

Volume II

Final MHCP Plan

Biological Analysis and Permitting Conditions

Prepared for:

Multiple Habitat Conservation Program

Administered by:



**for the Cities of Carlsbad, Encinitas,
Escondido, Oceanside, San Marcos,
Solana Beach, and Vista**

March 2003

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Prepared by:

**AMEC Earth & Environmental, Inc.
Conservation Biology Institute**

March 2003



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SECTION 1.0

INTRODUCTION AND OBJECTIVES

1.0 INTRODUCTION AND OBJECTIVES

This biological analysis evaluates conservation of 29 plant and 48 animal species targeted for protection by the Multiple Habitat Conservation Program (MHCP) (Table 1-1). It reflects our best assessment of how the MHCP will conserve these species and their habitats based on the currently proposed preserve configuration, conservation levels, and conservation policies. The analysis is based on the October 2002 Focused Planning Area (FPA) and assumptions about how conservation will occur under city subarea plans. It comprehensively updates results of the analysis presented in the MHCP Public Review Draft, which analyzed the May 1999 FPA, and incorporates changes based on comments received during public review. It also reflects a major update to the species occurrence database during 2002, as well as some refinements in basic conservation and management assumptions. To the degree possible, the analytical assumptions reflect current city subarea plan policies, which continue to evolve during negotiations with the wildlife agencies, the California Coastal Commission, and other entities. Among other things, this analysis assumes that area-specific management directives will be developed and implemented to ensure conservation of covered species.

Results of this analysis are being used by the wildlife agencies to evaluate species coverage for the issuance of take authorizations to each city that submits a subarea plan with the MHCP. It was prepared by biologists at the Conservation Biology Institute (CBI) and AMEC. Although prepared with input and advice from the U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Game (CDFG), Biological Resources Division of the U.S. Geological Survey (USGS BRD), and other agencies, it does not necessarily represent the views of these agencies. Rather, it presents an objective and independent assessment by CBI and AMEC biologists of the preserve system proposed at this time by the participating MHCP cities.

Table 1-1

MHCP SPECIES EVALUATED FOR COVERAGE

Scientific Name	Common Name	Status ¹	CNPS, RED List, Code ²	Habitat ³
Plants				
<i>Acanthomintha ilicifolia</i>	San Diego thorn-mint	FT/CE	1B, 2-3-2	G, CSS
<i>Ambrosia pumila</i>	San Diego ambrosia	FE/	1B, 3-3-2	CSS
<i>Aphanisma blitoides</i>	Aphanisma	FSC */	1B, 2-2-2	MSS
<i>Arctostaphylos glandulosa</i> ssp. <i>crassifolia</i>	Del Mar manzanita	FE/	1B, 3-3-2	SMC
<i>Baccharis vanessae</i>	Encinitas baccharis	FT/CE	1B, 2-3-3	CHP
<i>Brodiaea filifolia</i>	Thread-leaved brodiaea	FT/CE	1B, 3-3-3	VP, G, seeps, wet meadows
<i>Brodiaea orcuttii</i>	Orcutt's brodiaea	FSC */	1B, 1-3-2	VP, G, seeps, wet meadows
<i>Ceanothus verrucosus</i>	Wart-stemmed ceanothus	FSC */	2, 2-2-1	CHP, SMC
<i>Chorizanthe orcuttiana</i>	Orcutt's spineflower	FE/CE	1B, 3-3-3	SMC
<i>Comarostaphylis diversifolia</i> ssp. <i>diversifolia</i>	Summer holly	FSC */	1B, 2-2-2	CHP
<i>Corethrogyne filaginifolia</i> var. <i>linifolia</i>	Del Mar Mesa sand aster	FSC †/	1B, 3-3-3	CSS, CHP (openings), SMC
<i>Dudleya blochmaniae</i> ssp. <i>blochmaniae</i>	Blochman's dudleya	FSC */	1B, 2-3-2	CBS
<i>Dudleya blochmaniae</i> ssp. <i>brevifolia</i>	Short-leaved dudleya	FSC †/CE	1B, 3-3-3	SMC
<i>Dudleya variegata</i>	Variegated dudleya	FSC */	1B, 2-2-2	CSS
<i>Dudleya viscida</i>	Sticky dudleya	FSC */	1B, 2-2-3	CSS, CHP
<i>Eryngium aristulatum</i> var. <i>parishii</i>	San Diego button-celery	FE/CE	1B, 2-3-2	VP (clay)
<i>Euphorbia misera</i>	Cliff spurge	None	2, 2-2-1	MSS, CBS
<i>Ferocactus viridescens</i>	San Diego barrel cactus	FSC */	2, 1-3-1	CSS, CHP, MSS
<i>Hazardia orcuttii</i>	Orcutt's hazardia	FSC */CT	1B, 3-3-2	CHP
<i>Iva hayesiana</i>	San Diego marsh-elder	FSC */	2, 2-2-1	AM, RP
<i>Lotus nuttallianus</i>	Nuttall's lotus	FSC */	1B, 3-3-2	Coastal strand/dune
<i>Muilla clevelandii</i>	San Diego goldenstar	FSC */	1B, 2-3-2	G, CHP, CSS (openings)
<i>Myosurus minimus</i> ssp. <i>apus</i>	Little mousetail	FSC */	3, 2-3-2	VP, AM
<i>Navarretia fossalis</i>	Spreading navarretia	FT/	1B, 2-3-2	VP
<i>Orcuttia californica</i>	California Orcutt grass	FE/CE	1B, 3-3-2	VP
<i>Pinus torreyana</i> ssp. <i>torreyana</i>	Torrey pine	FSC */	1B, 3-2-3	SMC, Torrey Pine forest
<i>Quercus dumosa</i>	Nuttall's scrub oak	FSC */	1B, 2-3-2	SMC
<i>Quercus engelmannii</i>	Engelmann oak	None	4, 1-2-2	CHP, CLOW, G
<i>Tetradococcus dioicus</i>	Parry's tetradococcus	FSC */	1B, 3-2-2	CHP, CSS

Table 1-1 (Continued)

MHCP SPECIES EVALUATED FOR COVERAGE

Scientific Name	Common Name	Status ¹	CNPS, RED List, Code ²	Habitat ³
Invertebrates				
<i>Streptocephalus woottoni</i>	Riverside fairy shrimp	FE/		VP
<i>Branchinecta sandiegoensis</i>	San Diego fairy shrimp	FE/		VP
<i>Cicindela hirticollis gravida</i>	Sandy beach tiger beetle	FSC */		Sandy beaches
<i>Cicindela latesignata obliviosa</i>	Oblivious tiger beetle	FSC */		Mudflats
<i>Coelus globosus</i>	Globose dune beetle	FSC */		Coastal dunes
<i>Euphyes vestries harbisoni</i>	Harbison's dun skipper	FSC */		RW, RS, OW (rip)
<i>Panoquina errans</i>	Salt marsh skipper	FSC */		SM
<i>Lycaena hermes</i>	Hermes copper	FSC */		CSS, CHP
<i>Euphydryas editha quino</i>	Quino checkerspot	FE/		CSS, VP, NG
Amphibians and Reptiles				
<i>Scaphiopus [Spea] hammondii</i>	Western spadefoot toad	FSC*/CSC		Aquatic, G
<i>Bufo californicus</i>	Arroyo toad	FE/CSC		CSS, CHP (along streams)
<i>Rana aurora draytonii</i>	California red-legged frog	FT/CSC		Aquatic, RP
<i>Clemmys marmorata pallida</i>	Southwestern pond turtle	FSC */CSC		Aquatic, RP
<i>Phrynosoma coronatum blainvillei</i>	San Diego horned lizard	FSC */CSC		CSS, CHP
<i>Cnemidophorus hyperythrus beldingi</i>	Orange-throated whiptail	FSC */CSC		CSS, CHP, G
Birds				
<i>Pelecanus occidentalis californicus</i>	California brown pelican	FE/CE-FP		Open water
<i>Plegadis chihi</i>	White-faced ibis	FSC */CSC		FWM, estuaries, SM
<i>Circus cyaneus</i>	Northern harrier	/CSC		G, SM, FWM, AG, open CSS
<i>Accipiter cooperii</i>	Cooper's hawk	/CSC		RW, OW (breeding)
<i>Pandion haliaetus</i>	Osprey	/CSC		Open water, wetland
<i>Aquila chrysaetos</i>	Golden eagle	BEPA/CSC-FP		CSS, CHP, G
<i>Falco peregrinus anatum</i>	Peregrine falcon	/CE-FP		G, AG fields, cliffs, coastal RP
<i>Rallus longirostris levipes</i>	Light-footed clapper rail	FE/CE-FP		SM
<i>Charadrius alexandrinus nivosus</i>	Western snowy plover	FT/CSC		Saltflats, mudflats, sandy beach, dunes
<i>Numenius americanus</i>	Long-billed curlew	FSC */CSC		SM, mudflats, G, fallow AG

