammondi*), San Diego horned



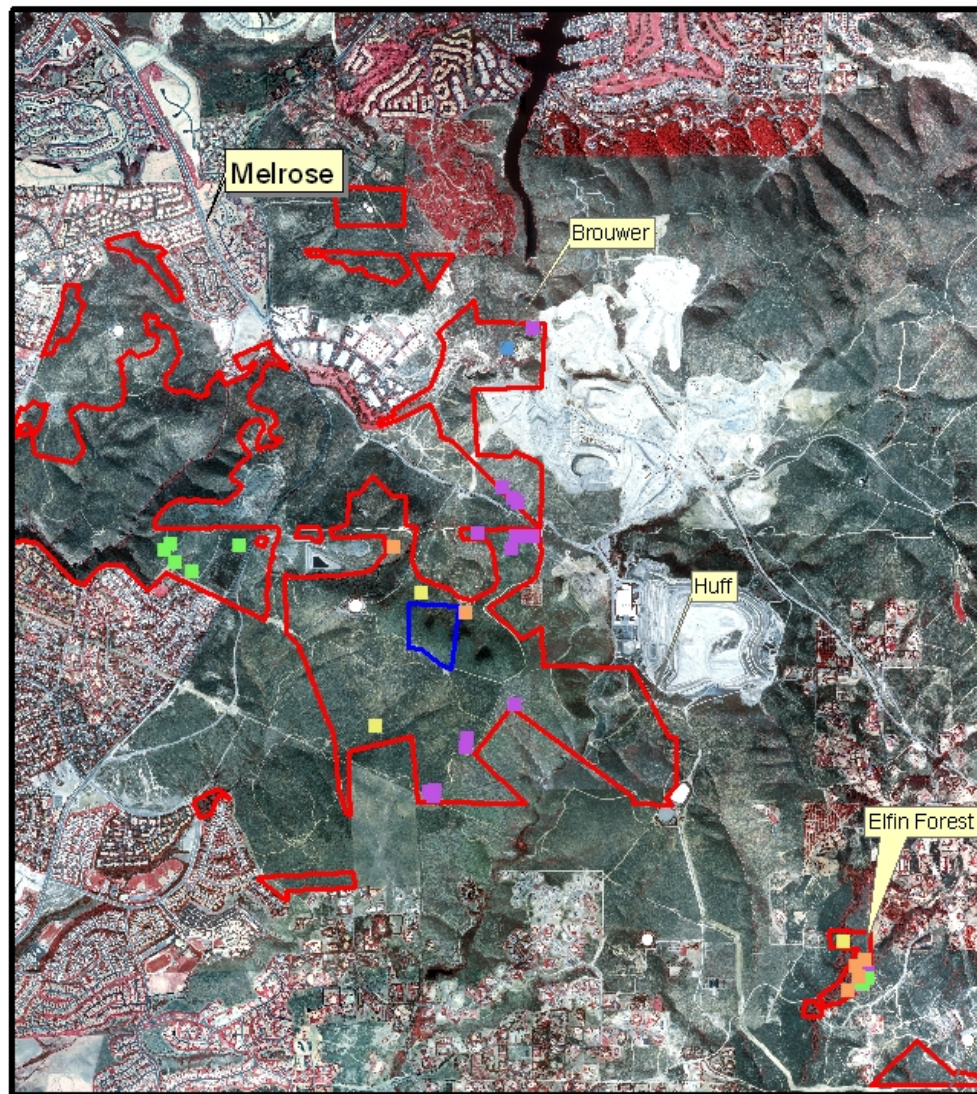
Sensitive Plant Species

- California adolphia
- Palmer's grapplinghook
- San Diego marsh elder
- San Diego thornmint
- Southwestern spiny rush
- Summer holly
- Thread-leaved brodiaea

0 0.1 0.2 0.4 Miles



Figure 3.
Sensitive Plants Species
at the "Greens"



Sensitive Plant Species

- California adolphia
- Orcutt's brodiaea
- San Diego goldenstar
- San Diego marsh elder
- Southwestern spiny rush
- Summer holly
- Wart-stemmed ceanothus

0 0.2 0.4 0.6 Miles



Figure 4.
Sensitive Plants Species

lizard (*Phrynosoma coronatum blainvillei*), and orange-throated whiptail (*Cnemidophorus hyperythrus beldingi*).

Raptors. Raptor species observed include red-tailed hawks (*Buteo jamaicensis*), red-shouldered hawk (*Buteo lineatus elegans*), American kestrel (*Falco sparverius*), Northern harrier (*Circus cyaneus*), Cooper's hawk (*Accipiter cooperii*), sharp-shinned hawk (*Accipiter striatus velox*), golden eagle (*Aquila chrysaetos canadensis*), and osprey (*Pandion haliaetus*). In the spring of 2005, five red-tailed hawk nests were observed spanning from the Greens to the Huff parcel.

Table 2. Vegetation Communities

Vegetation Community	Total Acreage	La Costa Villages on and off-site parcels	University Commons on and off-site parcels	Nelson
Diegan Coastal Sage Scrub	871.6	677.0	175.6	19.0
Southern Maritime Chaparral	79.1	79.1		
Southern Mixed Chaparral	255.8	97.2	157.7	0.9
Native Grasslands	10.0	10.0		
Disturbed	84.6	46.8	37.4	0.4
Non-native Grasslands	63.0	63.0		
Cliff	3.6		3.6	
Alkali Seep	0.2		0.2	
DCSS Restoration Area	5.8	5.8		
Disturbed Wetland	1.4	1.4		
Flood-plain Scrub	11.2	11.2		
Chamise Chaparral	2.0	2.0		
Eucalyptus Woodland	2.3	0.9	1.4	
Mule-fat Scrub	2.7		2.7	
Open Water	0.6	0.5	0.1	
Southern Willow Scrub	0.7		0.7	
Sycamore/Live Oak Woodland	7.4		7.4	
Valley Grassland/DCSS	0.8		0.8	
Fresh Water Marsh	2.3	1.1	1.2	
Ornamental	0.1		0.1	
Riparian Scrub	29.8	29.8		
Total acreage	1,435.0 acres	1,025.8	388.9	20.3

C. Species Covered Under the Carlsbad HMP and City of San Marcos MHCP Subarea Plan.

Many of the species noted in this section are covered under the Carlsbad HMP, the City of San Marcos MHCP Draft Subarea plan (see Appendix A) and the North San Diego County MHCP.

D. Threats

The predominant threat to the HCA comes from fragmentation, urban edge, isolation, altered fire regime and non-native animals and plants. Other threats include abuse, vandalism, global climate change and erosion. The Center will evaluate all of these threats as part of its management and monitoring program. A more detailed explanation of threats to the HCA is provided in Section IV.

E. Fire History

The history of fire at the HCA was researched by analyzing the USDA Department of Forest and California Department of Forestry and Fire Protection database (Fire and Resource Assessment Program, http://frap.cdf.ca.gov/projects/fire_data/fire_perimeters/). Most of the HCA (not including the Greens) burned in the Harmony Grove fire in October of 1996. The Box Canyon Area also had a complete burn in 1935 (no month provided), and a partial burn in September of 1970. The area between RSF road and the Huff parcel also burned in 1945 (no month provided). It is also likely that there are been smaller, unrecorded fires within the HCA over the last 100 years.

IV. Ecological Models, Management Goals and Adaptive Management

A. Ecological Models

Descriptive ecological models are valuable tools to identify assumptions about how a particular habitat/landscape/species responds to natural and artificial perturbations. While the models reflect current knowledge, they are meant to be modified over time as our knowledge of, and experience with, particular habitat or species increases. Models represent an assumption about how a particular habitat/landscape will respond to management practices and thus provide a rationale for the implementation of particular management technologies. The model also represents a testable hypothesis for inclusion in an adaptive management scenario.

The Center has created a few models, primarily based on threats to communities and species, that will guide HCA monitoring and management over the next several years.

A.1. General Coastal Sage Scrub Threats Model

The threats model (Figure 5) for the HCA will be based on the ecology of its primary natural community, Diegan coastal sage scrub (DCSS). The dominant plant species of DCSS at the HCA are black sage (*Salvia mellifera*) and laurel sumac (*Malosma laurina*). However, there are several patches (less than 50 acres total) of DCSS that are dominated by California sagebush (*Artemisia californica*) and buckwheat (*Erigonum fasciculatum*).

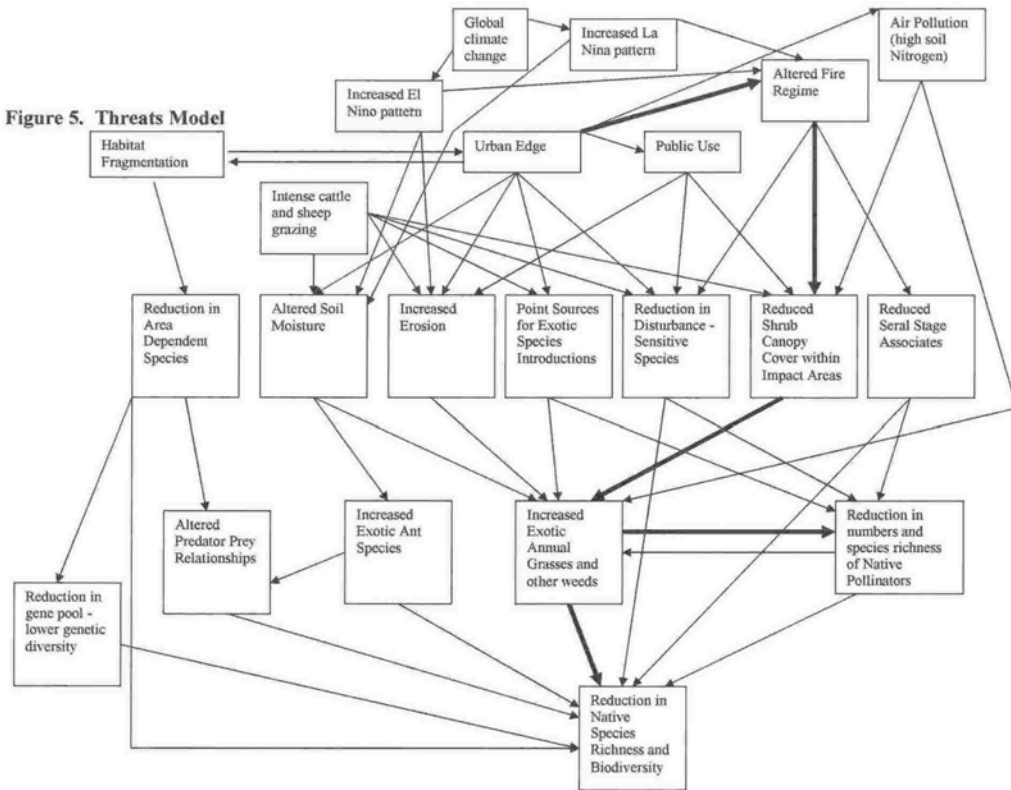
DCSS is a fire-adapted vegetation community with fires occurring naturally, but most severely under the extreme Santa Ana heat and winds of late summer and fall. During these conditions there would generally be a “complete burn” where all above ground vegetation within the fire’s path would be consumed. After such a fire herbaceous plants, which are known to sprout after fires, would dominate the landscape for a few years. Over time (3-5 years) the shrub lands would regain their dominance, and after 7-10 years a mature assemblage of plants and wildlife would again be found on site.

As stated earlier, most of the HCA (not including the greens) burned in the Harmony Grove fire in October of 1996. The Box Canyon Area also had a complete burn in 1935, and a partial burn in September of 1970. The area between RSF road and the Huff parcel also burned in 1945. DCSS habitat has been re-establishing nicely in most areas since the 1996 fire, but steep, southern facing slopes of Box Canyon seem to have converted to laurel sumac savannah (i.e. dominated by laurel sumac with an understory of grasses and mustard (*Brassica* spp.)). Black sage on these steep slopes is sparse. In addition, areas east of Rancho Santa Fe Road have been invaded by tecolote (*Centaurea melintensis*) and other non-native plants. At this time, the Center does not have any habitat structure or composition data. Plant and animal species have re-colonized as noted in many monitoring efforts conducted by CNLM since HCA inception (Appendices B and C).

The issue (or threat) of main concern is that the fire regime in the HCA will no longer follow natural fire cycles which will possibly lead to an altered habitat structure and loss of plant and animal diversity. Since the Harmony Grove fire, many new roads, buildings and houses have been built which has created habitat fragments that make it unlikely that the HCA will have a complete burn in the future. Also, although most natural fires occur in summer and fall, ignitions may now occur at all times of the year due to the site’s urban nature. Lastly, the fire department’s policy in the area is to suppress all fires as soon as possible, and since the City of Carlsbad is installing a new fire station adjacent to the HCA near Ranch Santa Fe Road, it is unlikely that fires will consume large areas all at one time. Active fire management will not be a management option because of the close proximity to residential homes. Therefore, it is likely that patches of habitat will burn, but that the entire HCA will not burn at once.

Another issue of concern is the encroachment of non-native plants due to the urban nature of the HCA and the existing level of non-native plant species. Although most of the HCA is in very good shape and of high quality, encroachment of non-native plants species is apparent in many areas.

Figure 5. Threats Model



As per the model, there are also other threats to the preserve other than just an altered fire regime and invasive non-native plant species. These include threats posed by human encroachment, global climate change, and air pollution.

Therefore, management strategies will be implemented that will combine the knowledge of the natural ecological characteristics and parameters of Diegan coastal sage scrub, with the challenges posed by the threats to the Preserve's integrity.

A.2. San Diego Horned Lizard Threats Model

The Center has developed a threats model for the horned lizards at the HCA (Figure 6) based on a literature review. As the threats model shows, habitat fragmentation and an increase in urban edge can lead to an increase in soil moisture and density of non-native grasses which can then result in an increase in Argentine ant (*Linepithema humile*) abundance and the potential decrease in native harvester ant abundance (primary food of horned lizards). Suarez et al. (1998) have shown that native ant species diversity and abundance declines in the presence of increased abundance of Argentine ants in fragmented open space areas. Suarez et al. (1998) also showed that the abundance of Argentine ants decreases within increasing distance from the urban edge as Argentine ants generally prefer mesic conditions.

Fisher et al (2002) have shown that the presence and abundance of horned lizards is generally correlated with the absence of Argentine ants (and the presence of native ants). And lastly, it was found in a lab experiment that juvenile horned lizards had poor growth rates (or no growth rate at all) on a diet of Argentine ants compared to a diet of native ants (Suarez and Case 2002).

Since the HCA is a fragmented preserve within an urbanizing matrix and increased level of edge, it is assumed that harvester ant abundance could decline or their distribution could be altered due to the invasion of Argentine ants. This alteration of food base could detrimentally effect the population of horned lizards at the HCA. On a positive note, although the HCA is fragmented, some of the patch sizes exceed 400 acres and are contiguous with other protected open space, which should reduce the ability of Argentine ant invasion into the core areas of the preserve.

A.3. Bird Community Threats Model

The Center has developed a bird community model for the HCA (Figure 7). A number of research studies have studied bird species diversity and composition in urban fragments in San Diego (Soule et al. 1988, Bolger et al. 1997, Crooks et al. 2004, Bolger 2002). In general, these studies have shown that fragmentation and edge effects leads to changes in diversity and relative abundances of bird species in comparison to more natural core areas. Most of these studies occurred in areas containing less than 200 acres with little or no corridor connection. The general principals of effects of fragmentation and increased urban edge on bird species (derived from these papers) and the CSS community applies to the HCA. Crooks et al (2004) point out that changes in bird assemblages in fragmented areas were likely due to marked differences in vegetation structure between core and fragment areas. Fragment areas tended to have more non-native trees, overgrown native shrubs and non-native species than core areas.

Figure 6. Coast Horned Lizard Threats Model

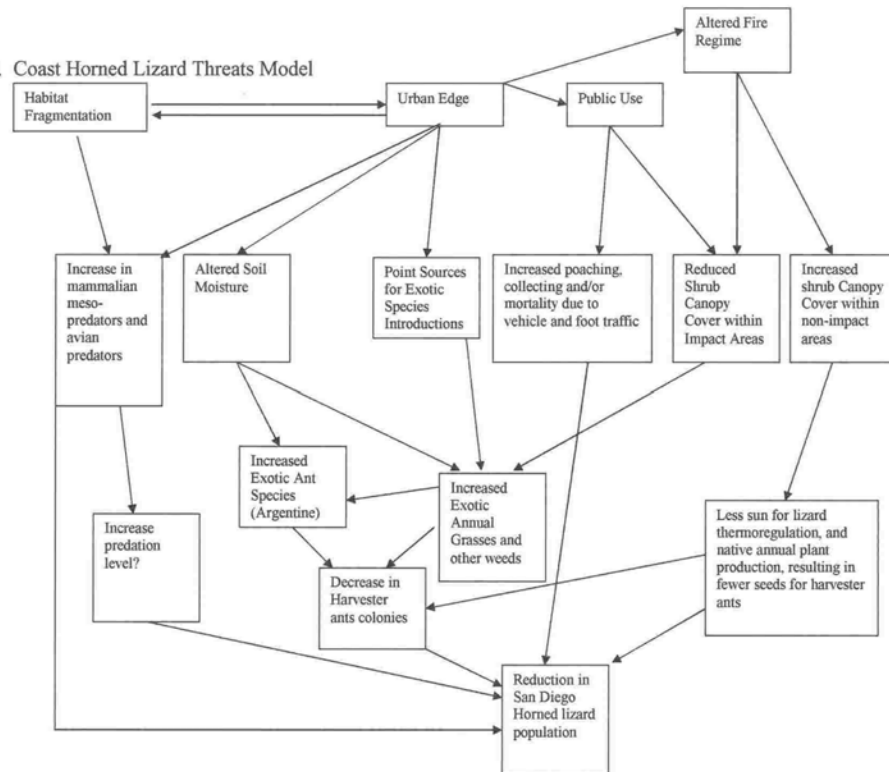
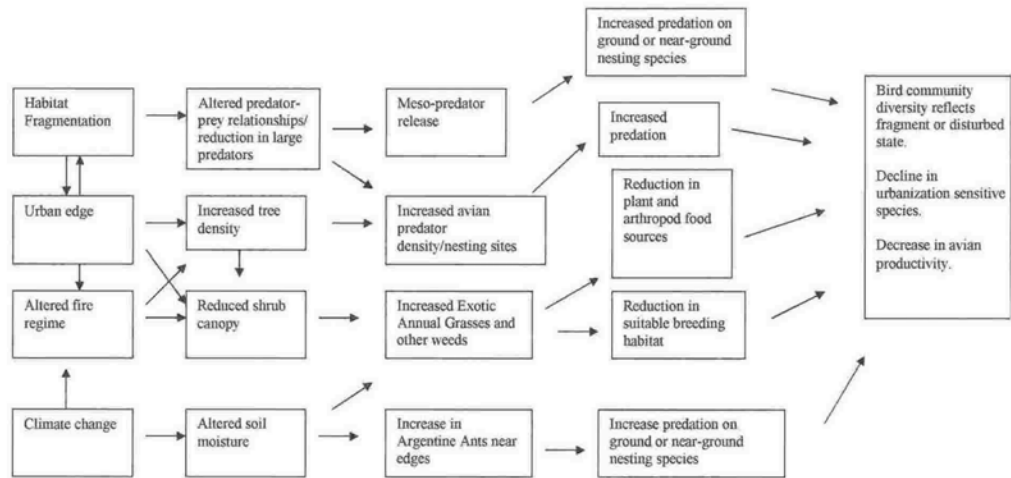


Figure 7. Bird Community Threats Model



In comparison to Crooks et al (2004), the current bird assemblage (Table 3) in the core area of the HCA (the Center defines its “core” as the areas around Box Canyon and east of Rancho Santa Fe Road out to the Huff parcel, about 700 acres split by RSF road) reflects an intermediary position to what Crooks defines as core and large fragment of CSS (but more leaning towards core). For example, we found species, such as ash-throated flycatcher and northern flicker, in the HCA core, but which Crooks only found in fragments. We also observed species, such as the grasshopper sparrow, which Crooks only observed in the core. Most importantly, we found 11 of the 12 species that Crooks labels “urbanization sensitive” (rare in fragments). These species include the Rufous-crowned sparrow, Spotted towhee, California quail, coastal California gnatcatcher and the California thrasher.

Table 3. Bird community profile derived from point county surveys

Species	Average #/pt	Species	Average #/pt
Anna’s hummingbird	0.768	Loggerhead shrike	0.009
Ash-throated flycatcher	0.018	Mallard	Rare or flyover
Bewick’s wren	0.231	Morning dove	0.018
Blue grosebeak	0.092	Northern harrier	Rare or flyover
Bell’s sage sparrow	0.046	Northern mockingbird	0.018
Bushtit	0.305	Nuttall’s woodpecker	Rare or flyover
California gnatcatcher	0.055	Poor whil	Rare or flyover
California quail	0.120	Pacific-sloped flycatcher	0.009
California thrasher	0.046	Rufous-crowned sparrow	0.722
California towhee	0.907	Rock dove	Rare or flyover
Cliff swallow	Rare or flyover	Ret-tailed hawk	Rare or flyover
Cooper’s hawk	Rare or flyover	Say’s phoebe	Rare or flyover
Costa’s hummingbird	0.129	Spotted towhee	0.296
Common raven	Rare or flyover	Turkey vulture	Rare or flyover
Common yellowthroat	0.259	White-crowned sparrow	0.037
Great egret	Rare or flyover	Western kingbird	0.027
Grasshopper sparrow	0.055	Western meadowlark	0.027
House finch	Rare or flyover	Western scrub jay	Rare or flyover
Horned lark	Rare or flyover	Wrentit	0.509
American kestrel	Rare or flyover	White-tailed kite	Rare or flyover
Lazuli bunting	0.111	White-throated swift	Rare or flyover
Lesser goldfinch	0.185		

The primary threats to and/or drivers of the CSS bird community are the changes that may occur to the vegetation community resulting from an altered fire regime, habitat fragmentation and urbanization which could result in a “fragment-like” bird community composition. These include reduced shrub cover, increased non-native plant species and increased non-native tree cover. Signs of these changes already exist within the HCA, such as stands of eucalyptus trees and non-native grasses and forbs along the edges.

Fragmentation and urbanization can also result in changes to the predator community, resulting in increased predation on bird species and/or their productivity which in turn could result in bird species declines.

The HCA has both large parcels (over 300 acres) and many small parcels (between 5 and 100 acres). The Center's management goal will be provide suitable CSS that would represent core habitat areas in San Diego rather than fragmented areas. Although it is unlikely that many of the very small parcels (less than 20 acres) will support "core" like bird diversity, the Center can manage these areas to minimize the complete change in vegetation structure that is seen in many urban fragments in San Diego. The Center's removal of eucalyptus, acacia and myoporum trees along Box Canyon is an example of our management activities that should help us support natural bird assemblages.

B. Biological Management Goals

The following biological management goals are based on compliance monitoring requirements, and the threats models described in Section IV.A. The goals are set out to learn more about the HCA and its resources and to direct management actions.

These goals are consistent with the MHCP Management and Monitoring Plan (CBI, 2003), the City of Carlsbad's Open Space Management Plan (TAIC, 2004) and the Habitat Management Plan for the La Costa Preserve (CNLM, 2001). Since HCA inception, the Center has been collecting baseline data on plants, animals and vegetation communities. The results of these monitoring activities have resulted in generating the specific goals listed below. It should be noted that not all baseline data collection activities have been completed.

B.1. Coastal sage scrub

Goal. Manage the coastal sage scrub vegetation community to provide suitable habitat for the coastal California gnatcatcher and other MHCP covered species found at the HCA. Ensure that coastal sage scrub acreage is not impacted or decreased.

- Identify and measure the threat of non-native plant species to the coastal sage scrub and control, minimize or eliminate this threat.
- Measure the cover and composition of shrubs and herbaceous plants within this community.
- Map the extent and quantify the acreage of the coastal sage scrub and compare to previous maps and aerial photographs.
- Assess the impact of past fires on this habitat type.

B.2. Native and non-native grasslands (clay lenses)

Goal. Manage to the native and non-native grassland (including clay lenses) vegetation community to provide suitable habitat for sensitive plant species, such as the San Diego thornmint, Palmer's grapplehook, and thread-leaved brodiaea.

- Identify and measure the threat of non-native plant species to the native and non-native grassland (clay lense) vegetation community and control, minimize or eliminate this threat.

B.3. Riparian Scrub/Willow woodland/Riparian habitat

Goal. Manage and protect the riparian scrub/willow woodland/riparian habitat to provide suitable habitat for MHCP covered species.

- Identify and measure the threat of non-native plant species to the riparian scrub/willow woodland habitats and control, minimize or eliminate this threat.
- Monitor wildlife use of these habitats.
- Evaluate habitat structure and composition of these habitat types.

B.4. Coastal California gnatcatcher and the coastal sage scrub bird community.

Goal. Protect and maintain suitable habitat for the coastal California gnatcatcher, other MHCP covered bird species, and the coastal sage scrub bird community in general.

- Identify and measure the shrub composition within gnatcatcher occupied and unoccupied coastal sage scrub habitat to potentially identify site specific habitat requirements of the gnatcatcher.
- Determine the distribution and abundance of gnatcatchers, MHCP covered bird species and the coastal sage scrub bird community in general.
- Identify threats to the gnatcatcher and bird community.

B.5. Cooper's hawk and other raptors

Goal. Protect nesting and foraging habitat of raptors.

- Determine status and distribution of raptor species in the HCA.
- Identify raptor nesting sites within the HCA.
- Protect raptor nesting sites.
- Identify threats to the raptor community.

B.6. San Diego horned lizard, spadefoot toad and orange-throated whiptail.

Goal. Protect and maintain suitable habitat for the San Diego horned lizard, spadefoot toad and orange-throated whiptail as well as other reptiles and amphibians found at the HCA.

- Determine status and distribution of San Diego horned lizard, spadefoot toad and orange-throated whiptail.
- Identify threats to the habitat and to individual San Diego horned lizard, spadefoot toad and orange-throated whiptail.
- Assess/monitor the native and non-native ant species richness. In particular, focus on learning more about the intrusion of Argentine ants and the integrity of harvester ant colonies.
- Ensure that there are suitable breeding areas for spadefoot toads.

- Measure habitat variables around known locations of these species.
- Protect these species from poaching.

B.7. Wildlife Corridors

Goal. Maintain the integrity of wildlife under-crossings and corridors.

- Monitor animal use of wildlife crossings and corridors.
- Regularly assess wildlife under-crossing areas to ensure that they are free of debris or other obstructions.
- Assess habitat conditions around under-crossings and corridors to ensure adequate cover for wildlife species.

B.8. San Diego thornmint, thread-leaved brodiaea, Orcutt's brodiaea, Palmer's grappling hook and Cleveland's goldenstar.

Goal. Protect existing populations of San Diego thornmint, Palmer's grapplinghook (*Harpagonella palmeri*), thread-leaved brodiaea, Orcutt's brodiaea (*Brodiaea orcuttii*), and Cleveland's goldenstar (*Muilla clevelandii*) and identify potential threats and enhancement opportunities.

- Identify, measure and control the threat of non-native plant species the habitat of the San Diego thornmint, Palmer's grapplinghook, thread-leaved brodiaea, Orcutt's brodiaea, and Cleveland's goldenstar.
- Enhance habitat of these species.
- Enhance population of these species where necessary.

B.9. Del Mar manzanita, summer holly, California adolphia, wart-stemmed ceanothus, sticky-leaved dudleya and scrub oak.

Goal. Protect existing populations of Del Mar manzanita, summer holly, California adolphia, wart-stemmed ceanothus, sticky-leaved dudleya and scrub oak (*Quercus dumosa*).

- Identify the threat of non-native plant species, habitat degradation and altered fire regime on these species.
- Determine the age-stand of each species (where appropriate) and look for recruitment.
- Map and estimate the population size of each species at regular intervals.

C. Habitat Maintenance Goals

Habitat maintenance includes tasks such as erosion control and non-native plant removal. At this time, no significant erosion problems have been identified. However, there are a few old dirt roads that are showing signs of slight erosion. Non-native plants are probably the biggest

challenge to our management and will be for many years to come. The Center categorizes non-native plants into “zero” tolerance species and “moderate” tolerance species. We will remove all zero tolerance species and will develop thresholds (i.e. acceptable percent cover) for moderate tolerance species.

Goal. Control the spread and invasion of non-native invasive plant species with greatest priority on those that have the highest potential for sensitive species population or habitat degradation and restore or enhance native habitat where feasible.

- Remove or eliminate all Pampas (*Cortaderia jubata*), fountain grass (*Pennisetum* spp.), palm (*Washingtonia filifera*), salt-cedar (*Tamarisk* spp.), fennel (*Foeniculum vulgare*), acacia (*Acacia* spp.) and other zero tolerance species. Remove eucalyptus (*Eucalyptus* spp.) that are unwanted, but leave those that provide suitable perches or nesting for raptors.
- Annually inspect property for non-native plant species.
- Develop a long-term strategy for removing “moderate” tolerance non-native plant species, such as filaree (*Erodium* spp.), annual grasses (*Bromus* spp. *Avena* spp.) and mustard (*Brassica* spp.).

Goal. Minimize or eliminate erosion control problems.

- Identify and map erosion problems and develop methodologies to minimize erosion problems.

D. Public Use Goals

Public use includes passive recreation, such as hiking, or scientific research or other activities that are appropriate to and compatible with the purposes for which this area is being managed. The preserve, with proper stewardship, is a significant amenity to the surrounding community and has been used historically by many people. The Center recognizes that informing and educating the surrounding community of the preserve value as open space and wildlife habitat will be essential to protecting the resources at the HCA. There will be continued misuse and degradation without community support.