Table 1-1 (Continued)

MHCP SPECIES EVALUATED FOR COVERAGE

Scientific Name	Common Name	Status¹	CNPS, RED List, Code²	Habitat³
Birds (Continued)				
<i>Sterna elegans</i>	Elegant tern	FSC */CSC		SM, shoreline, estuarine/intertidal
<i>Sterna antillarum browni</i>	California least tern	FE/CE-FP		Coastal strand, mudflats, saltflats
<i>Athene cunicularia hypugaea</i>	Burrowing owl	FSC */CSC		G, coastal strand, AG
<i>Empidonax traillii extimus</i>	Southwestern willow flycatcher	FE/CE		RW
<i>Vireo bellii pusillus</i>	Least Bell's vireo	FE/CE		RW
<i>Campylorhynchus brunneicapillus cousei</i>	Coastal cactus wren	FSC */CSC		CSS, cactus patches
<i>Polioptila californica californica</i>	Coastal California gnatcatcher	FT/CSC		CSS
<i>Sialia mexicana</i>	Western bluebird	None		OW (edges), G
<i>Icteria virens</i>	Yellow-breasted chat	/CSC		RW
<i>Aimophila ruficeps canescens</i>	Rufous-crowned sparrow	FSC */CSC		CSS
<i>Passerculus sandwichensis beldingi</i>	Belding's savannah sparrow	FSC */CE		SM
<i>Passerculus sandwichensis rostratus</i>	Large-billed savannah sparrow	FSC */CSC		SM
<i>Amphispiza belli belli</i>	Bell's sage sparrow	FSC */CSC		CSS, CHP
<i>Ammodramus savannarum</i>	Grasshopper sparrow	None		G
<i>Agelaius tricolor</i>	Tricolored blackbird	FSC */CSC		FWM, G, AG
Mammals				
<i>Corynorhinus townsendii pallescens</i>	Townsend's western big-eared bat	FSC */CSC		Caves, mines, buildings, OW, RW, CHP
<i>Eumops perotis californicus</i>	California mastiff bat	FSC */CSC		Cliffs, crevices, CHP, G, CSS
<i>Dipodomys stephensi</i>	Stephens' kangaroo rat	FE/CT		G, sparse CSS
<i>Perognathus longimembris pacificus</i>	Pacific pocket mouse	FE/CSC		Sparse CSS, G, ruderal
<i>Chaetodipus fallax fallax</i>	Northwestern San Diego pocket mouse	FSC */CSC		CSS, CHP, G
<i>Lepus californicus bennettii</i>	San Diego black-tailed jackrabbit	FSC */CSC		CSS, G, CHP
<i>Felis concolor</i>	Mountain lion	CA protected		CSS, CHP, RW
<i>Odocoileus hemionus fuliginata</i>	Southern mule deer	CA game species		CHP, CSS, RW

Table 1-1 (Continued)

MHCP SPECIES EVALUATED FOR COVERAGE

¹Status (Federal/State)	³Habitat (Holland 1986)
FE = Federally endangered	AG = Agriculture
PE = Proposed for federal listing as endangered	AM = Alkali marsh
FT = Federally threatened	CB = Coastal bluff scrub
PT = Proposed for federal listing as threatened	CHP = Chaparral
C = Candidate for federal listing	CLOW = Coast live oak woodland
BEPA = Bald Eagle Protection Act	CSS = Coastal sage scrub
CE = State endangered	FWM = Freshwater marsh
CT = State threatened	G = Grassland
CSC = State Species of Special Concern	MSS = Maritime succulent scrub
FP = State fully protected	OW = Oak woodland
FSC * = Federal Species of Concern; formerly Category 2 or Category 3 candidate or proposed for federal listing	RF = Riparian forest
FSC † = Federal Species of Concern; proposed rule to list as endangered or threatened has been withdrawn	RP = Riparian
protected = moratorium on hunting	RS = Riparian scrub
none = no federal or state status	RW = Riparian woodland
	SM = Salt marsh
	SMC = Southern maritime chaparral
	VP = Vernal pool

²California Native Plant Society (CNPS) Status

List of Species Designation

- 1B = Rare or endangered in California and elsewhere (meets CDFG criteria for rare or endangered listing)
- 2 = Rare or endangered in California, more common elsewhere
- 3 = Plants about which more information is needed
- 4 = Plants of limited distribution

R-E-D Code

- R - Rarity
 - 1 = Rare, but found in sufficient numbers and distributed widely enough that the potential for extinction or extirpation is low
 - 2 = Occurrences confined to several populations or one extended population
 - 3 = Occurrence limited to one or a few highly restricted populations, or present in such small numbers that it is seldom reported
- E - Endangerment
 - 1 = Not endangered
 - 2 = Endangered in a portion of its range
 - 3 = Endangered throughout its range
- D - Distribution
 - 1 = More or less widespread outside California
 - 2 = Rare outside California
 - 3 = Endemic to California

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SECTION 2.0

METHODS

2.0 METHODS

The MHCP jurisdictions identified FPAs within which the bulk of the MHCP preserve system will be assembled (Figure 2-1). The FPAs comprise a combination of “hard line” preserves, indicating lands that will be conserved and managed for biological resources, and “soft line” planning areas, within which preserve areas will ultimately be delineated and managed based on further data and planning. Some areas outside of FPAs may also be conserved, especially wetland vegetation communities subject to the MHCP no net loss policy, but preserve management may not be assured outside the FPA. The analysis examines the level of conservation and take of biological resources expected under the plan, and how well the proposed MHCP preserve system is expected to achieve its biological goals.

The overall process for analyzing the MHCP preserve involved several major steps, each of which has had several iterations during the planning and analysis process:

1. Review available data, and refine and update the geographic information system (GIS) database for biological resources and preserve areas.
2. Use the GIS to quantify expected levels of conservation and take for vegetation communities and species throughout the study area and within each participating city.
3. Evaluate preserve viability for each of the 77 MHCP species, guided in large part by the MHCP Biological Goals, Standards, and Guidelines (Ogden 1998) as updated by information provided in this document.
4. Specify management actions that must be implemented to assure adequate conservation.

This section describes the methods involved in each of these major steps. First, we describe recent upgrades and refinements of the MHCP GIS database made prior to performing the biological analysis. Second, we describe the numerous calculation assumptions and algorithms that were used to quantify levels of conservation and take for acreages of vegetation communities, numbers of species location points, critical population areas, and so forth. Third, we discuss the detailed steps involved in interpreting this quantitative information—along with all other relevant biological and management information discussed in the standards and guidelines—to assess how the preserve would affect species viability and recovery. This step, species evaluation, integrates a large and complex body of qualitative and quantitative information, based on the species biology and other information. For some species, such as the California gnatcatcher, additional computer modeling efforts were involved, as detailed below and in Appendix A.

2.1 DATABASE REFINEMENTS

The MHCP biological database was originally created by Dudek & Associates, Inc., in 1994, and has been periodically refined and updated throughout the planning process (see Section 2.2 of the MHCP, Volume 1). Prior to this biological analysis, additional refinements were made to ensure that the database was as accurate as feasible in depicting the distribution of biological resources, planning boundaries, and other relevant features. This was essential to ensure that the GIS could be used, to the degree feasible, to accurately quantify expected levels of conservation and take under the plan.