Goal. In the long-term, allow for the sustainable public use that is compatible with the conservation goals and obligations of the HMP, OSMP and MHCP.

- Control unwanted public use such as Off-highway vehicle activity.
- Post and sign the HCA with signs that define permitted and non-permitted activities.
- Enforce access restrictions. Establish patrols to monitor trail maintenance needs, garbage, vandalism and habitat degradation.
- Identify and sign a permitted trail system.
- Develop a public outreach program that could include brochures, literature, web sites, list-serves and/or regular meetings.

E. Adaptive Management

The City of Carlsbad, City of San Marcos and other preserve managers in the area are responsible for managing individual preserve areas to ensure that conservation goals of the HMP/MHCP are met. The cities expect that management and monitoring by preserve managers will occur through an adaptive management approach. The specific models for experiments, observational studies, and adaptive management will be developed by preserve managers in their preserve management plans to implement management actions and test “a priori” assumptions via purposeful science-based monitoring (TAIC 2004).

Monitoring at the preserve area scale needs to be focused on obtaining information for management purposes. In most instances, the array of threats or stressors of preserved habitats, their mechanisms of action, and the responses of the habitats and associated species are not completely understood at this time. Information gained through monitoring will inform management decisions through the adaptive management process. Adaptive management acknowledges the lack of complete knowledge and understanding of a system at the outset of management actions. Adaptive management is a means to learn more about the system through the implementation of management actions and the monitoring of management results. Management actions can then be adapted to optimize management goals by incorporating new information gained through an iterative implementation and monitoring process (TAIC, 2004).

There are six main steps in adaptive management:

- 1) Identification of the problem or management goal
- 2) Design of the management action or implementation plan
- 3) Implementation
- 4) Monitoring of management results
- 5) Evaluation of the results relative to the desired management goals, and
- 6) Adjustment of management actions.

The trigger for a change in the management approach/actions occurs when management results have not achieved the desired management goals. The assumptions underlying management goals must be stated explicitly and considered as hypotheses to be tested by carefully designed and implemented monitoring programs that are, in effect, management experiments. Ideally, management actions would be designed and implemented with experimental control sites and replication that would allow statistical interpretation of management results. At a minimum, careful measurement of key environmental and biological variables before and after the management action can provide some insight into the effects of management at that particular site (TAIC 2004).

V. Management and Monitoring Strategies

A. Biological Monitoring

The following sections detail management and monitoring strategies that will be employed to attain each goal set out in Section IVB. Table 4 outlines the Biological Monitoring Goals which the Center is striving to attain during the 2005-2010 time period.

Table 4. Biological Monitoring Goals

Habitat type, Community or Species	Biological Management Goal (from section IVB)	Biological Monitoring and Habitat Maintenance Goals
Coastal Sage Scrub	B1	Measure the species composition and cover of native and non-native plants species at various distances from the edges of the HCA to characterize the vegetation community and to guide non-native removal management actions.
Bird Community	B4, B5, B6	Track changes in the status (present/absent), distribution and abundance of the sage scrub bird community using point counts
Coastal California gnatcatcher, Bell's sage sparrow and Grasshopper sparrow	B4	Track changes in the abundance, distribution and status (pair, unpaired) of coastal California gnatcatcher, grasshopper sparrow and Bell's sage sparrow using focused surveys
San Diego horned lizard, orange-throated whiptail, spade-foot toad	B6	Conduct research activities to learn more about the diet, distribution and threats to coast horned lizard. Monitor the distribution and abundance of these species using herp arrays and focused surveys. Identify suitable breeding ponds for spade-foot toads. Monitor the ant community.
Thread-leaved brodiaea and San Diego thornmint	B8, B2	Manage the population thread-leaved brodiaea and thornmint by monitoring the percent cover of native and non-native annual plant species within its habitat and by removing non-native plant species.
Sensitive Plants	B8 and B9	Monitor and map sensitive plant species. Enhance habitat of these species by removing non-native plant species.
Wildlife corridors	B7	Track wildlife movement through wildlife corridors.

A.1. Diegan Coastal Sage Scrub (DCSS)

Goal. Measure the species composition and structure of the DCSS vegetation community, and measure species composition and cover of native and non-native plants species at various distances from the edges of the HCA to characterize the vegetation community to guide non-native removal management actions.

Over the next five years, the Center will focus on monitoring and assessing the species composition and structure of the DCSS in various locations of the preserve to guide management decisions and minimize the threats posed by the potential of an altered fire regime and the increasing urbanized nature of the HCA (See DCSS threats model). Other items noted in the DCSS threats model will be addressed in the future.

In summary, the following conditions are assumed based on the DCSS threats model.

The HCA will have an altered fire regime that will result in patches of habitat being burned, rather than complete burns. More frequent, but smaller, fires are also anticipated. We predict that the altered fire regime will result in a decrease in shrub canopy within impact areas. We also predict an increase in non-native plant species, especially non-native grasses and forbs, both in fire impact areas and in areas near to urban edges.

Method: A stratified random design approach will be applied to achieve the objective of the coastal sage scrub goal. In the spring of 2005, the Center selected various locations within the HCA for study by creating six research plots (stratified by distance to edge, observed disturbance, topography, slope, aspect, previous fire impacts and other variables). Between 3 and 6 50-meter point intercept transects were randomly assigned within each plot (about 1 transect per 3 acres). Data collected along each transect included species observed at each point and height of each shrub. This data will generate information regarding plant species composition and structure within in plot and therefore, provide information to guide management decisions.

A.2. Sensitive Bird Species and the Bird Community

Goal 1. Measure changes in species richness, abundance and distribution of the sage scrub bird community.

As per the MHCP Management and Monitoring Plan, the Center is to monitor the status of the bird community within the HCA. Birds are one of the primary taxa that have shaped the preserve design of all HCP's in San Diego and bird density has been shown to be relatively good indicators of habitat condition (Bock, 2004). In addition, it is our goal to protect bird species diversity and to provide high quality habitat and minimize potential threats to these species (see Bird Community Threats Model). Therefore, the Center will evaluate changes in the trends of bird species coupled with measurements of habitat and climate variables as part of its monitoring programs.

As will be discussed below, it is most likely that the Center will focus on generating monitoring methodologies for a subset of bird species as generating data and results for all species is not possible due to rarity of some species, difficulty in developing statistically meaningful trends for the entire community of any species, and budget constraints. It should also be noted that due to all the development activities in the area (i.e. loss of habitat, noise etc) it is likely that the bird community in the HCA in the next 10 years or more will not necessarily reflect the true species composition and density that the HCA can support long-term. There is surely an abnormal influx and/or exodus of species during this early timeframe.

In summary, the following conditions are assumed based on the DCSS threats model and the bird community threats model.

*** Without active management, the potential changes to the structure and composition of the vegetation community will result in the composition and abundance of resident coastal sage scrub bird species reflecting small or urban fragments, rather than core areas in San Diego.***

Method: Point counts are a valuable tool used to monitor changes in abundance in birds species (Ralph et al. 1993). However, this method does have its limitations. For example, the number of points required to monitor trends in rare species, or to monitor trends in small fragments, may be too high to make monitoring feasible (i.e. not enough habitat for all the points needed). In addition, it has been pointed out that although point counts are popular, analysis of such data often ignores potential differences in detection probabilities (Farnsworth, 2002 and others).

Adding to the constraints of using point counts, life histories and habitat requirements of many birds species is poorly understood making community level monitoring more complex than just a few simple correlations. However, developing trends of species richness and abundance in the bird community is the first step at exploring these complex relationships.

The Center has begun working on Goal 2 in 2003 and 2004 using point counts. Pilot studies were set out to generate preliminary data and to determine the effectiveness of using point counts for a variety of species.

During 2003, the Center set up 6 50-acre plots (2 in SMC and 4 in DCSS) and placed 6 avian point counts within each plot. 50-acre plots were set up to allow CNLM to compare species richness to other CNLM preserves and other natural areas in San Diego where research is being conducted. At each point, the surveyor documented all species (and their abundance) observed during the 0-3 minute interval and additional species (and their abundance) observed in the 3-5 minute interval at 0-50 and 50-100 meters from the point. The average number of birds observed per point is shown in Table 3 (0-50 meters from point).

Statistical analysis (power analysis) of this data revealed that for the five most abundant species (Rufous-crowned sparrow, California towhee, Anna's hummingbird, Wrentit, Bewick's wren) the number of plots and points would need to be increased to detect significant changes in average density at the 20, 40, 60 and 80% effect level using the 2003 survey methodology (Table 5 shows statistics for Plot 1, which is similar as those for Plots 2-4). The large number of points and plots required is a reflection of the high variance in the data set.

In addition, detection probabilities (calculated using Kery, 2002., Reed 1996) revealed that only a few species had a greater than 5% probability of being detected at on any given day using the 2003 survey methodology (Although the rufous-crowned sparrow (RCSP) and the California towhee (CATO) had detection probabilities of 0.77 and 0.28 in the five minute interval, respectively). This also suggested that more visits and/or longer visits per point were required.

Therefore, in 2004, the Center modified its bird survey methodology. We used the same 4 plots in DCSS, but added 3 points per plot (for a total of 9 points) and noted bird species and their abundance during the 0-3, 3-5 and 5-10 minute interval at 0-50 meters from the point (i.e. total abundance in each interval).

Table 5. Plot requirements based on the average density for the 5 most abundant species.

Plot 1	Number of Plots Needed		Number of Plots Needed	
Effect size	Alpha=0.05		Alpha=0.2	
	2003 method	2004 method	2003 method	2004 method
20	196	>100	113	>100
40	49	50	28	35
60	22	25	13	15
80	13	15	7	9

[Note: Prior to the 2004 field season, the Center was made aware of research that employed using point counts in a manner that the data could be analyzed using Mark Recapture Analysis (Farnsworth et al, 2002). The USFWS is currently applying such an approach to estimate abundance and percent area occupied of coastal California gnatcatchers in San Diego (Winchell, 2004). Although the Center is not using this form of analysis at this time, our survey methodology and data collection will also allow the data to be evaluated using Mark Recapture Analysis as outlined by Farnsworth.]

The change in survey methodology improved our ability to detect meaningful trends (see Table 5) and improved our detection probabilities (Table 6). Most common resident, and some migratory, bird species had detection probabilities greater than 0.3 per point per plot on any given survey day using the modified survey methodology.

Table 6. Detection probabilities for selected bird species observed during point counts

Bird Species	Average Detection Probability/ Point/ Plot*
Bell's sage sparrow	0.33
Bewick's wren	0.46
California gnatcatcher	0.36
California towhee	0.87
Grasshopper sparrow	0.33
Rufous-crowned sparrow	0.82
Spotted towhee	0.52

*using Kery 2002 and Reed 1996, average probability of three visits per point

Regardless of methodology, it is unlikely that the Center will be able to monitor meaningful trends in many species using point counts because we do not have enough habitat and therefore, cannot place enough point counts within the HCA. However, we will continue to collect data to add information to regional databases as many other acres and habitat (especially in the North County MHCP) are being set aside and many other groups will be or are collecting bird data. In addition, the Center will add points and plots within its chaparral communities which should allow for better trend analysis.

The Center will use its data to compare assemblages and species richness in this HCA to other CNLM HCA's and other natural areas in San Diego (similar to Crooks 2004). The Center will then draw comparisons between these areas to generate questions, objectives and management solutions. For example, we have observed that one of our other HCA's has 200 times (per point) the number of western scrub jays than our RLC core. This information is being used to determine the effect of increased density of scrub jays on bird productivity, since scrub jays prey heavily on bird nests.

The Center has decided to continue to evaluate and conduct pilot studies using point counts. We are likely to improve our sampling methodology by increasing the number of points and slightly modifying our count intervals. In 2006, the Center will continue this program by adding more points to the HCA, making the plots larger (or adding additional plots) and by modifying the time intervals for data collection.

Method: Between 50 and 60 points will be established in the DCSS and SMC habitat from El Camino Real to Choumas-Pappas, in small fragments and large core areas. Each point will be visited 1-3 times (with visits separated by 5 to 8 days) between March 1 and May 30. Data will be collected in 3 to 5 3-minute intervals in which all birds detected in each interval are recorded. Species richness and abundance can be analyzed on a per plot or per point basis.

Goal 2. Track changes in the abundance, distribution and status (pair, unpaired) of coastal California gnatcatcher, Bell's sage sparrow and grasshopper sparrow.

Since the primary habitat type within the HCA is Diegan coastal sage scrub and since the coastal California gnatcatcher is the primary reason this habitat type was set aside, it will be imperative for the Center to monitor and manage for this species. In addition, the MHCP Management and Monitoring Plan specifically identifies that this species will need to be monitored by preserve management entities. The Center will also monitor for the presence of Bell's sage sparrow and grasshopper sparrow, since these species have been noted to be present at the HCA. The other sensitive bird species is the rufous-crowned sparrow, which will be monitored as part of the bird community surveys since it is difficult to map at this density.

The objective of our preserve management is to ensure that there is suitable habitat to maintain a population of gnatcatchers found at the Preserve. At this time, however, it is uncertain as to how many pairs of gnatcatchers can reasonably be expected to persist on the site. Twenty-three (23) pairs were estimated to be protected by the HCA during the permitting process. However, project development, the October 1996 fire, and natural factors may temporarily leave the site with an excess or lack of pairs in relation to the site's "normal" capacity. The Center has been conducting focused surveys for gnatcatchers since 2002, but this has not covered all the parcels which make up the HCA (i.e. the other parcels were not deeded). In 2004, the Center found 17 pairs and 3 single males using the HCA.

Since it is likely that the Center will receive or be managing all parcels by the spring of 2005, the Center will continue to conduct focused surveys to track population trends of the gnatcatcher yearly from 2005 to 2007, and possibly through 2010. If after this period a baseline range has

been determined, the Center will manage the site to maintain the population within this range. Gnatcatcher populations may fluctuate naturally with “natural” oscillations of resource levels. This natural variability will be determined and the target population size will be managed to be within those normal highs and lows, rather than at a static level.

The Center will note and map the presence of grasshopper sparrows and Bell’s sage sparrow during the gnatcatcher focused surveys.

Method: Focused surveys for gnatcatchers will follow current USFWS protocols, which include three (3) visits separated by at least 7 days within the breeding season. No more than 100 acres of suitable habitat will be surveyed per day. All gnatcatchers and their status (paired, single male, etc) will be noted and mapped.

A.3. San Diego Horned Lizard, Spade-foot toad and Orange-throated whiptail and other reptile and amphibian species.

Goal. Conduct research activities to learn more about the diet, distribution and threats to coast horned lizard.

The San Diego horned lizard warrants specific monitoring and management activities as it has been shown to be impacted by habitat fragmentation and other anthropogenic threats (see Ecological Models section). In addition, it is proposed as a covered species in the San Marcos Draft SubArea Plan. Therefore, the Center is interested in learning more about horned lizards at the HCA.