2.1.1 Vegetation

In 1998, the vegetation map was refined in some areas based on recent projects that removed vegetation or where ongoing subarea planning provided more refined vegetation maps. Refined mapping was generally based on aerial reconnaissance, with limited field verification in Encinitas, Carlsbad, Escondido and Oceanside. In most cases, these changes were subtle and incremental, with no large discrepancies with the previous MHCP vegetation coverage. However, these changes increased the mapping detail and accuracy, and updated areas where ecological succession or other processes had changed vegetation composition or structure in recent years. For example, some areas formerly mapped as annual grasslands have succeeded in recent years to coastal sage scrub, and other areas formerly mapped as disturbed or agriculture have succeeded to annual grasslands or other vegetation communities. Figure 2-2 shows the vegetation map used in this analysis.

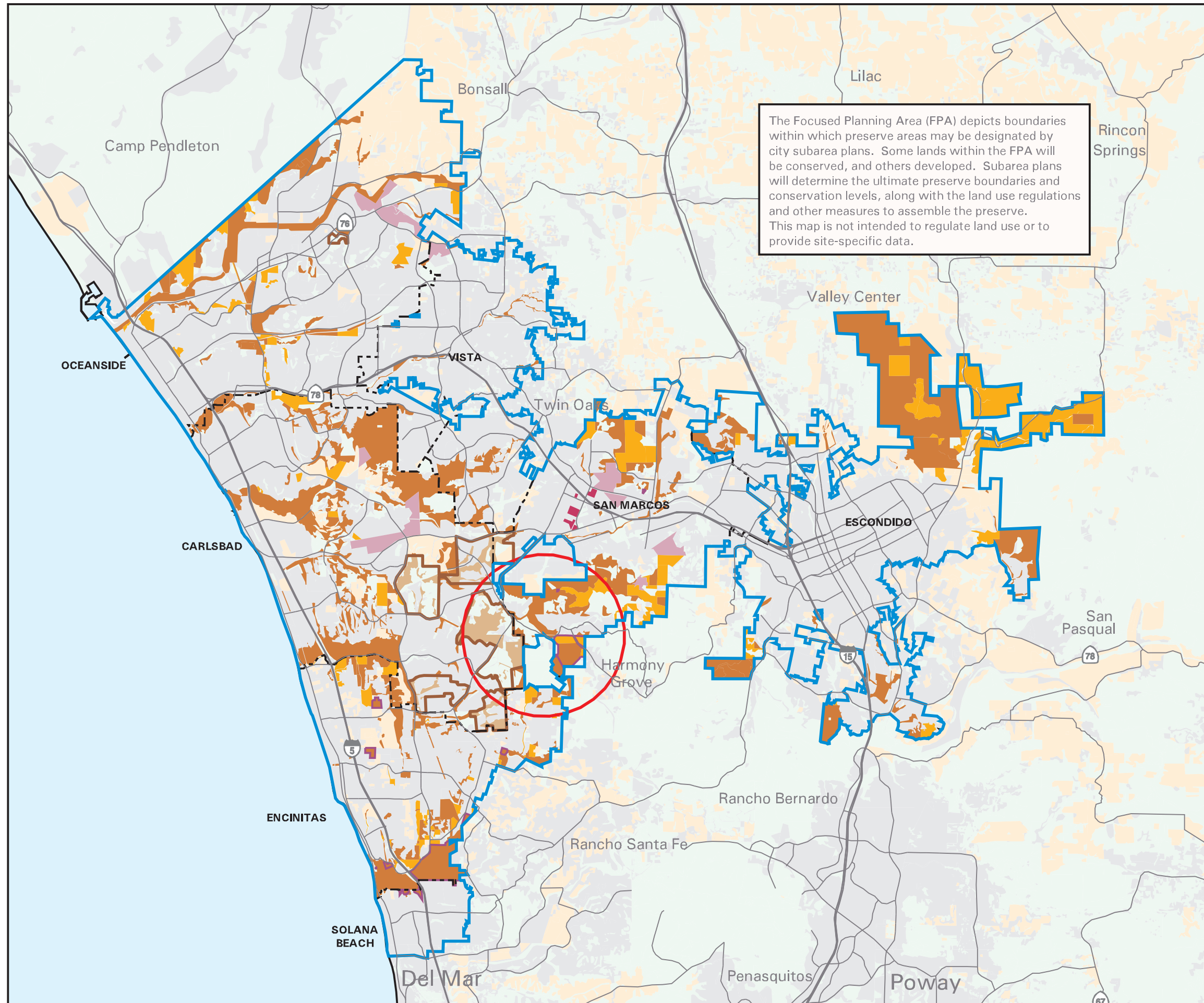
2.1.2 Species Locations

Additional species location points were added to the database in 1998-99, and again in 2002, based on recent biological surveys in the study area. New data were acquired from recent biological technical reports on file with USFWS, CDFG, and the participating MHCP cities. In some cases, new information was also incorporated based on comments received on the Public Review Draft, where such data could be corroborated. In addition, substantial new bird location data were obtained from the San Diego Bird Atlas project, care of the San Diego Natural History Museum.

All species location points in the database were overlaid on the revised vegetation maps and systematically reviewed for accuracy. Species points that fell outside habitat areas (e.g., in developed areas) were investigated closely. Where possible, original data sources were consulted to determine input mapping scales and accuracy of the original mapping, and to determine whether the location was likely still extant. Where appropriate, point locations that fell within developed areas were deleted or modified as follows:

1. If the point represented a species location that no longer exists (e.g., was removed by development), it was coded in the GIS as deleted. Generally, points more than about 200 feet from potential habitat (i.e., natural vegetation) were deleted. This reflects the level of mapping imprecision reasonably expected based on the MHCP mapping scale of 1:24000 (1 inch = 2,000 feet).

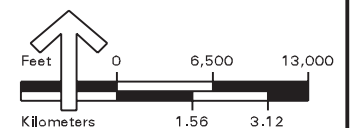
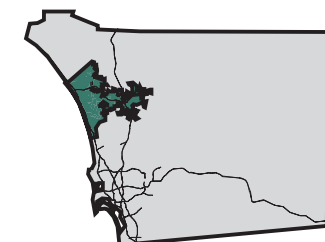
Figure 2-1 Focused Planning Area MHCP Study Area



The Focused Planning Area (FPA) depicts boundaries within which preserve areas may be designated by city subarea plans. Some lands within the FPA will be conserved, and others developed. Subarea plans will determine the ultimate preserve boundaries and conservation levels, along with the land use regulations and other measures to assemble the preserve. This map is not intended to regulate land use or to provide site-specific data.