In early 2003, eight herp arrays were constructed in the HCA (7 buckets each), of which 3 are in the Box Canyon area (or about 1 per 70 acres), 4 in the Rancho Santa Fe to Huff parcel area (1 per 125 acres) and one is on the Brouwer parcel (1 per 100 acres). The average distance an array is from the preserve edge is about 325 meters (range 157-735 meters). To date, arrays have been run for 7 one-week periods. In that time, coast horned lizards have been detected at 4 arrays; two of these arrays are in the east parcel, one in the west parcel and one in the north parcel. In addition, horned lizards have been sighted in the west parcel on two occasions (i.e. not trapped).

Ant species have been collected from the herp arrays during three one-week periods. Both native harvester ants (*Messor andrei*) and non-native Argentine ants have been observed, with both species being observed at 3 of 8 arrays. Eleven species of ant were identified across all arrays. Although harvester ants were not commonly observed within the buckets of the herp arrays, colonies were observed near 7 of the 8 arrays. Argentine ant “density” (as calculated by noting the number of ants per bucket per day during the May 2004 trap session (3 days of ant data collection) at each array, except array 6 (37.1 ants per day per bucket), is generally low (i.e. less than 1 ants per day per bucket). Array 6 is located at 157 meters from the edge and is within a CSS restoration area that has high non-native grass cover, and is not typical of the rest of the preserve (i.e. Diegan coastal sage scrub was created as part of a CSS restoration project that brought top-soil to the area). Although these buckets allow ants to escape, they are a good indication of Argentine ant invasion at the distances that the arrays are located.

Thirty-nine (39) horned lizard scat have been collected during surveys in 2004. Lab analysis showed that harvester ants (*Messor andrei*) were the primary arthropod within the scats (estimated range of 75% to 90%) with a few scat having about 30% beetle parts and one scat having about 20% *Crematogaster californica* and 5% other ant species.

Lastly, visual inspection of the habitat quality around the preserve coupled with ant findings at the pit-arrays confirms what Suarez et al (1998) reported: areas with increased non-native grasses generally have higher density of Argentine ants. CNLM has noted that non-native grasses tend to be denser around the edges of the preserve and within habitat restoration areas and that arrays near these areas generally had a higher presence of Argentine ants.

In sum, the Center would like to learn more about Argentine ant invasion rates into the newly fragmented preserve and determine if this species will negatively affect harvester ant distribution and abundance, and thus potentially impact the population of horned lizards. Three objectives are set forth:

Objective 1. Continue to document horned lizards abundances and distribution.

Objective 2. Measure the abundance of Argentine ants at varying distances from the edge of the HCA.

Methods:

Objective 1 will be accomplished by continuing to run herp arrays for 4 one-week session during the 2005 and 2006 field seasons and by counting and observing horned lizards during focused surveys or anecdotal sitings. After 2006, the Center will re-evaluate its approach to monitoring horned lizards.

Objective 2 will be accomplished by following the same method used by Suarez et al (1998) to determine Argentine abundances at varying distances from the edge. A number of arrays (not determined yet) will be placed at varying distances from the edge of the HCA (from about 20 meters to 150 meters, most likely the mid-point of each vegetation transect). Each array will consist of 5 pit-cups which will be filled with anti-freeze and opened for a 5 day monitoring period in September or October coinciding with peak Argentine ant activity found by Suarez et al (1998).

Goal 2. Locate breeding sites for spadefoot toads.

Spade-foot toads have been captured west of Box Canyon. Breeding ponds will be critical for the survival of these species. The Center will identify breeding ponds and look for eggs and tadpoles.

Goal 3. Determine the distribution and abundance of San Diego horned lizard, orange-throated whiptail and spadefoot toad, as well as other reptiles and amphibians.

The Center will determine the status of reptile and amphibians at the HCA using the 8 herp arrays and focused surveys. Herp arrays will be run 4 times per year for 1 week each period. Traps will be checked and animals released daily. All animals will be marked by toe-clipping or ink.

A.4. Thread-leaved brodiaea, San Diego thornmint and non-native/native grassland community

Goal. Manage the population thread-leaved brodiaea and San Diego thornmint by monitoring the percent cover of native and non-native annual plant species within its habitat and by removing non-native plant species.

The estimated population of thread-leaved brodiaea (TLB) is over 4,600 individuals and San Diego thornmint (SDTM) is 1,000 individuals found entirely on the “Greens” parcel of the HCA. In 2003, surveys estimated less than 1,500 individuals of TLB, but it should be noted that not all individuals flower each year, and that there was only average rainfall (less than 10 inches) during that year. Regardless, the Center has observed that the habitat areas occupied by TLB and SDTM is overrun by *Bromus diandrus*, a non-native and weedy species. *Bromus diandrus* represents a serious threat to TLB and SDTM, as does tecolote (*Centaurea melitensis*) and purple star thistle (*Centaurea calcitrapa*), and a few other non-native species, such as fennel and artichoke thistle, which have been observed within the TLB habitat.

Method. In 2004, the Center began evaluating the percent cover of native (including TLB) and non-native plant species using one pilot stratified random plot (Table 7). Results clearly show that *B. diandrus* is very abundant. Visual observation of other TLB and SDTM habitat areas show the same trend.

The Center objective is to evaluate the cover of non-native and native plant species to guide the removal of non-native weedy species and evaluate the progress of such activities. Since the total area occupied by TLB and SDTM disturbed by *B. diandrus* is too large to handle in any given year, the Center will focus on four areas in the next 5 years to conduct vegetation measurements and to remove (by dethatching, see section D below) *B. diandrus* and other unwanted plant species. These four areas are located within TLB habitat along the golf course, along Poinsetta Avenue and along Alicante Street.

At least two (2) stratified random plots (similar to the pilot plot) will be permanently placed (and marked using GPS) in the “treatment” areas (de-thatched) and three (3) will be placed in areas which will receive no treatment (i.e. control areas). Monitoring of vegetation plots will begin in 2005. Vegetation monitoring of these plots may not occur on an annual basis, as it is assumed that de-thatching will take several seasons. The Center will evaluate the need for vegetation monitoring on an annual basis, but it is likely that it will occur at least during two seasons during the next five years.

In addition to monitoring plots, the Center will conduct annual counts of flowering TLB. Each TLB in each area will be pin-flagged to ensure accuracy.

Table 7. Pilot Vegetation Plot Data

(15X15 meter plot, 5 transects, 75 quadrats)

Species	Average % cover (stdev) point intercept	Average % cover (stdev) quadrats	Frequency (# of quadrats containing species	Average number of individuals/ quadrat (stdev)
<i>Bromus diandrus</i>	80.6 (28.6)	73.07 (34.7)	69	100% cover= ca. 200 individuals
<i>Avena ssp.</i>		0.04 (0.1)	2	0.04 (0.06)
<i>Centaurea ssp.</i>	5.8 (8.0)	2.92 (2.9)	34	2.67 (2.52)
<i>Foeniculum vulgare</i>		0.67 (1.5)	1	0.01 (0.03)
<i>Hazardia squarrosa</i>	1.3 (1.8)	0.87 (1.9)	1	0.01 (0.03)
<i>Hemizonia fasciculata</i>	11.0 (15.6)	3.16 (5.1)	34	2.43 (3.42)
<i>Calystegia macrostegia</i>		0.16 (0.3)	2	0.03 (0.04)
<i>Plantago erecta</i>		0.07 (0.1)	1	0.09 (0.21)
<i>Anagalis arvensis</i>		0.52 (0.8)	7	0.12 (0.17)
<i>Sisyrinchium bellum</i>	1.3 (2.9)	1.11 (1.8)	5	0.16 (0.32)
Bare ground	9.7 (10.7)			
Duff		1.07 (2.4)	1	

In conjunction with the aforementioned vegetation monitoring, the Center will be working with RECON Environmental (at their cost) to set up a system of frequency plots through the occupied habitat of TLB. In the next year or so, RECON will be trans-locating TLB as part of a mitigation requirement of another development project. As part of their monitoring requirement, they have to document the flowering frequency of a known population. They have asked to use our population and we have agreed. No method has been exactly agreed upon, but it will likely entail randomizing a number of quadrats throughout the occupied habitat and monitoring every year for 5 years. More information about these activities will be included in the Center's annual work plans for the HCA. This project may fall through, so at this time, we can only be hopeful.

A.5. Other Sensitive Plant Species

Goal 1. Monitor and map sensitive plant species.

Sensitive Plant Species. In 2003, the Center conducted surveys to map and estimate the abundance of all sensitive plant species that are known or have potential to occur (Appendix A). Since rainfall was a bit below average (about 9-10 inches in 2003), the Center was not able to fully evaluate the abundance or distribution of those species such as annuals. Based on the data

collected, the Center evaluated and determined a threat level (high, medium, low) for each species and prioritized future management and monitoring activities (Table 8). Species, such as thread-leaved brodiaea, which are being impacted by non-native plant species, were given a high threat level which implies active management. Species such as Palmer's grapplinghook, were given a medium threat level which implies that some active management will be required, but is not a top priority. And lastly, species such as California adolphia, were given a low threat level because the species is widespread, abundant and not likely to be significantly impacted by anthropogenic or non-native plant threats.

Table 8. Sensitive Plant Monitoring Timetable

Plant Species	Last survey year	Next survey year	Threat assessment**	Proposed Management Actions
San Diego thornmint	2004	2005	High	Remove non-native grasses and forbs around population, propagate and establish new populations
Del Mar manzanita	2003	2008	Low	Map and monitor only
Thread-leaved brodiaea	2004	2005	High	Remove non-native grasses and forbs around population
Summer Holly	2003	2008	Low	Map and monitor only
Nuttall's scrub oak	2003	2008	Low	Map and monitor only
Palmer's grappling hook	2003	2008	Med	Remove non-native grasses and forbs around population
California adolphia	2003	2008	Low	Map and monitor only
Southwestern spiny rush	2003	2008	Low	Map and monitor only
Ashy spike-moss	2003	2008	Low	Map and monitor only
San Diego march elder	2003	2008	Low	Map and monitor only
Western dichondra	2003	2008	Low	Map and monitor only
Orcutt's hazardia	2004	2005	Med	Monitor and protect existing planted individuals
San Diego sagewort	2003	2008	Low	Map and monitor only
Orcutt's brodiaea	2003	2008*	Low	Map and monitor only
Sticky-leaved liveforever	2004	2009	Low	Map and monitor only
Wart-stemmed ceanothus	2003	2008	Low	Map and monitor only
San Diego goldenstar	2003	2008	Med	Map and monitor only

*95% of population currently being monitoring and managed by Dudek and Associates until 2007 per University Commons mitigation requirements).

**High, Medium and Low risk of extirpation or damage by public.

The following addresses proposed management and monitoring for the few listed plant species that are known to occur.

Del Mar Manzanita. The Del Mar manzanita population is estimated at approximately 854 individuals all located in the “Greens” parcel. There are no active management activities proposed for this species in the next 5 years as threats to this species are considered low at this time and our time and budget will focus on species with greater needs of management. The population will be re-counted and mapped in 2008.

Thread-leaved Brodiaea. See goal 5.

Orcutt’s hazardia. 200 Orcutt’s hazardia were introduced into the HCA (on the “greens” parcel) in 2004 as part of the Center’s management activities for the species at the Manchester HCA. The population will be monitored annually to assess survivorship. The Center will also be measuring a sub-sample of 40 of these individuals to assess their growth from 2004-2006. No other activities are proposed for this species.

San Diego thornmint. About 1000 San Diego thornmint were observed in 2003 in a localized portion of the ‘Greens’ parcel (see 2003 annual report). They occupy an area of about 50 x 100 feet that is within or near to a TLB population. The Center will monitor this species annually to determine its abundance trend and map its distribution trend. All activities associate with TLB (Goal 5) will benefit the thornmint and involve similar management strategies. If time and money permits, the Center will attempt to propagate individuals using seeds from the on-site population and distribute them into other suitable habitat within the HCA.

A.6. Wildlife Corridors

Goal. Track wildlife movement through wildlife corridors.

“Large” mammals, such as coyote and bobcat, are important predators within an ecosystem. A lack of coyotes, for example, has been suggested to cause “meso-predator release”, or an increase in cats, skunks and opossums, suggesting the potential for an increased impact to bird, small mammal and reptile populations (Crooks 1999 and 2002). The HCA has a number of wildlife corridor links connecting the area to parcels within the HCA and to land outside the HCA. Corridor areas include the wildlife under-crossing under Rancho Santa Fe Road, the eastern portion of the Huff, the under-crossing near the intersection of Melrose and Rancho Santa Fe Road, and the west end of Box Canyon.

Mammal Track Stations. Mammal tracking will occur every two years. Track stations will be set and checked twice per year (winter and summer) at the four locations described above (at a minimum). Scent stations will be set, checked and baited daily for two five-day periods (start Monday, end Friday). Analysis will follow those used by Crooks 1999.

A.7. Timetable for biological monitoring activities.

Table 9 outlines the timetable for biological activities that the Center will conduct between 2005-2010. The Center will accommodate each of these activities within its annual budget.

Table 9. Schedule of Biological Monitoring Tasks

Monitoring task	Year					
	2005	2006	2007	2008	2009	2010
A1. Vegetation Plots	X	X		X		X
A2. Bird Community		X		X		X
A2. CAGN Monitoring	X		X		X	
A3. Horned lizard, orange-throated whiptail and spadefoot toad	X	X	X		X	
A4. <i>Brodiaea filifolia</i>	X	X	X	X		
A5. Sensitive Plants	See Table 4	See Table 4	See Table 4	See Table 4	See Table 4	See Table 4
A6. Wildlife Corridors	X		X		X	
A3. Herp arrays	X	X				

B. Habitat Maintenance (Enhancement and restoration)

Most of the habitat within the Preserve is of good quality and will require no restoration. However, there are several disturbed areas that are being restored as part of REMEC and Brookfields permit requirements. These include the wetland areas along Poinsetta Drive, the wetlands in the Brouwer and Huff property and the upland areas of the Wilern parcel.

The Center has received a special contribution (\$100,000) from Brookfield to restore the former mulch facility at the Huff parcel. Brookfield Homes was required to restore this area as part of their permit condition, but the Center saw it as a chance to create a nursery facility. Brookfield was released of the restoration obligation as long as the funds provided to the Center were used to restore the area once the nursery closed. At this time the Center is evaluating the opening of a nursery facility. Brookfield's wetlands restoration activities and the removal of large piles of mulch within the Huff will need to be implemented or completed before the Center can open any nursery or begin restoration activities of the upland area.

Habitat enhancement across the HCA will occur in those areas that are determined to be disturbed or degraded, or for areas such as non-native grasslands. Habitat enhancement will mostly involve removing non-native species.

Management will include removing non-native plant species which are found to be invading the site. The following species observed in the HCA are considered “zero tolerance” and require complete removal if possible: acacia trees (*Acacia* sp.), iceplant (*Carpobrotus edulis*), Eucalyptus (*Eucalyptus* sp.), Myoporum trees (*Myoporum laetum*), fountain grass (*Pennisetum sataceum*), fennel (*Foeniculum vulgare*), castor bean (*Ricinus commnis*), tamarisk (*Tamarix spp.*) and pampas grass (*Cortaderia spp.*).