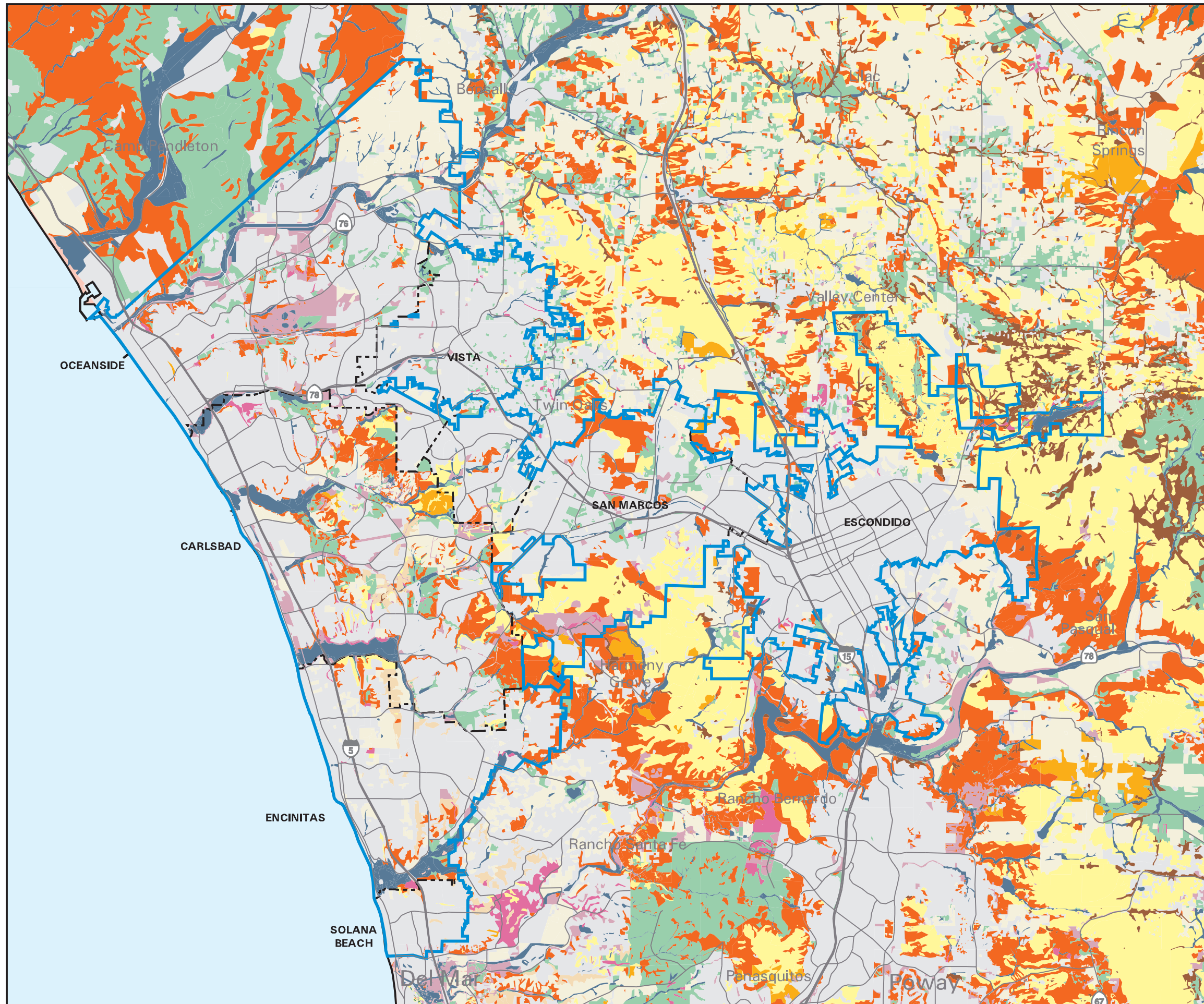
-  Hardline Areas (90% to 100% Conservation)
-  Softline Areas (Less than 90% Conservation)
-  Hardline Preserves on Already Permitted Properties
-  Not Part of Subarea Plans
-  Major Amendment Areas
-  Natural Habitats (Outside FPA)
-  Agricultural Land
-  Developed/Disturbed Land
-  General Area for Core Gnatcatcher Conservation (USFWS Circle)
-  County-owned FPA land
-  Projects Already Permitted
-  Generalized Subarea Plan Boundary
-  MHCP Boundary

SOURCE: Local Jurisdictions in MHCP Study Area



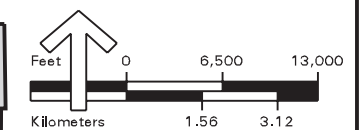
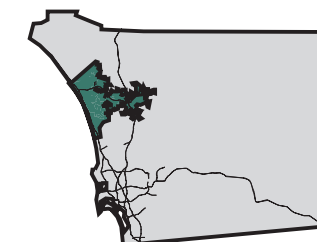
January 16, 2003

Figure 2-2 Vegetation Communities MHCP Study Area



- Dunes and Beaches
- Coastal Sage Scrub
- Chaparral
- Southern Maritime Chaparral
- Coastal Sage Scrub/Chaparral Mix
- Grassland
- Riparian/Wetlands
- Oak Woodlands
- Eucalyptus Woodlands
- Agricultural Land
- Disturbed Land
- Developed
- Generalized Subarea Plan Boundary
- MHCP Boundary

SOURCE: 1995 Vegetation Inventory, SANDAG



2. If the point fell within about 200 feet of habitat, it was considered potentially extant but imprecisely mapped during original mapping. Where possible, original sources or biologists familiar with the site were then consulted, and appropriate adjustments were made to the point location. Where original mapping could not be verified, some points were moved to lie just inside the nearest suitable habitat boundary and assumed extant, based on reasonable biological assumptions. For example, if a point for a highly mobile animal was recorded near natural vegetation, the point was considered representative of use by the species within the adjacent natural area, and the point was shifted into that habitat. However, in no case was a point shifted more than 300 feet in the GIS database. The purpose of shifting points into the nearest reasonable habitat area was to avoid artificially discounting species locations as already removed by development, when the species may still be extant and worthy of consideration in conservation and management plans.

2.1.3 Biological Core and Linkage Areas

In 1994, biologists mapped a biological core and linkage area (BCLA), which encompassed the best remaining habitat areas, including all the largest remaining blocks of habitat and critical linkages between them, based on the configuration of extant natural vegetation communities, results of the composite habitat quality map, the known or likely occurrence of sensitive species, topographic connectivity, and other biological considerations. This BCLA was also updated slightly in 1998-99 based on the revised biological database and other new information. In particular, former areas of the BCLA that had become developed were removed. In addition, some small areas of the former BCLA were deleted based on new information demonstrating that those areas do not support important biological resources or otherwise contribute to preserve design. In a few instances, BCLA boundaries were adjusted slightly to more precisely include critical resource areas (e.g., vernal pools) or to reflect recent revisions to vegetation boundaries. The BCLA has not been updated since 1999, because the 1999 version is still considered to represent a solid basis for analysis, and because removing any additional areas that were subsequently developed would inappropriately shift the baseline for assessing habitat lost during the interim of plan development. Figure 2-3 illustrates the BCLA used in this analysis.

2.1.4 Study Area Boundary Adjustments

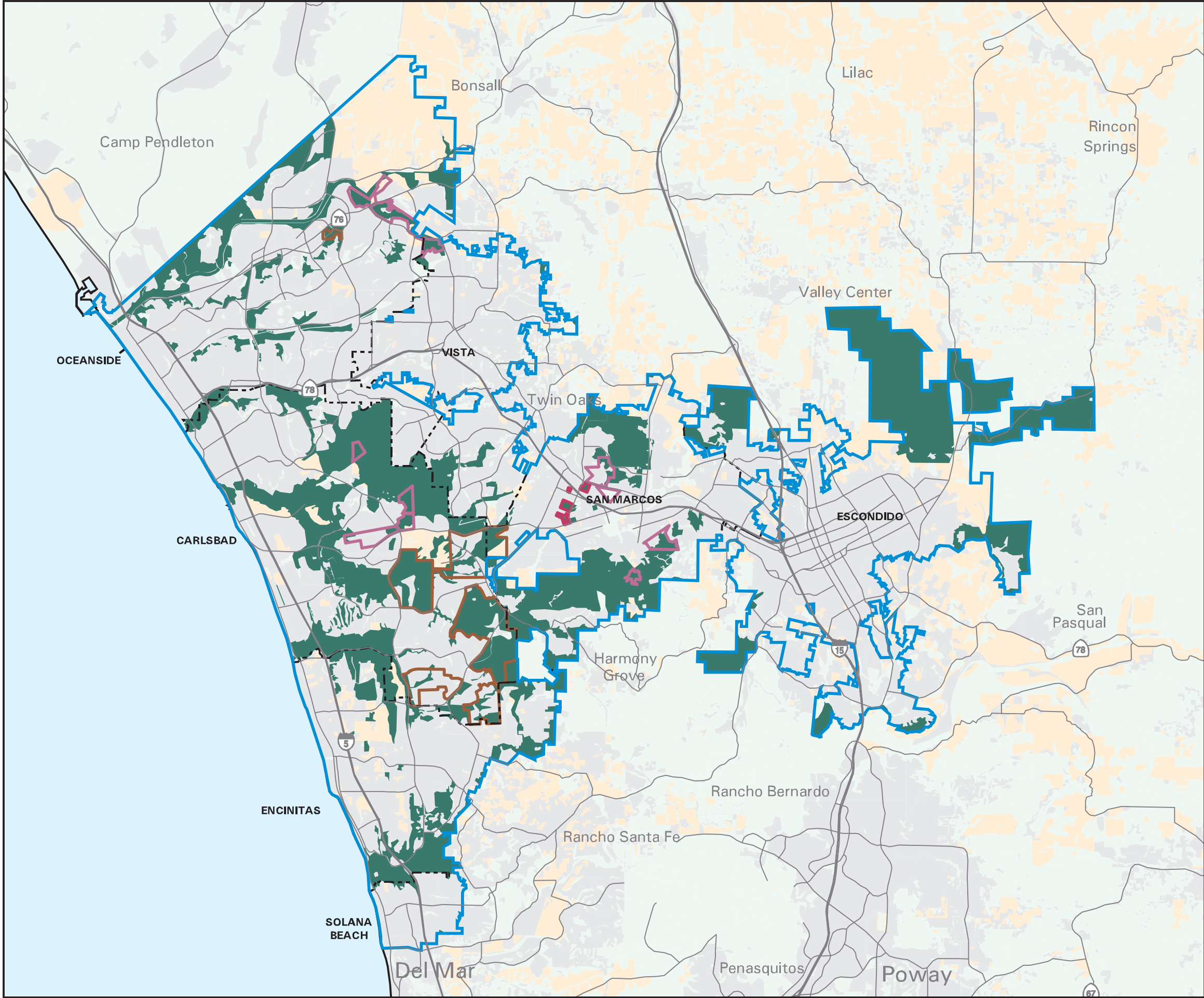
The MHCP study area boundary was also updated several times during 1996-2002 to reflect modifications to subarea planning areas. Such changes included adding properties recently annexed by cities and excluding lands over which cities felt they had insufficient land use authority to regulate habitat conversion (for example, school district properties, university land, and some county-owned properties). Caltrans rights-of-way associated with highways and freeways were also excluded from the study area.








Table 2-1

**GENERAL PERCENT CONSERVATION ASSUMPTIONS FOR
CALCULATION OF LEVELS OF TAKE AND CONSERVATION**

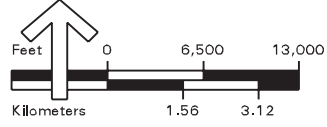
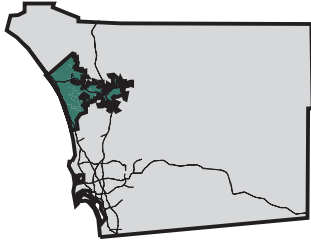
Conservation Target	Inside FPA Assumptions	Outside FPA Assumptions
<u>Vegetation Communities</u>		
Wetland Communities	100% conservation of acreages and biological function and values. No net loss.	100% conservation of acreages. No net loss.
Upland Communities	FPA% conservation applied to all natural upland vegetation communities, or variable mitigation ratio percents for certain areas in Oceanside and Encinitas (Table 2-2).	0% conservation.
Nonhabitat (developed, disturbed, agriculture)	0% conservation.	0% conservation.
<u>Species Points</u>		
Obligate Wetland Species	100% conserved.	0% conservation because not guaranteed against take and not managed within preserve.
Narrow Endemics	<u>Hardline areas (90-100% FPA areas):</u> 100% of points, populations, or acreage conserved by avoidance. <u>Softline areas (<90% FPA areas):</u> 95% of points, populations, or acreage conserved by avoidance.	80% conservation of points, populations, or acreage, or conservation by city-specific guidelines, whichever yields higher net conservation.
All other species	<u>Hardline areas:</u> 100% conservation of points, populations, or acreage. <u>Softline areas:</u> Percent conservation of points, populations, or acreage based on FPA%. For Oceanside and Encinitas, % conservation is based on mitigation ratio % for the vegetation in which the species locations occur (Table 2-2).	0% conservation.

**Figure 2-3
Biological Core and
Linkage Area (BCLA)
MHCP Study Area**



-  Biological Core and Linkage Area
-  Natural Habitats (Outside BCLA)
-  Agricultural Land
-  Developed/Disturbed Land
-  Not a Part of Subarea Plans
-  Major Amendment Area
-  Projects Already Permitted
-  Generalized Subarea Plan Boundary
-  MHCP Boundary

SOURCE: MHCP Biological Consultants



2.2 QUANTIFICATION OF CONSERVATION AND TAKE

Updated vegetation maps and species distribution maps were used to calculate levels of conservation and take within the FPA, the BCLA, and the seven-city study area as a whole. The assumptions used in calculating conservation levels for habitats are described here to show how conceptual planning maps produced by the cities (i.e., the FPA maps) are interpreted using GIS to calculate acreages of habitats and numbers of species locations expected to be conserved or taken under the plan. These calculation methods are the same as those used in Public Review Draft analysis.

Each city provided a map outlining land areas within which some conservation is expected to occur. Each portion of this FPA was labeled with a percent conservation level (FPA%). This FPA% represents the expected *proportion of currently mapped natural vegetation communities* to ultimately be conserved within that area, or averaged across similar areas throughout the study area. Further assumptions and interpretation are necessary to determine likely levels of conservation for specific habitat types and species within these areas and to determine the configuration of preserve areas that will ultimately be protected and managed within them. All of these assumptions (summarized in Table 2-1) were translated into mathematical algorithms that were used in the GIS to calculate the expected acreages and locations to be conserved and taken once the preserve system and development areas are completely “built out.” Results are generally presented as acreages, points, or proportions of a resource expected to be conserved, with an assumption that those resources not conserved will be taken, unless otherwise stated.

Different calculation rules may apply to “hardline” areas versus “softline” areas. Hardline areas generally represent existing preserve areas, or areas where planning and landowner negotiations have progressed sufficiently that lines depicting ultimate preserve versus development areas can be confidently drawn at this time. Habitat acreages within hardline preserve areas are generally assumed to be at least 90% conserved (with most at 95% or 100%); and species locations in hardline areas are generally assumed to be 100% conserved (through avoidance of impacts). For example, a 95% preserve area might allow up to 5% loss of habitat acreage to create hiking trails or other facilities, but these are expected to be sited in the least sensitive portions of the area and to avoid direct impacts to known species locations.

Softline preserve areas are those properties on which some lesser level of conservation is expected (generally 50 to 80%), but where precise lines defining which portions will be conserved and which will be developed cannot be drawn at this time. Softline areas will ultimately be “hardlined” through future planning and negotiations during subarea plan implementation. For GIS calculations, conservation of natural habitats on softline properties is calculated based on the percent conservation level predicted by the city. For example, in a 50% area, it is assumed that 50% of the acreage of each upland vegetation community on the property will ultimately be conserved, and 50% taken. With some exceptions, species location points and populations are also assumed to be conserved and taken proportional to the percent conservation level. Exceptions to this rule apply to treatment of MHCP narrow endemic species and some other species, as described below.