Since 2002, the Center has killed over 500 pampas clumps, 2 acres of salt cedar, 50 small eucalyptus trees, 100 acacia trees, 25 Myoporum trees, 100's of clumps of fennel and fountain grass and several patches of ice plant. The Center will currently leave several patches of large eucalyptus trees found north of the Denk water tank and north of Poinsetta Road because the cost of removal is too high and because stump spraying will leave a fire hazard of dead plant material. In addition, and probably more importantly, both of these locations support nesting red-tailed hawks.

The San Elijo Lagoon Conservancy will be removing all pampas from the “Greens” parcel from 2005-2008 as part of a Coastal Commission Grant they received. The “Greens” is essentially the only location left in the HCA where there is an infestation of pampas. Other zero tolerance species that will be treated in the next few years include fountain grass along Rancho Santa Fe Road (about 2 acres), about 10 Eucalyptus south of the Denk water tank and several hundred clumps of fennel at the “Greens”.

The Center feels that it have will killed almost all zero tolerance species by the end of 2006 and will only have to spot treat any re-occurring individuals in the long-term. Zero tolerance species are generally killed by the use of herbicides, chain saws or other mechanical methods.

The following “moderate tolerance” non-native plant species are known to occur: black mustard (*Brassica nigra*), tocolote (*Centaurea melintensis*) and non-native grasses (*Bromus* spp., *Avena* spp. See Appendix B). The long-term goal of HCA management is to reduce the cover of these species in effected areas. First, however, the Center will have to determine the cover of these species (See Goal 1 in biological monitoring section). Once cover is determined, percent cover thresholds will be determined.

The Center also desires to reduce the cover of the native *Bromus diandrus* from clay lenses that are known to have *Brodiaea filifolia* populations (see Goals and Monitoring and Management sections). This will likely be done using “thatch” removal.

At this time, no reintroduction of any plant or animal species is anticipated. However, it should be noted that the Center has introduced 200 Orcutt’s hazardia (*Hazardia orcuttii*) to the preserve as part of its management efforts at the Manchester HCA.

C. Public Use

The Preserve, with proper stewardship, is a significant amenity to the surrounding community. Informing and educating the local residents of the Preserve's value as open space and wildlife habitat will be essential to maintaining the current resource levels found onsite. Without that local support, there will be an ongoing degradation through misuse, vandalism, poaching and trash dumping. With an actively involved community there will be hundreds of eyes and ears keeping a vigilant watch over the habitat. Rules of access include:

1. Dogs on leashes only
2. No motorized vehicles
3. Horseback riding, mountain biking and hiking on designated trails only.
4. No collecting of plant and wildlife species
5. No hunting or shooting.
6. No camping.

Preserve management will include sending information brochures to the members of the surrounding community, guided nature walks, and possible volunteer programs. Trail head signs and have been posted for visitor information. Since HCA inception, the Center has created one brochure and guided one nature walk. More activities are anticipated once the entire development area is completed and new home owners arrive. In the next five years we anticipate that public outreach will consist mostly of yearly newsletters and outreach information.

Preserve management also includes regular patrolling to monitor public use to ensure that it is not degrading the resources found at the Preserve. Since inception, the Center has conducted weekly enforcement activities at a minimum, but is many times at the HCA several times a week (see Appendices in the 2002-3 and 2003-4 annual reports). The amount of OHV use and illegal pit-fires has been dramatically reduced in the last three year as regular patrols, fencing, gating and new development has kept people out of the HCA.

Of major importance and concern is the Box Canyon "pond" area. The management goal for this area is to keep people out of the pond area. This area has been used in the past for cliff jumping and swimming. To limit or eliminate trespass into this area, new 12 foot high chain link fencing was constructed near the intersection of Piragua Street and Cadencia Street to replace an existing 6 foot chain link fence. The Center has been active since 2002 at citing trespassers and has cited over 100 people with the help of local law enforcement.

D. Fire Management

D1. Fuel Zones and Site Evaluation

At this time, the only fire management activities involve the Center clearing brush at three fuel zone locations within the preserve to protect homes along the edge of the HCA. The Center clears brush behind the homes along El Fuerte (southwest of the school), behind the homes

located at the end of Estera Street and along a segment along Cadencia Road. No other fire management activities occur or are planned.

As soon as homes are built as part of the La Costa Villages and University Commons developments, there will be additional fuel zones, but these will be handled by the home owners associations (HOA) for these projects. The Center will work with the HOA's to ensure that fuel management activities adjacent to the HCA do not encroach into the HCA.

As per the OSMP, the Carlsbad Fire Department will be responsible for developing a fire management plan for Carlsbad's HMP as soon as the HMP is finalized. The Center will work with the fire department to ensure that they understand all resource issues.

The MHCP asks that the regional assumption of over-frequent fire in the case of each preserve management plan is disussed, as it relates to the potential to vegetation types conversion and as well as the protection of fire-dependent species. As per our discussion within the CSS threats model section, the Center assumes that the chance of a large (>1,500 acres) destructive fire (as with the Harmony Grove Fire) is less likely than a few years ago because of all the new development in the area that has resulted in more fragmented habitat and because of the location and policy of the fire department. The Center predicts small and more frequent fires in the future. A complete burn, however, is possible under certain conditions and without fire suppression support (such as what occurred in San Diego in October of 2003).

The following points are key to the fire planning context for the Preserve:

- All of the preserve area is considered a wildland-urban interface (W-UI). W-UI can be defined as the portion of burnable vegetation within 1.5 miles of occupied structure densities greater than 1 unit/40 acres. Policy-specific criteria for defining a W-UI was published in the Federal Register (January 4, 2001 66 FR 751), which established a minimum density of one occupied structure per 40 acres (16 ha). In its identification of a W-UI, the California Fire Alliance (2001) defined W-UI as all areas within 1.5 miles (2.4 km) of wildland vegetation, roughly the distance that firebrands can be carried from a wildland fire to the roof of a house.
- Under certain Santa Ana wind conditions (such as occurred in the county in October of 2003), the entire preserve could be consumed by fire more quickly than a fire suppression unit could be on site. In the mature chaparral or riparian vegetation, flame lengths could exceed 100 feet. In the mature riparian community, flame lengths could reach even higher.
- The HCA is connected to larger, undeveloped areas to the east and through other native habitat corridors. Native vegetation in adjoining lands is part of the same fire context as the HCA. Fire can either spread from this preserve onto those lands, or reach the preserve from them.
- The native vegetation of the HCA positioned adjacent to urban land use, as well as the public access planned for the HCA, predispose this property to a high wildfire risk. The fire threat comes largely from human caused ignitions, such as from fires set by illegal pit-fires or, homeless, or illegal aliens staying overnight within the HCA. Other possible ignition

sources could come from arson, children with matches, or sparks from equipment used on site or from off-road vehicles.

D2. Risks to plants and wildlife

The plant and wildlife communities at the HCA evolved with a natural fire regime as a key, natural ecological disturbance process, primarily driven by weather and the low moisture content of vegetation in late summer and fall. The diversity of plants and wildlife present in the region have a range of adaptation to fire, and the open habitat conditions which is created by fire. Development and fragmentation of habitats does not allow natural fire regimes to continue without placing adjacent homes and businesses at risk, thereby increasing pressure on fire protection agencies and land managers to suppress wildfires. In the modern setting of a wildland-urban interface and a large investment in fire suppression, fires have become more frequent, and possibly much larger and more disastrous than was natural. Additionally, today's prevalence of exotic annual grasses and forbs has altered fuel load characteristics such that fires can ignite and carry through into shrublands more easily. Thus, the risk of extreme fire scenarios to species we want to protect should be evaluated in the context of the preserve systems we manage. The highest risk is with respect to too short a return interval between fires, which prevents plants from either accumulating sufficient carbohydrate in their underground storage organs to resprout, or from accumulating sufficient seed bank storage in the soil to replace their populations post-fire. There is a risk that fires may be either too cool to germinate seeds that require fire stimulus to germinate, or so hot that the seed is killed. And, in the compressed and fragmented native habitats we now work with, there is a risk of large portions of the preserve being taken by fire in a single event, and species unable to disperse into the post-fire environment. In this latter case, the highest risk is to species with narrow niche specialties, those with sedentary life histories, or with low dispersal capability.

E. General Maintenance

The maintenance program includes maintaining fences, gates, signs and trails. Both 4-strand barbed wire and chain link fencing is found at various locations throughout the Preserve. In addition, more fencing will be added with the development of the neighboring project. These fences will be maintained to eliminate unwanted trespass and dumping. Gates will be replaced as necessary, but most likely every 20 to 30 years. Various signs will be posted at main access points to the Preserve. Signs will delineate the limits of the Preserve, the preserve manager, and what activities are permitted or illegal. An information kiosk will be set up at the northeastern entrance of the La Costa Oaks and Ridge section.

A trail system will be designed in the La Costa Oaks and Ridge section of the HCA and is primarily based on the existing dirt roads that are used to service power lines and underground utilities. Access to these utility roads will be gated to limit off-road activity and illegal use of the trails. No new trail alignments are planned at this time.

VI. Staffing, Operations and Funding Mechanisms

A. Funding and Budgets

Preserve management was funded by endowments set aside by the RECMC, Brookfield Homes, Scandia Development and the National Fish and Wildlife Foundation (Table 7). Other funding mechanisms could include volunteerism, public and private donations or grants from wildlife groups or entities.

The Center separates its funding into two categories, Initial and Capital, and Ongoing. Initial and Capital funds are generally used for the first one to three years of management. Ongoing represents funds generated from interest earned from our endowments. As of October 1, 2004, the Center spent all of its Initial and Capital funding for this HCA and is now spending interest earned from the endowments. The Center spends about 4.5% of the endowment each year for management purposes. The total annual budgets for the next five or so years will mostly likely be around \$80,000 to \$100,000. The fiscal year 2004-5 budget is provided in the 2004-5 annual work plan which is under a separate cover.

The total funding, including endowment and restricted funds as of September 31, 2004 is shown in Table 10. The Center also holds \$100,000 for the future restoration of the abandoned mulch facility at the Huff property. Also shown in Table 7 is the “Inflation Adjusted Endowment” which is calculated by adding the total amount of inflation that has occurred since endowment funds were received to the original endowment. The Center’s goal is to maintain funds near this inflation adjusted amount so that we are not “wasting” the endowment.

Table 10. HCA funding summary

HCA sub-area/ Developer	Original Endowment***	Inflation Adjusted Endowment**	Actual Endowment and Restricted Funds*
La Costa Villages/RECMC	\$1,322,959	\$1,423,127	\$1,563,870
University Commons/ Brookfield Homes*	\$679,923	\$697,509	\$827,743
University Commons/Skandia	\$104,600	\$111,573	\$134,366
Nelson	\$66,733	\$67,250	\$82,326
Totals	\$2,174,215	\$2,299,459	2,608,305

*as of December 31, 2004.

**Original endowment x total inflation (CPI) since funds received.

***Does not include “Initial and Capital” funds.

B. Operations

The Center for Natural Lands Management’s main office is based out of Fallbrook, California (425 East Alvarado Street, Suite H, Fallbrook CA 92028. 760.731.7790). The San Diego field

office is based near downtown San Diego (4367 Coronado Avenue, San Diego, CA 92107. 619.295.4953). The main office is responsible for field office oversight, fund management and preserve, accounting, and employee benefits and payments. The field office is responsible for the day-to-day management of the HCA.

C. Staffing

The Executive Director of the Center is Sherry Teresa. The Director of Operations is Michael Stroud. The San Diego Preserve Manager is Markus Spiegelberg and the position of Assistant Preserve Manager is currently being filled. Resumes of the preserve manager is provided in Appendix D.

VII. Reporting Requirements

Reporting includes five-year management plans, yearly work plans, annual reports, and GIS and other database compilation.

A. Management Reports

Management plans outline the primary goals of preserve management, the management techniques employed, funding mechanisms and budgets, and preserve manager qualifications. Although the City of Carlsbad's Open Space Management Plan calls for HCA specific management plans (termed "Area Specific Management Plan's) to be completed every three (3) years, the Center cannot afford this and did not budget for this frequency at the time it received title and funds to these properties. This document will suffice as the second five year management plan and will be updated in 2010.

B. Annual Reports and Work Plans

Annual reports summarize all management activities undertaken in a particular year and report and discuss survey results. Work plans will outline specific projects and management activities that will be undertaken in a coming year. Both reports will include budget information, such as expenditures for the year and total remaining funds.

The annual reports and work plans will be submitted to the Cities of Carlsbad and San Marcos and the wildlife agencies by December 15 of each year.

C. Data

Various data collected during the year will be entered into MSAccess or MSEXcel and/or GIS databases for long term storage and use. The Center will submit all GIS layers, such as project boundaries, vegetation, and sensitive species, each year to the Cities and the wildlife agencies.

VIII. References

- Alliance Environmental Services, 1999. Phase I Environmental Site Assessment. (Parcel Numbers 264-041-19-00, 264-111-05-00). February.
- Bolger, D. T., T.A. Scott and J.T. Rotenberry. 1997. Breeding Bird Abundance in an Urbanizing Landscape in Coastal Southern California. *Cons. Bio.* 11(2): 406-421.
- Bolger D.T. 2002. Habitat Fragmentation effects on Birds in Southern California: Contrast to the “Top-Down” Paradigm. *Studies in Avian Biology*. No. 25:141-157.
- CBI, 2003. MHCP Biological Monitoring and Management Plan. Prepared by CDFG, USFWS and Conservation Biology Institute. March, 2003.
- CNLM, 2001. Habitat Management Plan for the La Costa Preserve. Center for Natural Lands Management. August, 2001.
- Crooks, K. R. and M.E. Soule. 1999. Mesopredator release and avifaunal extinctions in a fragmented system. *Nature*. Volume 400. Pages 563-567.
- Crooks, K. R. 2002. Relative Sensitivities of Mammalian Carnivores to Habitat Fragmentation. *Cons. Bio.* 16(2): 488-902.
- Crooks, K.R., A.V. Suarez and D.T. Bolger. 2004. Avian assemblages along a gradient of urbanization in a highly fragmented landscape. *Bio. Cons.* 115: 451-462.
- Farnsworth, G.L., K.H. Pollock, J.D. Nichols, T.R. Simons, J.E. Hines and J.R. Suaer. 2002. A Removal Model fro Estimating Detection Probabilities from Point-Count Surveys. *The Auk*: 119(2): 414-425.
- Fieldstone/La Costa Associates 1995. Habitat Conservation Plan/Ongoing Multi-Species Plan for the Properties in the Southeast Quadrant of the City of Carlsbad, California. Volume I and II. June.
- Fisher, R.N., A.V. Suarez and T.J. Case 2002. Spatial Patterns of Abundance of Coastal Horned lizard. *Cons. Bio*: 16(1): 205-215.
- Holldobler and Wilson, *The Ants*, 1990.
- Kery, M. 2002. Inference of Absence in Snakes. *J. of Wildlife Management* 66:330-338.

Ralph, J.C., G.R. Geupel, P. Pyle, T.E Martin, and D.F. DeSante. 1993. Handbook of field methods for monitoring landbirds. Gen. Tech. Rep. PSW-GTR-144. Albany, CA: Pacific Southwest Research Station. Forest Service. U.S. Dep. Of Ag. 41 p.

Reed J M. 1996. Using Statistical Probability to Increase Confidence of Inferring Extinction. *Conservation Biology* 10:1283-1285 (originally presented by McArdle, B. H. 1990 When are Rare Species not There? *Oikos* 57:276-277.

Suarez, A.V., D.T. Bolger and T.J. Case. 1998. Effects of fragmentation and invasion on native ant communities in coastal southern California. *Ecology*. 79(6): 2041-2056.

Suarez, A.V, J.Q Richmond and T.J. Case. 2002. Prey selection of horned lizards following the invasion of Argentine ants in southern California. *Ecological Applications* 10(3): 711-725.

Soule, M.E., Bolger, D.T., Alberts, A. C., Sauvajot, R., Wright, J, Sorice, M and S. Hill. 1988. Reconstructed dynamics of rapid extinction of chaparral-requiring birds in urban habitat islands. *Cons. Bio.* 2: 75-92.

TAIC, 2004. City of Carlsbad Open Space Management Plan. Technology Associates International Corporation. May 2004.

T&B Planning Consultants, Inc. Villages of La Costa Specific Plan No./EIR No. First Screen Check. June 30, 2000.

Wheeler and Rissing, 1975. *Pan-Pacific Entomologist* 51: 205-216.;

Winchell, C. 2004. A reserve wide survey of local California gnatcatcher population maintained by the San Diego multi-species conservation plan with rapid response to the 2003 fires. U.S. Fish and Wildlife Service. Carlsbad, CA.

IX. Appendices

Appendix A. Sensitive Species

Current Status of Listed and Sensitive Species observed at the Rancho La Costa HCA and their coverage level under the City of Carlsbad HMP (X), City of San Marcos draft MHCP Subarea plan (Z) and North County MHCP (Y). NC= Not Covered, but considered notable or sensitive.

Species	Historical Population Estimate*	Current Population Estimate or Most Recent Survey Result**	Carlsbad HMP Covered Species	City of San Marcos MHCP Covered Species
San Diego Thornmint (<i>Acanthomintha ilicifolia</i>)	None	1 population ca. 1000 individuals on greens property	Y	Z, Y
Thread-leaved brodiaea (<i>Brodiaea filifolia</i>)	approximately 4,610	Approximately 1,350 on greens	X, Y	Y
Orcutt's hazardia (<i>Hazardia orcuttii</i>)	0	200 planted on greens	X, Y	Y
Nuttall's scrub oak (<i>Quercus dumosa</i>)	640	many hundreds on greens parcel	X, Y	Y
California adolphia (<i>Adolphia californica</i>)	3,100 widespread	Thousands widespread across property.	NC	NC
Del Mar manzanita (<i>Arctostaphylos glandulosa</i> var. <i>crassifolia</i>)	750-850 individuals on "greens" property	<1000 individuals on "greens" property.	Y	Y
San Diego sagewort (<i>Artemisia palmeri</i>)	"less than 100 individuals" on the Huff parcel	less than 100 individuals on Huff parcel.	NC	NC
Orcutt's brodiaea (<i>Brodiaea orcuttii</i>)	none at La Costa Villages, 4,176 corms transplanted to Winston parcel in 2002	717 of transplanted corms flowered on Winston property in 2003. Approximately 328 found on Huff, Elfin forest, Brouwer and misc parcels by CNLM.	NC	NC
Sticky-leaved liveforever (<i>Dudleya viscida</i>)	"several large populations in San Marcos Creek"	several large populations in Box Canyon.	Y	Y
Wart-stemmed ceanothus (<i>Ceanothus verrucosus</i>)	"several thousands" on Huff and Brouwer parcels, hundreds on greens	thousands on Huff and Brouwer parcels	Y	Y, Z

Species	Historical Population Estimate*	Current Population Estimate or Most Recent Survey Result**	Carlsbad HMP Covered Species	City of San Marcos MHCP Covered Species
Summer-holly (<i>Comarstaphylis diversifolia</i>)	460 on greens	hundreds on “greens” property, too dense to get accurate count. <5 on Elfin Forest parcel	Y	Y, Z
Western dichondra (<i>Dichondra occidentalis</i>)	2 to 5 populations	thousands on Oaks, Ridges, Greens, Nelson, Setter and Questhaven parcels	NC	NC
San Diego barrel cactus (<i>Ferocactus viridescens</i>)	none	none	NC	Z
Palmer’s grappling-hook (<i>Harpagonella palmeri</i>)	3,500 on greens	1,150 on greens only	NC	NC
San Diego marsh elder (<i>Iva hayesiana</i>)	“Large populations along San Marcos Creek” “several hundred in Copper Creek on Huff parcel”	approximately 600 on greens and 500 on Brouwer parcels.	Y	Y, Z
Southwestern spiny rush (<i>Juncus acutus</i> var. <i>leopoldii</i>)	“Large and small populations” 635 on greens and oaks	70 on greens, 20 in upper tributaries to Box Canyon, more possible in Box Canyon	NC	NC
San Diego golden-star (<i>Muilla clevelandii</i>)	“Approximately 400 individuals”	<250 observed, but population estimated to be around 100 on Elfin Forest parcel and around 1,700 for Oaks parcel.	NC	NC
Engelmann Oak (<i>Quercus engelmannii</i>)	1	Most likely impacted by development, no others found	Y	Y
Ashy spike-moss (<i>Selaginella cinerascens</i>)	many patches throughout	many patches throughout entire property	NC	NC
Cooper’s hawk (<i>Accipiter cooperii</i>)	observed	observed	Y	Y, Z
Osprey (<i>Pandion haliaetus</i>)	observed	observed	Y, X	Y

Species	Historical Population Estimate*	Current Population Estimate or Most Recent Survey Result**	Carlsbad HMP Covered Species	City of San Marcos MHCP Covered Species
Least Bell's vireo (<i>Vireo bellii pusillus</i>)	not observed	1 territory in 2003 on Brouwer parcel	Y, X	Y
Coastal California gnatcatcher (<i>Poliophtila californica californica</i>)	20-25 pair	20-25 pair	Y, X	Y
Yellow-breasted chat (<i>Icteria virens</i>)	?	3 territories	Y, X	Y
Californica rufous-crowned sparrow (<i>Aimophila ruficeps cansescens</i>)	not estimated	Abundant	Y,X	Y, Z
Golden eagle (<i>Aquila chrysaetos</i>)	observed	observed	Y	Y
Northern harrier (<i>Circus cyaneus</i>)	observed	observed	Y	Y, Z
Bell's sage sparrow (<i>Amphispiza belli belli</i>)	observed	Observed, but rare	Y	Y, Z
Grasshopper sparrow (<i>Ammodramus savannarum</i>)	observed	Observed, but rare	Y	Y, Z
Northwestern San Diego pocketmouse (<i>Chaetodipus fallax fallax</i>)	observed	observed	NC	Z
Black-tailed jackrabbit (<i>Lepus californicus bennetti</i>)	observed	observed	Y	Y, Z
Mountain lion (<i>Felis concolor</i>)	?	Scat observed	Y	Y
Mule deer (<i>Odocoileus hemionus fuliginata</i>)	observed	observed	Y	Y
Western spadefoot toad (<i>Scaphiopus hammondi</i>)	tadpoles observed	1 adult captured	NC	NC
Orange-throated whiptail (<i>Cnemidophorus hyperythrus beldingi</i>)	not estimated	localized	Y, X	Y, Z
San Diego horned lizard (<i>Phrynosoma coronatum blainvillei</i>)	observed	5 adults, 1 juvenile captured between 2003-4	Y	Y,Z

*Data from La Costa Villages and University Commons EIR

** Current data for plants is based on 2003 survey results. Birds is based on 2003-4 survey results.

Appendix B. Plant Species

Plant List (Spring 2003 surveys)

SPECIES	COMMON NAME	STATUS	GREENS	ELFIN FOREST	UNIVERSITY COMMONS	OAKS & RIDGES
Acacia spp.*	Acacias	1B 2-3-2			X	X
Acanthomintha ilicifolia	San Diego thornmint	CE/FT	X			
Achillea millefolium	Yarrow		X	X	X	X
Achnatherum coronatum	Giant needlegrass					
Acourtia microcephala	Sacapellote		X		X	X
Adenostoma fasciculatum	Chamise		X	X	X	X
Adolphia californica	California spinebush	2 1-3-1	X	X	X	X
	California maiden-hair					
Adiantum jordani	fern			X	X	X
Agave americana	American Agave					
Agrostis diegoensis	Leafy bent grass			X	X	X
Allium praecox	Early onion		X	X	X	X
Amaranthus blitoides*	Prostrate amaranth					
Ambrosia psilostachya	Western ragweed		X	X	X	X
Amsinkia menziesii	Fiddleneck		X	X	X	X
Anagalis arvensis*	Scarlet Pimpernel		X	X	X	X
Anemopsis californica	Yerba manza		X		X	X
Antirrhinum nuttallianum	Nuttall's snapdragon		X	X	X	X
Antirrhinum kelloggii	Climbing snapdragon		X		X	X
Apiastrum angustifolium	Mock Parsley		X			X
Apium graveolens*	Celery					
Arctostaphylos glandulosa ssp. crassifolia	Del Mar manzanita	1B 3-3-2 FE	X			
Arctostaphylos glandulosa ssp. glandulosa	Manzanita		X			X
Artemisia californica	Coastal sagebrush		X			X
Artemisia douglasiana	Mugwort		X	X	X	X
Artemisia dracunculus	Tarragon					
Artemisia palmeri	Palmer's sagewort	4 1-2-1			X	X
Asclepias fascicularis	Narrow-leaf milkweed				X	X
Atriplex lentiformis	Quail saltbush					
Atriplex pacifica	Pacific saltbush	1B 3-3-2 FSC				
Atriplex semibaccata*	Australian saltbush		X	X	X	X
Avena spp.*	Wild oats		X	X	X	X
Baccharis pilularis	Coyote bush		X	X	X	X
Baccharis salicifolia	Mule fat		X	X	X	X
Baccharis sarothroides	Broom Baccharis		X	X	X	X
Bloomeria crocea	Common goldenstar		X			X
Bothriochloa barbinodis	Plumed beardgrass					
Brassica geniculata*	Short-podded mustard		X	X	X	X
Brassica nigra*	Black mustard		X	X	X	X
Brickellia californica	California Brickellbush		X	X	X	X

SPECIES	COMMON NAME	STATUS	GREENS	ELFIN FOREST	UNIVERSITY COMMONS	OAKS & RIDGES
Brodiaea filifolia	Thread-leaf Brodiaea	1B 3-3-3 CE/FT	X			
Brodiaea orcutii	Orcutt's Brodiaea	1B 1-3-2 FSC		X	X	X
Bromus carinatus	California brome		X			X
Bromus diandrus*	Ripgut grass		X	X	X	X
Bromus hordeaceus*	Soft chess		X	X	X	X
Bromus madritensis ssp. rubens*	Foxtail chess		X	X	X	X
Calandrinia ciliata	Red maids		X	X	X	X
Calochortus concolor	Golden-bowl mariposa				X	X
Calochortus splendens	Splendid mariposa		X			X
Calyptridium monandrum	Pussy paws					X
Calystegia macrostegia	Morning-glory		X	X	X	X
Camissonia bistora	California sun cup		X			X
Camissonia californica	False mustard			X	X	X
Capsella bursa-pastoris*	Shepard's purse			X	X	X
Cardamine californica	Milkmaids		X		X	X
Cardionema ramosissimum	Tread lightly		X			
Carex triquetra	Triangular-fruit sedge		X		X	X
Carpobrotus edulis*	Sea-fig				X	X
Castilleja densiflora	Owl's clover		X			X
Castilleja exserta	Purple owl's clover		X	X	X	X
Castilleja foliolosa	Woolly Indian paintbrush					
Caulanthus heterophyllus var. heterophyllus	San Diego jewell flower			X	X	X
Ceanothus tomentosus	California lilac		X		X	X
Ceanothus verrucosus	Wart-stemmed Ceanothus	2 2-2-1 FSC	X		X	X
Centaurea calcitrapa*	Purple star-thistle		X			X
Centaurea melitensis*	Tocalote		X	X	X	X
Centaurium venustum*	Chanchalagua		X	X	X	X
Centunculus minimus	Common chaffweed		X			
Cerastium glomeratum*	Mouse-ear chickweed		X	X	X	X
Cercocarpus minutiflorus	San Diego mountain-mahogany		X		X	X
Chaenactis artemisifolia	White pincushion			X		X
Chaenactis glabriuscula	Yellow pincushion		X	X	X	X
Chamaesyce polycarpa	Small-seed sandmat		X	X	X	X
Chamomilla suaveolens*	Pineapple weed		X	X		X
Chenopodium californicum	California goosefoot		X	X	X	X
Chenopodium murale*	Nettle-leaf goosefoot					X
Cheilanthes newberryi	Cotton fern				X	X
Chlorogalum parviflorum	Small-flower soap plant		X	X	X	X
Chorizanthe fimbriata	Fringed spineflower					X

SPECIES	COMMON NAME	STATUS	GREENS	ELFIN FOREST	UNIVERSITY COMMONS	OAKS & RIDGES
Chorizanthe procumbens	Prostrate spineflower		X	X	X	X
Chorizanthe staticoides	Turkish rugging		X			X
Chrysanthemum coronarium*	Chrysanthemum		X			X
Cirsium occidentale var. californicum	California thistle		X		X	X
Clarkia purpurea ssp. viminea	Large Clarkia				X	X
Claytonia perfoliata	Miner's lettuce		X	X	X	X
Clematis pauciflora	Ropevine		X	X	X	X
Cneoridium dumosum	Spice bush		X	X	X	X
Collinsia heterophylla	Purple Chinese houses		X	X	X	X
Comarostaphylis diversifolia ssp.		1B 2-2-2				
diversifolia	Summer-holly	FSC	X	X		
Conium maculatum*	Poison hemlock					
Convolvulus arvensis*	Bindweed		X		X	X
Convolvulus simulans	Clay bindweed	4 1-2-2	X		X	X
Conyza canadensis*	Horseweed		X	X	X	X
Cordylanthus rigidus	Dark-tip bird's-beak		X		X	X
Cortaderia jubata*	Pampass grass		X	X	X	X
Cotula coronopifolia*	Brass-buttons		X		X	X
Crassula connata	Pygmy weed		X	X	X	X
Cressa truxillensis	Alkali weed					
Cryptantha intermedia	Porcorn flower		X	X	X	X
Cucurbita foetidissima	Calabazilla					
Cuscuta californica	Dodder		X	X	X	X
Cynara cardunculus*	Artichoke thistle		X			X
Cynodon dactylon*	Bermuda grass					
Cyperus involucratus	African umbrella plant		X	X	X	X
Datura wrightii	Jimson weed		X			X
Daucus pusillus	Rattlesnake weed		X			X
Delphinium parryi ssp. parryi	Parry's larkspur		X	X	X	X
Dichelostemma capitatum	Blue dicks		X	X	X	X
Dichondra occidentalis	Western Dichondra	4 1-2-1	X	X	X	X
Distichlis spicata	Saltgrass		X		X	X
Dodecatheon clevelandii	Shooting star		X	X	X	X
Dryopteris arguta	Coastal wood fern		X	X	X	X
Dudleya edulis	Lady-fingers					
Dudleya lanceolata	Coastal Dudleya		X			X
Dudleya pulverulenta	Chalk Dudleya		X	X	X	X
Dudleya viscida	Sticky-leaf Dudleya	1B 2-2-3				
Echium sp.*	Echium	FSC				X
Eleocharis macrostachya	Pale spike-sedge		X		X	X
Elymus spp.	Native wild rye grasses		X		X	X
Emmenanthe penduliflora	Whispering bells		X		X	X
Encelia californica	California Encelia		X	X	X	X
Encelia farinosa	Incienso					X