Table 2-2

**MHCP MITIGATION RATIOS AND ASSOCIATED PERCENT CONSERVATION
LEVELS USED FOR PURPOSES OF ANALYSIS
IN OCEANSIDE AND ENCINITAS**

Habitat Group	Inside FPA Mitigation Ratio (%) Conservation	Outside FPA Mitigation Ratio (%) Conservation ¹
<u>Group A. Wetland Communities</u>	No net loss (100%)	No net loss (100%)
Coastal salt marsh	Riparian woodland	
Alkali marsh	Riparian scrub	
Freshwater marsh	Vernal pool	
Estuarine	Disturbed wetland	
Salt pan/mudflats	Flood channel	
Riparian forest	Fresh water	
<u>Group B. Rare Upland</u>	3:1 (75%)	2:1 (67%)
S. coastal bluff scrub	Engelmann oak woodland	
Maritime succulent scrub	Coast live oak woodland	
S. maritime chaparral	Native grassland	
<u>Group C. Coastal Sage Scrub</u>	2:1 (67%) or 3:1 (75%) ²	1:1 (50%)
Coastal sage scrub		
Coastal sage/chaparral mix		
<u>Group D. Chaparral</u>	1:1 (50%)	0.5:1 (33%)
Chaparral (excluding southern maritime chaparral)		
<u>Group E. Annual Grassland³</u>	0.5:1 (33%)	0.5:1 (33%)
Annual (nonnative) grassland		
<u>Group F. Other</u>	None (0%)	None (0%)
Disturbed land		
Agricultural land		
Eucalyptus		

¹ Impacts outside of FPA are assumed to be mitigated inside the FPA.

² For Oceanside, a ratio of 3:1 (75% conservation) was assumed for coastal sage scrub inside of the FPA.

³ See Appendix F for definition of annual grassland versus agricultural or disturbed lands.

Table 2-3

**MHCP SPECIES CONSIDERED WETLAND COMMUNITY OBLIGATES
FOR PURPOSES OF ANALYSIS**

Scientific Name	Common Name	Habitat
Plants		
<i>Eryngium aristulatum</i> var. <i>parishii</i>	San Diego button-celery	Vernal pools
<i>Myosurus minimus apus</i>	Little mousetail	Vernal pools
<i>Navarretia fossalis</i>	Spreading navarretia	Vernal pools
<i>Orcuttia californica</i>	California Orcutt grass	Vernal pools
Animals		
<i>Streptocephalus woottoni</i>	Riverside fairy shrimp	Vernal pools
<i>Branchinecta sandiegoensis</i>	San Diego fairy shrimp	Vernal pools
<i>Panoquina errans</i>	Salt marsh skipper	Salt marsh
<i>Clemmys marmorata pallida</i>	Southwestern pond turtle	Aquatic, riparian
<i>Pelecanus occidentalis californicus</i>	California brown pelican	Open water
<i>Plegadis chihi</i>	White-faced ibis	Fresh water marsh, estuaries, salt marsh
<i>Pandion haliaetus</i>	Osprey	Open water, wetlands
<i>Rallus longirostris levipes</i>	Light-footed clapper rail	Salt marsh
<i>Sterna elegans</i>	Elegant tern	Salt marsh, shoreline, estuarine/ intertidal
<i>Empidonax traillii</i>	Southwestern willow flycatcher	Riparian woodlands
<i>Vireo bellii pusillus</i>	Least Bell's vireo	Riparian woodlands
<i>Icteria virens</i>	Yellow-breasted chat	Riparian woodlands
<i>Passerculus sandwichensis beldingi</i>	Belding's Savannah sparrow	Salt marsh
<i>Passerculus sandwichensis rostratus</i>	Large-billed Savannah sparrow	Salt marsh

Table 2-4

MHCP NARROW ENDEMIC SPECIES LIST^{1,2}

Scientific Name	Common Name
Plants	
<i>Acanthomintha ilicifolia</i> (s)	San Diego thorn-mint
<i>Ambrosia pumila</i> (g)	San Diego ambrosia
<i>Arctostaphylos glandulosa</i> spp. <i>crassifolia</i> (g)	Del Mar manzanita
<i>Baccharis vanessae</i> (g)	Encinitas baccharis
<i>Brodiaea filifolia</i> (s)	Thread-leaved brodiaea
<i>Chorizanthe orcuttiana</i> (g)	Orcutt's spineflower
<i>Corethrogyne filaginifolia</i> var. <i>linifolia</i> (g)	Del Mar Mesa sand aster
<i>Dudleya blochmaniae</i> ssp. <i>brevifolia</i> (g, s)	Short-leaved dudleya
<i>Dudleya variegata</i> (s)	Variiegated dudleya
<i>Eryngium aristulatum</i> var. <i>parishii</i> (v, s)	San Diego button-celery
<i>Hazardia orcuttii</i> (g)	Orcutt's hazardia/Orcutt's goldenbush
<i>Lotus nuttallianus</i> (g)	Nuttall's lotus/Prostrate lotus
<i>Muilla clevelandii</i> (s)	San Diego goldenstar/Cleveland's goldenstar
<i>Myosurus minimus</i> spp. <i>apus</i> (v, s)	Little mousetail
<i>Navarretia fossalis</i> (v, s)	Spreading navarretia
<i>Orcuttia californica</i> (v, s)	California Orcutt grass/Southern Orcutt grass
Animals	
<i>Streptocephalus woottoni</i> (v)	Riverside fairy shrimp
<i>Branchinecta sandiegoensis</i> (v)	San Diego fairy shrimp
<i>Cicindela latesignata obliviosa</i> (g)	Oblivious tiger beetle
<i>Euphyes vestris harbisoni</i>	Harbison's dun skipper butterfly
<i>Campylorhynchus brunneicapillus cousei</i> (g)	Coastal cactus wren
<i>Perognathus longimembris pacificus</i> (g, s)	Pacific little pocket mouse

¹ Species on this list are highly restricted by geographical or ecological factors *and* may have important populations within the MHCP area, such that substantial loss of these populations or their habitat within the MHCP area might jeopardize the continued existence or recovery of that species.

² Letters in parentheses indicate the nature of the endemism: g = geographic endemic; v = vernal pool endemic; s = edaphic (soil) endemic. Note that some species classified as geographic endemics for purposes of the MHCP study are more widespread in Baja California.

As part of their subarea planning efforts, some cities have developed biological standards and criteria that apply to specific softline areas (all subarea plans will need to include such criteria and standards). These standards and criteria are designed to guide development away from the most sensitive biological resource areas, and to help achieve preserve design goals, once the property is hardlined in the future. Where possible (especially Carlsbad and Escondido), biologists have interpreted the intent of existing standards and criteria to calculate expected conservation and take in these softline areas.

In some portions of Oceanside and Encinitas, upland habitat conservation varies based on the mitigation ratio to be applied to each vegetation community type. For example, in these “ratio areas” if a 2:1 (conservation:take) ratio applies to a vegetation community, conservation of that community is calculated at 67% of its total mapped acreage on the property (i.e., 2 out of every 3 acres is assumed to be conserved). This approach assumes that onsite and offsite mitigation is balanced among all the ratio areas designated within a city (i.e., it assumes a “closed mitigation system”). Table 2-2 illustrates the minimum mitigation ratios proposed by the MHCP cities along with the resulting conservation percentages used in the GIS calculations. Note that Oceanside has assumed a higher, 3:1 ratio (75% conservation) for coastal sage scrub impacts than the minimum 2:1 (67% conservation) proposed by the MHCP. For calculating proportion of species points conserved, MHCP species were grouped into three general categories for which different calculation rules apply: obligate wetland species (Table 2-3), narrow endemic species (Table 2-4), and other species.

2.2.1 Vegetation Communities

Vegetation communities were grouped into wetland and upland communities. Wetland vegetation communities (listed in Table 2-2) were calculated as 100% conserved both inside and outside of FPAs, based on the MHCP no net loss policy. This calculation assumes 100% conservation of existing vegetation acreage as well as 100% conservation of biological functions and values as they pertain to MHCP species using these habitats. Although there are separate mitigation ratios for upland habitat types in Oceanside and Encinitas, all wetlands were calculated as 100% conserved in all jurisdictions, both inside and outside of FPAs.

Upland vegetation communities occurring inside the FPA were generally calculated at the FPA conservation percent in which they occur, except for those properties in the Cities of Oceanside and Encinitas where mitigation ratios were applied (see Table 2-2). Outside of the FPA, upland vegetation communities were calculated at 0% conservation in all jurisdictions. Although some natural vegetation will remain undeveloped outside the FPA, the conservation level is calculated at 0%, because these areas will not be actively managed as part of the MHCP preserve. Consequently, there is no assurance of the long-term maintenance of conservation value on these lands. Areas of nonhabitat include developed areas, disturbed areas of native or nonnative vegetation, and agricultural areas. These areas were calculated as 0% conserved both inside and outside the FPA. See Appendix F for definitions of these lands versus grasslands.