SPECIES	COMMON NAME	STATUS	GREENS	ELFIN FOREST	UNIVERSITY COMMONS	OAKS & RIDGES
Epilobium canum	California Fuchsia		X	X	X	X
Eremocarpus setigerus	Doveweed		X	X	X	X
Erigeron foliosus var. foliosus	Leafy daisy Thick-leaved Yerba		X		X	X
Eriodictyon crassifolium	Santa					
Eriogonum elongatum	Tall buckwheat		X		X	X
Eriogonum fasciculatum	Flat-top buckwheat		X	X	X	X
Eriophyllum confertiflorum	Long-stem golden- yarrow		X	X	X	X
Erodium cicutarium*	Red-stem filaree		X	X	X	X
Erodium moschatum*	White-stem filaree		X	X	X	X
Eschscholzia californica	California poppy		X	X	X	X
Eucalyptus spp.*	Eucalyptus trees		X			X
Eucrypta						
chrysanthemifolia	Eucrypta		X	X	X	X
Euphorbia misera	Cliff spurge	2 2-2-1				
Euphorbia spathulata	Reticulate-seed spurge		X			
Filago arizonica	Arizona Filago		X	X	X	X
Filago californica	California Filago		X	X	X	X
Filago gallica*	Narrow-leaf Filago		X	X	X	X
Foeniculum vulgare*	Sweet Fennel		X	X	X	X
Fritillaria biflora	Chocolate lily		X			X
	Narrow-leaved					
Galium angustifolium	bedstraw		X	X	X	X
Galium aparine*	Common Bedstraw		X	X	X	X
Gastrium						
ventricosum*	Nit grass		X	X	X	X
Gilia angelensis	Grassland Gilia		X	X	X	X
Gnaphalium bicolor	Bicolor cudweed					
Gnaphalium						
californicum	California everlasting		X	X	X	X
Gnaphalium canescens	White everlasting		X		X	X
Gnaphalium	Small-flowered					
microcephalum	everlasting			X	X	X
Gnaphalium palustre	Everlasting		X			X
Grindelia camporum	Gumplant		X			
Gutierrezia sarothrae	Matchweed					X
	Palmer's grappling					
Harpagonella palmeri	hook	4 1-2-1	X			
	Saw-toothed					
Hazardia squarrosa	goldenbush		X	X	X	X
Hedynois cretica*	Crete Hedynois		X	X	X	X
Helianthemum						
scoparium*	Rush-rose		X	X	X	X
Helianthus gracilentus	Slender sunflower				X	X
Heliotropium						
curassavicum	Salt heliotrope					
Hemizonia fasciculata	San Diego tarplant		X	X	X	X
Hesperevax sparsiflora var. sparsiflora	Erect Evax Toyon		X			
Heteromeles arbutifolia			X	X	X	X

SPECIES	COMMON NAME	STATUS	GREENS	ELFIN FOREST	UNIVERSITY COMMONS	OAKS & RIDGES
Heterotheca grandiflora	Telegraph weed		X		X	X
Hypochaeris glabra*	Smooth cat's-ear		X			X
Hirschfeldia incana*	Shortpod mustard		X			X
Hordeum murinum*	Wild barley					X
Hypochaeris glabra*	Smooth cat's-ear		X	X	X	X
Isocoma menziesii	Goldenbush		X	X	X	X
Isomeris arborea	Bladderpod		X			X
Iva hayesiana	San Diego marsh-elder	2 2-2-1 FSC	X		X	X
Jepsonia parryi	Coast Jepsonia		X	X	X	X
Juncus acutus ssp. leopoldii	Southwestern Spiny Rush	4 1-2-1	X		X	X
Juncus bufonius	Toad rush		X		X	X
Juncus dubius	Mariposa rush		X		X	X
Juncus xiphioides	Iris-leaved rush				X	X
	Climbing bush					
Keckiella cordifolia	Pestemon				X	X
Lactuca serriola*	Wild lettuce		X	X	X	X
Lamarckia aurea*	Goldentop		X	X	X	X
Lasthenia californica	Common goldfields		X	X	X	X
Lathyrus laetiflorus	San Diego sweet pea		X	X	X	X
Layia playglossa	Common tidy-tips				X	X
Lepidium lasiocarpum	Sand peppergrass		X			
Lepidium nitidum	Shinning peppergrass		X	X	X	X
Lessingia filaginifolia var. filaginifolia	San Diego sand-aster		X	X	X	X
Leymus condensatus	Giant wild rye		X	X	X	X
Linanthus dianthiflorus	Ground pink					X
Linaria canadensis	Blue toadflax		X	X	X	X
Lobularia maritima*	Sweet alyssum				X	X
Lolium spp.*	Ryegrass		X	X	X	X
Lomatium dasycarpum	Woolly-fruit Lomatium		X	X	X	X
Lonicera subspicata	San Diego honeysuckle		X	X	X	X
Lotus hamatus	Grab lotus		X	X		
Lotus purshianus	Spanish clover				X	X
Lotus scoparius	Deerweed		X	X	X	X
Lotus strigosus	Annual Lotus				X	X
Lupinus bicolor	Bicolored lupine		X		X	X
Lupinus concinnus	Bajada lupine			X		X
Lupinus hirsutissimus	Stinging lupine		X		X	X
Lupinus truncatus	Collar lupine		X			X
Lycium andersonii	Waterjacket		X			X
Lythrum hyssopifolium*	Grass poly				X	X
Malacothamnus fasciculatus	Bushmallow		X	X	X	X
Malosma laurina	Laurel sumac		X	X	X	X
Malva parviflora*	Cheeseweed					
Mammillaria dioica	Fish-hook cactus					
Marah macrocarpus	Wild-cucumber		X	X	X	X
Marrubium vulgare*	Horehound		X	X	X	X
	Pineapple weed					
Matricaria matricarioides*						

SPECIES	COMMON NAME	STATUS	GREENS	ELFIN FOREST	UNIVERSITY COMMONS	OAKS & RIDGES
Medicago officinales*	Yellow sweetclover		X			X
Medicago polymorpha*	Bur-clover		X			X
Melica imperfecta	Coast range melic		X	X	X	X
Melilotus albus*	White sweetclover		X		X	X
Melilotus indica*	Yellow sweet clover					
Mesembryanthemum crystallinum*	Crystalline iceplant					
Mesembryanthemum nodiflorum*	Slender-leaved iceplant					
Microseris elegans	Elegant Microseris		X		X	X
Mimulus aurantiacus	Coast monkey flower		X	X	X	X
Mimulus guttatus	Seep monkey flower		X		X	X
Mirabilis californica	Coastal wishbone plant		X	X	X	X
Muhlenbergia microsperma	Littleseed muhly					X
		1B 2-3-2				
Muilla clevelandii	San Diego goldenstar	FSC		X		X
Muilla maritima	Common muilla		X	X	X	X
Nemophila menzeisii	Baby blue eyes		X			X
Nasella pulchra	Purple needlegrass		X	X	X	X
Navarretia hamata	Skunkweed		X	X	X	X
Nerium oleander*	Oleander				X	X
Nicotiana glauca*	Tree Tobacco		X	X	X	X
Ophioglossum californicum	California adder's- tongue			X		X
Opuntia ficus-indica*	Indian-fig		X		X	X
Opuntia littoralis	Coastal prickly-pear		X	X	X	X
Opuntia prolifera	Cholla		X			
Osmadenia tenella	Osmadenia		X	X	X	X
Oxalis pes-caprae*	Bermuda-buttercup		X		X	X
Oxalis albicans	California wood-sorrel		X	X	X	X
Paeonia californica	California Peony		X			X
Pectocarya linearis	Slender Pectocarya			X	X	X
Pellaea mucronata	Bird's foot cliff-brake					
	Golden-rayed					
Pentachaeta aurea	Pentachaeta		X		X	X
Pentagramma triangularis ssp. triangularis	Goldenback fern			X		X
Pentagramma triangularis ssp. viscosa	Silverback fern				X	X
Phacelia cicutaria	Caterpillar Phacelia		X	X	X	X
Phacelia distans	Wild-Heliotrope		X		X	X
Phacelia parryi	Parry's Phacelia			X	X	X
Phalaris spp.*	Canary grasses		X	X	X	X
Pholistoma auritum	Fiesta flower		X	X	X	X
Pholistoma racemosum	Fiesta flower					X
Picris echioides*	Bristly ox-tongue		X	X	X	X
		1B 2-3-2				
Pinus torreyana	Torrey pine	FSC				
Plagiobothrys acanthocarpus	Adobe popcornflower					

SPECIES	COMMON NAME	STATUS	GREENS	ELFIN FOREST	UNIVERSITY COMMONS	OAKS & RIDGES
Plagiobothrys nothofulvus	Rusty popcorn flower				X	X
Plagiobothrys sp.	Popcorn flower		X			X
Plantago erecta	Dot-seed plantain		X	X	X	X
Plantago ovata*	Woolly plantain		X			
Plantago virginica*	Dwarf Plantain		X			
Platanus racemosa	California sycamore		X			X
Platystemon californicus	Cream cups		X		X	X
Pluchea odorata	Salt marsh fleabane					
Polygonum arenastrum*	Common knotweed					
Polypodium californicum	California polypody		X	X	X	X
Polypogon spp.*	Beard grass		X	X	X	X
Porophyllum gracile	Odora			X	X	X
Potentilla glandulosa	Sticky cinquefoil		X	X	X	X
Prunus ilicifolia	Holly-leaved cherry					
Pterostegia drymarioides	Granny's hairnet		X	X	X	X
Quercus agrifolia	Coast live oak		X	X	X	X
Quercus berberidifolia	Inland scrub oak		X	X	X	X
Quercus dumosa	Nuttall's Scrub Oak	1B 2-3-2	X	X	X	X
Rafinesquia californica	California chicory		X	X		X
Rhamnus crocea	Spiny redberry		X			X
Rhamnus ilicifolia	Holly-leaf redberry		X		X	X
Rhaphanus sativa*	Wild radish		X	X	X	X
Rhus integrifolia	Lemonade-berry		X	X	X	X
Ribes indecorum	Winter currant			X	X	X
Ribes speciosum	Fuchsia-flowered gooseberry		X		X	X
Rorippa nasturtium- aquaticum*	Water-cress		X		X	X
Rosa californica	California wild rose				X	X
Rumex crispus*	Curly dock		X		X	X
Rumex sp.*	Dock		X	X	X	X
Salicornia virginica	pickleweed		X			
Salix spp.	Willows		X			X
Salsola tragus*	Tumbleweed		X	X	X	X
Salvia apiana	White sage		X	X	X	X
Salvia columbariae	Chia		X			X
Salvia mellifera	Black sage		X	X	X	X
Sambucus mexicana	Blue elderberry		X	X	X	X
Sanicula arguta	Sharp-tooth sanicle			X	X	X
Sanicula bipinnatifida	Purple sanicle				X	X
Schinus molle*	Peruvian pepper tree				X	X
	Mediterranean					
Schismus barbatus*	Schismus		X	X	X	X
Scirpus californicus	California bulrush		X		X	X
Scrophularia californica	California figwort				X	X
Scutellaria tuberosa	Danny's skullcap					
Selaginella bigelovii	Bigelow's spike-moss			X	X	X
Selaginella cinerascens	Ashy spike-moss		X	X	X	X
Senecio californicus	California groundsel					X
Senecio vulgaris*	Common groundsel		X	X	X	X
	Checker-bloom					
Sidalcea malvaeflora			X	X	X	X

SPECIES	COMMON NAME	STATUS	GREENS	ELFIN FOREST	UNIVERSITY COMMONS	OAKS & RIDGES
<i>Silene gallica</i> *	Common catchfly		X	X	X	X
<i>Silene laciniata</i>	Fringed Indian pink				X	X
<i>Silybum marianum</i> *	Milk-thistle					
<i>Sisymbrium irio</i> *	London rocket					
<i>Sisyrinchium bellum</i>	Blue-eyed-grass		X	X	X	X
<i>Solanum douglasii</i>	Douglas' nightshade		X			X
<i>Solanum xanti</i>	Nightshade		X	X	X	X
<i>Sonchus oleraceus</i> *	Common sow-thistle		X		X	X
<i>Spergula arvensis</i> *	Stickwort starwort					
<i>Spergularia macrotheca</i>	Sticky sand-spurry					
<i>Spergularia villosa</i> *	Villous sand-spurry		X		X	X
<i>Stachys ajugoides</i>	Hedge nettle		X	X	X	X
<i>Stephanomeria diegensis</i>	San Diego wreath-plant		X	X	X	X
<i>Stylocline gnaphalioides</i>	Everlasting nest-straw		X	X	X	X
<i>Stylomecon heterophylla</i>	Wind poppy				X	X
<i>Tamarix</i> spp.*	Salt cedars		X	X		X
	Many-fruit meadow-rue					
<i>Thalictrum polycarpum</i>			X	X	X	X
<i>Toxicodendron diversilobium</i>	Poison oak		X	X	X	X
<i>Trichostema lanceolatum</i>	Vinegar weed		X			X
<i>Typha</i> spp.	Cat-tail		X		X	X
<i>Trifolium microcephalum</i>	Maiden Clover		X	X	X	X
<i>Trifolium depauperatum</i>	Clover		X			X
<i>Uropappus lindleyi</i>	Silver puffs		X	X	X	X
<i>Urtica urens</i> *	Dwarf nettle					
<i>Venegasia carpesioides</i>	Canyon sunflower				X	X
<i>Verbena lasiostachys</i>	Western Verbena		X		X	X
<i>Vicia ludoviciana</i> *	Deerpea vetch		X		X	X
<i>Viguiera laciniata</i>	San Diego sunflower	4 1-2-1		X		X
<i>Viola pedunculata</i>	Johnny jump-ups		X	X	X	X
<i>Vulpia myuros</i> *	Foxtail fescue		X			X
<i>Washingtonia filifera</i>	California fan palm		X	X	X	X
<i>Xanthium strumarium</i> *	Cocklebur		X		X	X
<i>Xylococcus bicolor</i>	Mission manzanita		X	X	X	X
<i>Yucca schidigera</i>	Mojave Yucca		X		X	X
<i>Yucca whipplei</i>	Our lord's candle		X	X	X	X
<i>Zygadenus fremontii</i>	Fremont's Camas		X	X	X	X