2.2.2 Ecological Communities

For purposes of analysis, the MHCP animal and plant species were grouped into ecological communities based on shared habitat requirements or co-occurrence within similar environments, such as those species associated with vernal pools or with riparian habitats. This community-level analysis was performed to illustrate how conservation and management actions within each ecological community may affect its member species as a group. However, because this analysis overlooks biological differences among the species comprising a community, the ecological community analysis should be viewed only as heuristic support for the species-specific analyses that follow. It is not sufficient by itself to determine effects of MHCP implementation on any particular species. The value of community-level analysis is in illustrating how groups of species may be affected in concert by certain aspects of the preserve design, implementation policies, or management actions.

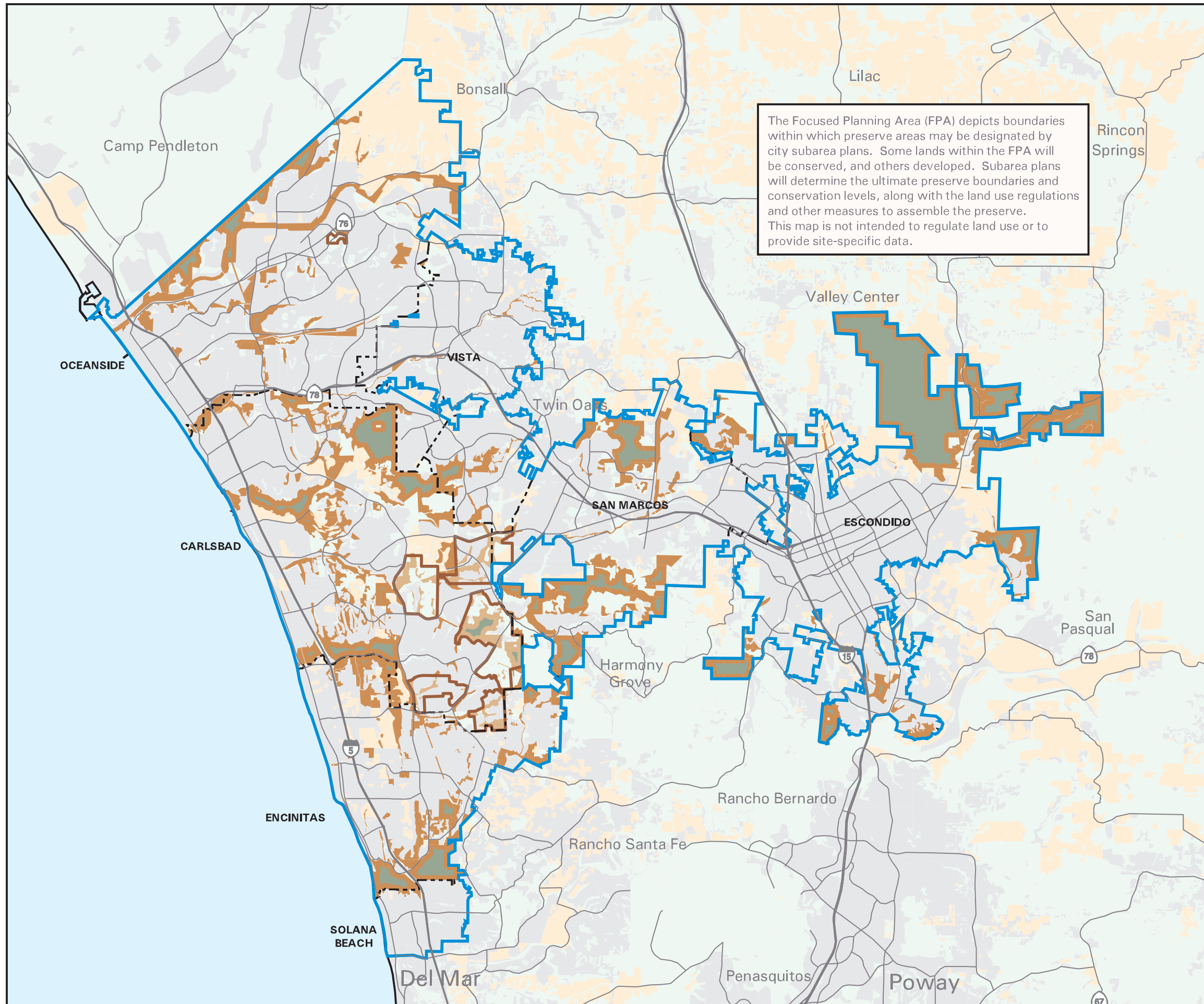
We defined the following ecological communities primarily by combining MHCP vegetation types into broader habitat categories: lagoon and marsh, riparian, grassland, coastal scrub, oak woodland, chaparral, and vernal pools. In addition, several “subcommunities” were defined for MHCP plant species that are restricted to particular substrates, such as clay soils or gabbro-derived soils within one of the above communities. Animal species were categorized according to their dependence on a community for each of three life requisites: reproduction (e.g., provision of breeding, nesting, egg laying, and rearing requirements), foraging (e.g., provision of food, water, and mineral requirements), and cover (e.g., provision of roosting, burrowing, hiding, hibernating, and aestivating requirements). Some animal species are listed in more than one ecological community, because different communities provide for different life requisites or life phases (e.g., amphibians that require wetlands for breeding and uplands for sheltering or foraging).

The proportion of habitat to be conserved or taken was then quantified for each ecological community and subcommunity using the GIS and the FPA calculation rules described above. This allows us to analyze how well the MHCP preserve design will provide all life requisites for a species or group of species, and how management or other implementation actions may affect the member species of a community.










2.2.3 Preserve Configuration

The configuration of the preserve system expected to result under MHCP implementation was assessed both quantitatively and qualitatively. Because the BCLA was delineated to capture the best remaining habitat areas, including all the largest remaining blocks of habitat and critical linkages between them, we used the proportion of the BCLA that would be preserved by the FPA as one relevant measure to assess preserve configuration. We also analyzed some measures of fragmentation and edge effects, including the size distribution of preserve patches and the amount of preserve area greater than 50 meters and 200 meters from a preserve edge (Figure 2-4). We also assessed preserve configuration qualitatively, at a landscape scale, by assessing the expected effects of MHCP implementation on wildlife movement between core preserve areas. This analysis looked specifically at linkages between the coastal lagoons and

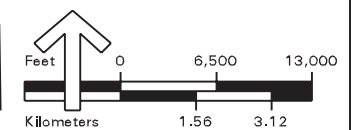
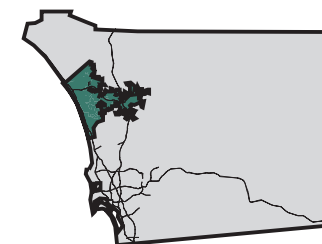
**Figure 2-4
Focused Planning Area
Edge Effects
MHCP Study Area**



The Focused Planning Area (FPA) depicts boundaries within which preserve areas may be designated by city subarea plans. Some lands within the FPA will be conserved, and others developed. Subarea plans will determine the ultimate preserve boundaries and conservation levels, along with the land use regulations and other measures to assemble the preserve. This map is not intended to regulate land use or to provide site-specific data.

-  Edge Habitat (200m edge effect)
-  Edge Habitat (200m edge effect) on Already Permitted Properties
-  Core FPA Habitat
-  Natural Habitats (Outside FPA)
-  Agricultural Land
-  Developed/Disturbed Land
-  Projects Already Permitted
-  Generalized Subarea Plan Boundary
-  MHCP Boundary

SOURCE: SANDAG



January 16, 2003

inland habitat areas (generally east-west corridors associated with riparian habitats), as well as north-south linkages to allow wildlife movement between the larger habitat blocks that lie north and south of the study area. Most importantly, preserve configuration was assessed separately for each MHCP species based on its particular space requirements, dispersal abilities, susceptibility to adverse edge effects, and so on. Each species evaluation in this volume includes a subsection on expected preserve configuration effects on the species' continued viability in the study area.