* Denotes non-native plant

Appendix C. Animal Species Observed

Species Name	Scientific Name
Invertebrates	
Perplexing hairstreak	<i>Callophrys affinis perplexa</i>
Behr's metalmark	<i>Apodemia mormo virgulti</i>
Southern blue	<i>Glaucopsyche lygdamus australis</i>
California ringlet	<i>Coenonympha californica</i>
Lorquin's admiral	<i>Liminitis lorquini lorquini</i>
Anise swallowtail	<i>Papilio zelicaon zelicaon</i>
Sara orangetip	<i>Anthocharis sara</i>
Velvet Ant (red variety)	
Dragonfly	Family Libellulidae
Harvester ants	Family Formicidae
Jerusalem cricket	
Stink bugs	
Centipede	
Millipede	
Dung beetle	
Wholly bears	
Scorpions	
Ant	<i>Camponatus</i> sp
Ant	<i>Crematogaster californica</i>
Ant	<i>Dorymyrmex insanus</i>
Argentine ant	<i>Linepithema humile</i>
Harvester ant	<i>Messor andrei</i>
Ant	<i>Myrmecocystus testaceus</i>
Ant	<i>Pheidole vistana</i>
Ant	<i>Prenolepis imparia</i>
Ant	<i>Solenopsis xyleni</i>
Ant	<i>Tapinoma sessile</i>
Mammals	
San Diego desert woodrat	<i>Neotoma lepida intermedia</i>
Deer mouse	<i>Peromyscus maniculatus</i>
Cactus mouse	<i>Peromyscus eremicus</i>
San Diego pocket mouse	<i>Chaetodipus fallax fallax</i>
Western harvest mouse	<i>Reithrodontomys megalotis</i>
Delzura kangaroo rat	<i>Dipodomys simulens</i>
Ornate shrew	<i>Sorex ornatus</i>
Cottontail rabbit	<i>Sylvilagus audubonii</i>
Coyote	<i>Canis latrans</i>
California ground squirrel	<i>Spermophilus beecheyi</i>
Black-tailed jack rabbit	<i>Lepus californicus bennettii</i>
Mule deer	<i>Odocoileus hemionus</i>
Mountain lion	<i>Felis concolor</i>

Herpetofauna

Tree frog	<i>Hyla regilla</i>
Western spadefoot toad	<i>Scaphiopus hammondi</i>
Alligator lizard	<i>Elgaria multicarinatus</i>
Western whiptail	<i>Cnemidophorus tigris</i>
Orange-throated whiptail	<i>Cnemidophorus hyperythrus beldingi</i>
Side-blotched lizard	<i>Uta stansburiana</i>
Western fence lizard	<i>Sceloporus occidentalis</i>
San Diego horned lizard	<i>Phrynosoma coronatum blainvillii</i>
Black-headed snake	<i>Tantilla planiceps</i>
Southern pacific rattlesnake	<i>Crotalus viridis</i>
Red-diamondback rattlesnake	<i>Crotalus exsul (= ruber ruber)</i>
Gopher snake	<i>Pituophis catenifer annectens</i>
California whipsnake	<i>Masticophis lateralis lateralis</i>
Gilbert's skink	<i>Eumeces gilberti rubricaudatus</i>
Western skink	<i>Eumeces skiltonianus</i>

Birds

Acorn woodpecker	<i>Melanerpes formicivorus bairdi</i>
American Crow	<i>Corvus brachyrhynchos</i>
American kestrel	<i>Falco sparverius</i>
Anna's hummingbird	<i>Calypte anna</i>
Ash-throated flycatcher	<i>Myiarchus cinerascens cinerascens</i>
Bell's sage sparrow	<i>Amphispiza belli belli</i>
Belted kingfisher	<i>Ceryle alcyon</i>
Bewick's wren	<i>Thyromanes bewickii</i>
Black and white warbler	<i>Mniotilta varia</i>
Black phoebe	<i>Sayornis nigricans</i>
Blue grosbeak	<i>Passerina caerulea salicaria</i>
Blue-gray gnatcatcher	<i>Poliophtila caerulea</i>
Brown-headed cowbird	<i>Molothrus ater</i>
Bushtit	<i>Psaltiriparus minimus minimus</i>
California gnatcatcher	<i>Poliophtila californica californica</i>
California quail	<i>Callipepla californica californica</i>
California thrasher	<i>Toxosoma redivivum redivivum</i>
California towhee	<i>Pipilo crissalis</i>
Canyon wren	<i>Salpinctes mexicanus conspersus</i>
Cassin's kingbird	<i>Tyrannus vociferans vociferans</i>
Cliff swallow	<i>Hirundo pyrrhonota tachina</i>
Common raven	<i>Corvus corax</i>
Common yellowthroat	<i>Geothlypis trichas</i>
Cooper's hawk	<i>Accipiter cooperii</i>
Costa's hummingbird	<i>Archilochus costae</i>
Golden eagle	<i>Aquila chrysaetos canadensis</i>
Grasshopper sparrow	<i>Ammodramus savannarum perpallidus</i>
Great blue heron	<i>Ardea herodias herodias</i>
Great egret	<i>Ardea alba</i>

Greater roadrunner	<i>Geococcyx californianus</i>
Great-horned owl	<i>Bubo virginianus pacificus</i>
Green heron	<i>Butorides striatus</i>
Hooded oriole	<i>Icterus cucullatus nelsoni</i>
Horned lark	<i>Eremophila alpestris</i>
House finch	<i>Carpodacus mexicanus frontalis</i>
House wren	<i>Troglodytes aedon parkmanii</i>
Killdeer	<i>Charadrius vociferous vociferus</i>
Lazuli bunting	<i>Passerina amoena</i>
Least bell's vireo	<i>Vireo bellii pusillus</i>
Lesser goldfinch	<i>Carduelis psaltria hesperophilus</i>
Loggerhead shrike	<i>Lanius ludovicianus</i>
Mallard	<i>Anas platyrhynchos platyrhynchos</i>
Morning dove	<i>Zenaida macroura marginella</i>
Northern harrier	<i>Circus cyaneus</i>
Northern mockingbird	<i>Mimus polyglottos polyglottus</i>
Nuttal's woodpecker	<i>Dendrocopos nuttallii</i>
Orange-crowned warbler	<i>Vermivora celata</i>
Osprey	<i>Pandion haliaetus carolinensis</i>
Pacific-sloped flycatcher	<i>Empidonax difficilis</i>
Poor-will	<i>Phalaenoptilus nuttallii</i>
Red-shouldered hawk	<i>Buteo lineatus elegans</i>
Red-tailed hawk	<i>Buteo jamaicensis</i>
Rock wren	<i>Salpinctes obsoletus obsoletus</i>
Rufous-crowned sparrow	<i>Aimophia ruficeps canescens</i>
Say's phoebe	<i>Sayornis saya</i>
Sharp-shinned hawk	<i>Accipiter striatus velox</i>
Song sparrow	<i>Melospiza melodia</i>
Spotted towhee	<i>Pipilo crissalis</i>
Turkey vulture	<i>Cathartes aura</i>
Western kingbird	<i>Tyrannus verticalis</i>
Western meadowlark	<i>Sturnella neglecta</i>
Western scrub jay	<i>Aphelocoma californica</i>
White-tailed kite	<i>Elanus leucurus</i>
White-crowned sparrow	<i>Zonotrichia leucophrys</i>
White-throated swift	<i>Aeronautus saxatalis</i>
Wrentit	<i>Chamaea fasciata henshawi</i>
Yellow warbler	<i>Dendroica petechia</i>
Yellow-breasted chat	<i>Icteria verens auricollis</i>

Appendix D.

Preserve Management Qualifications (Resumes)

MARKUS SPIEGELBERG

Preserve Manager, Ecologist, Wildlife Biologist

- Education/** Master of Science, Biology, San Diego State University, 1997
- Certifications** *Thesis:* Extra-pair paternity in least Bell's vireo
Bachelor of Arts, Environmental Science, University of California, Berkeley, 1990
Thesis: Sediment survey in the Montclair Park Pond
- Permits** U.S. Fish and Wildlife Service Permit #PRT-787924 for California gnatcatcher, southwestern willow flycatcher (survey and nest monitor), and least Bell's vireo (nest monitoring), and remove cowbird eggs and chicks from these species. Permitted to trap San Bernadino kangaroo rat
U.S. Fish and Wildlife Service Permit #PRT-787924 to survey for quino checkerspot butterfly
California Department of Fish and Game Scientific Collector's Permit (#801082) covering herp pit-arrays, small mammal trapping and cowbird egg and chick removal
Memorandum of Understanding with the California Department of Fish and Game for California gnatcatcher, least Bell's vireo, and willow flycatcher to nest monitor and remove cowbird eggs and chicks
- Experience** 15 years of experience

Center for Natural Lands Management

1999-present, Preserve Manager

I oversee and participate in management activities of 2,500 acres of dedicated natural open space located in San Diego County. I work with several endangered plant and animal species, develop and implement research programs and activities, and remove non-native plants and animals. I produce management plans, annual reports, work plans and budgets.

Center for Natural Lands Management

March 2002-March 2003, Southern California Regional Director

Oversight of CNLM preserve management in western Riverside County which included over 20 preserves and 5 employees.

RECON Environmental Inc.

1997-1999, Ecologist, Wildlife Biologist, Consultant

Worked as a biological consultant. Surveyed and monitored sensitive wildlife species and consulted with land owners and federal and state agencies.

MS Biological Services

1996-1999, Independent Wildlife Biologist

San Diego State University, Department of Biology

1995-1996, Wildlife Biologist

Research on least Bell's vireo including surveys, nest monitoring, mist netting, DNA fingerprinting, and data analysis.

University of California, Riverside

1996, Wildlife Biologist

Small mammal trapping in the spring and fall at Torrey Pines State Park, Pauma Valley, Point Loma, Sweetwater Preserve, and San Pasqual.

California Department of Transportation, District 11

1992-1995 and 1996-1997, Contract Ecologist

San Diego State University, Department of Biology

1995, Teaching Assistant

BioSystems Analysis, Inc.

1992, Intern

Parks and Recreation, Oakland

1989-1990, Environmental Technician

**CNLM
Management
Plans**

2005-2010 Management Plan for the Rancho La Costa Habitat Conservation Area

Habitat Management Plan for the La Costa Villages Preserve, August 2001

2005-2010 Management Plan for the Manchester Habitat Conservation Area

2005-2010 Management Plan for the Woodridge Habitat Conservation Area

2000-2004 Management Plan for the Woodridge Habitat Conservation Area

2001-2004 Management Plan for the Wilmont Habitat Conservation Area

2002-2005 Preliminary Management Plan for the Morro Hills Preserve

2002-2006 Management Plan for the Kelly Ranch Preserve

**Sensitive
Species
Focused
Surveys and
Reports**

Participated in surveys of over 1,000 vernal pools for San Diego fairy shrimp, Riverside fairy shrimp and versatile fairy shrimp at U.S. Marine Base, Camp Pendleton, San Diego

Murphy Canyon/Chollas Heights naval family housing vernal pool preserve fairy shrimp surveys

Research Projects

1998 and 1999 field surveys and progress reports for the coastal California gnatcatcher on-site monitoring study for the Rancho del Rey SPA III development in Chula Vista

Del Mar sand aster directed survey (Caltrans District 11)

California gnatcatcher surveys for Interstate 5/805 widening (Caltrans District 11)

Light-footed clapper rail surveys in Peñasquitos Lagoon (Caltrans District 11)

California gnatcatcher surveys at selected potential Caltrans mitigation sites such as Lawrence Canyon, Pilgrim Creek, Blue Sky Ranch, Willow Glen, and Lake Hodges in addition to numerous other smaller sites within the Poway, Oceanside, and Fallbrook areas (Caltrans District 11)

Coastal cactus wren territory mapping and surveys for interchange improvements at State Route 54 and Briarwood Drive and Sweetwater Road (Caltrans District 11)

Currently conducting several research projects on CNLM lands in San Diego County. Research includes studying the effects of fragmentation on bird and small mammal populations. Also includes a study of the reproductive success of least Bell's vireo in small, fragmented patches of willow woodland.

Work Plan for Effects of Noise on Least Bell's Vireo at MCAS Pendleton (co-author)

Work Plan for Effects of Noise on Coastal California Gnatcatcher at MCAS Miramar (co-author)

Field Surveys and First-Year Study Report of the Effects of Noise on Least Bell's Vireo at MCAS Camp Pendleton

Field Surveys and First-Year Study Report of the Effects of Noise on Coastal California Gnatcatcher at MCAS Miramar

Habitat Restoration Plans and Monitoring Programs

Bonita Road Mitigation Site, Caltrans

First Annual Report for Bonita Road Mitigation Site, Caltrans

Selected Projects

Biological Resources Inventory and Analysis Reports

Otay Water District Pointe Reservoirs, City of Chula Vista

Mission Trails Business Park, City of San Diego

Sunwest II, City of Oceanside

Beyer Hills, City of San Diego

Sorrento Pointe, City of San Diego

Biological Assessment: Oceanside Detention Basins, City of Oceanside

Intersection 606 and Rigsbee Parcel, City of San Diego

Shaw and Lorenz Parcels, City of San Diego

Gildred Property, San Diego County

East J Street School Site, City of Chula Vista

Brandywine Site, City of Chula Vista

Interstate 15 Widening at Pomerado, Caltrans

I-15/Balboa Pipe Realignment, Caltrans

SR-67 Pavement Overlays, Caltrans

- Publications** Sediment Survey in the Montclair Park Pond. In *Conservation and Restoration in San Francisco California*, edited by D. Sloan. U.C. Berkeley. 1990.
An Investigation of Extra-pair Paternity in Least Bell's Vireo, *Vireo bellii pusillus*. Master's Thesis. San Diego State University.
- Workshops and Symposiums** Cuyamacca Fire Conference, 2004. Effects of the Cedar Fire in San Diego on the conifer forests of Cuyamacca State Park.
- Wildlife Society Symposium 2002, Riverside, California
Declining Reptiles and Amphibians, Parts 1 & 2, San Diego Natural History Museum, 1997, 1998
Participant in the Avifauna Workshop for the Coachella Valley MSHCP, 1997, and General Planning Meeting, 1998
Least Bell's vireo and southwestern willow flycatcher recovery meetings, 1995-1998
Fifth Mountain Lion Workshop, 1996
Willow Flycatcher Workshop, San Diego Natural History Museum, 1996
Calgnat '95, symposium on the biology of the California gnatcatcher, 1995
Exotic Pest Plant Symposium, 1994
Bird Banding Workshop, Inyo County, 1993
- Grants and Fellowships** Sigma Xi National Chapter, 1995
Sigma Xi San Diego Chapter, 1996