2.2.4 Species Locations

Species data in the MHCP database are generally represented as point locations, which are sometimes associated with population estimates in the database. However, actual population estimates do not exist for most MHCP species or point locations included in the database. Consequently, caution must be used in interpreting the GIS point data in evaluating levels of conservation and take. Points indicate a location where a species was detected at some time in the recent past, but surveys have not been comprehensively performed for all species or all portions of the study area (e.g., surveys are lacking on many private properties not proposed for development). Consequently, absence of species points in an area does not necessarily connote absence of the species. Furthermore, surveys vary in their intensity and in whether or not they report population estimates. Thus, although point location summaries are included in many of the species evaluations in this document, other data, such as acreages of suitable habitat, are more reliable measures of conservation and take for many species.

Despite the above concerns, point locations in the database were used as one measure of species conservation and take. For this purpose, MHCP species were grouped into three general categories for which different calculation rules apply: obligate wetland species (Table 2-3), narrow endemic species (Table 2-4), and other species.

Obligate Wetland Species—These are species for which all life requisites provided in the MHCP area are expected to be within open water or wetland vegetation communities, which are subject to the no net loss policy. Consequently, inside the FPA, all points for obligate wetland species are calculated as 100% conserved. This assumes 100% conservation of the habitat and active habitat management to ensure no loss of habitat value to support the species. Although wetland habitats outside the FPA are also 100% conserved by the no net loss policy, associated wetland species are calculated as 0% conserved, because active management to ensure habitat value will not be guaranteed outside the FPA.

Narrow Endemic Species—In hardline FPA areas, location points for narrow endemics are calculated as 100% conserved by impact avoidance. In softline areas, narrow endemic points are calculated as 95% conserved by avoidance, minimization, and species-specific mitigation. Outside of the FPA, narrow endemic points are calculated as 80% conserved based on avoidance, minimization, and species-specific mitigation.

Other Species—For species that are not wetland obligates or narrow endemics, all points that fall outside of the FPA are calculated as 0% conserved. All points falling inside hardline FPA

areas are calculated as 100% conserved, based on impact avoidance. In softline FPA areas, points are generally calculated as conserved at the FPA percent level for the area the point falls within.

Once the appropriate conservation level is assigned for each point based on its location and the type of species, overall conservation level for the species' location points is calculated by summing these weighted values over all points.

Additional Analyses for the California Gnatcatcher

Additional analyses were performed for the California gnatcatcher due to the abundance of data on the species, its wide distribution in the study area, and its high priority as a preserve planning species and conservation target. The purpose of these additional analyses was to better quantify expected levels of conservation and take and the effects of the MHCP preserve on species viability than is possible with the MHCP gnatcatcher point data alone. The point database was previously suspected of being biased toward showing proportionately more gnatcatcher locations in areas subject to development than in areas already conserved or proposed for conservation by the MHCP. This is because gnatcatcher surveys are generally required for development projects and, consequently, areas proposed for development tend on average to have been more reliably and recently surveyed than other areas. However, the 2002 database update incorporated many new gnatcatcher points in previously under-surveyed areas. The database benefited particularly from points provided by the San Diego Bird Atlas project, which represents a more systematic and comprehensive survey of bird distribution than was ever before available in the county. The Bird Atlas data increases our confidence in using species point data to quantify conservation and take levels for gnatcatchers and other birds.

California Gnatcatcher Habitat Evaluation Model—A gnatcatcher habitat evaluation model was used in the Public Review Draft conservation analysis as one attempt to supplement the gnatcatcher point data and to avoid the biases discussed above. The importance of this model has declined somewhat due to the greatly improved gnatcatcher distribution database.

The gnatcatcher habitat evaluation model developed initially for the Multiple Species Conservation Program (MSCP) was revised in 1999 for the MHCP. These revisions reflect new information concerning gnatcatcher biology and tailor the model better to the scale of the MHCP study area. The gnatcatcher habitat evaluation model ranks, for purposes of preserve planning, the value of potential gnatcatcher habitat (coastal sage scrub, mixed coastal sage scrub/chaparral, maritime succulent scrub, or alluvial fan scrub) as high, medium, or low based on patch size, shape, elevation, slope, and climate zone (coastal versus transitional). In general, larger habitat patches, at lower elevations, in coastal climates, and on gentle slopes rank the highest. These rankings were then statistically correlated with known gnatcatcher densities in various locations and used to better estimate effects of the plan on conservation and take of gnatcatcher habitat. They were also used to better estimate gnatcatcher carrying capacity throughout the study area for purposes of conservation analysis and population viability modeling. The main changes from the original MSCP habitat evaluation model (which was intensively peer reviewed) were to decrease the minimum suitable patch size (based on patterns

of occupancy by gnatcatchers in the MHCP study area) and to decrease the value of coastal sage scrub patches dominated by black sage (*Salvia mellifera*).

This model could be criticized as (1) not directly reflecting details of gnatcatcher biology and effects of habitat on species fitness and (2) insufficiently tested using empirical statistical methods. However, we believe that, for purposes of preserve planning, the model reliably represents habitat value to the gnatcatcher within the MHCP study area, based on both published and unpublished studies in San Diego County (Ogden 1992a; Bontrager 1991; B. Wagner pers. comm.). It represented our best professional judgment at the time, based on the collective knowledge and experience of numerous contributing biologists who have extensive experience surveying for gnatcatchers and researching their habitat requirements in this area. In addition to receiving input from the wildlife agencies and other local biologists (e.g., Howie Wier, Anita Hayworth, David King, Kris Preston), the model revisions were subjected to peer review by Jonathan Atwood, Patrick Mock, and Gerald Braden. Details of the model and the 1999 refinements are provided in Appendix A.

Carrying Capacity Estimates—Because gnatcatcher survey coverage is variable across the MHCP study area, we used a modeling approach to derive an alternative measure based on the concept of population carrying capacity (K). Again, these additional quantification methods may be less important now than in previous analyses, given improvements in the gnatcatcher point database.

We estimated local K values based on the local density of gnatcatcher point localities in well-surveyed areas that appeared to be saturated with breeding territories (even and densely packed distributions of breeding localities). We correlated these local densities with results of the MHCP gnatcatcher habitat evaluation model for areas of varying habitat quality and distance from the Pacific coast (see the Species Evaluation for the California Gnatcatcher in Section 4 and Appendix A for details). This allowed us to extrapolate densities of breeding gnatcatchers at presumed saturation to under-surveyed areas having similar habitat quality. The results provide an additional measure for assessing preserve viability and the level of gnatcatcher conservation and take that avoids the biases due to differing survey intensities. However, these results should be used with caution, for their intended purpose only, which is to provide a relative and supplementary evaluation of the overall level of conservation and take expected under the plan. The results do not provide an absolute prediction of how many gnatcatchers the MHCP can or will support now or in the future.

Population Viability Analysis—We conducted a population viability analysis (PVA) for the gnatcatcher in the MHCP study area. The PVA was used as a heuristic tool that assisted in the integration of knowledge of the gnatcatcher biology (e.g., reproductive rates, dispersal, and territory size) with the geographic distribution of habitat (based on the habitat evaluation model) in the regional vicinity of the MHCP study area. The PVA was conducted using RAMAS/Metapop (Akçakaya 1998), a stochastic simulation model. The set of gnatcatcher subpopulations contained within the MHCP study area appear to be closely linked (in terms of demographics and gene flow) to populations north, south, and southeast of the study area. Based on our understanding of source-sink dynamics and the structure of the regional

gnatcatcher metapopulation, we conclude that the MHCP gnatcatcher population is dependent on the linkages to other subpopulations outside the MCHP for long-term viability; and that these subpopulations outside the MHCP rely on the linkages provided by the MHCP population to maintain gene flow and possibly long-term metapopulation viability. The PVA was not used to test the ability of the MHCP to ensure the species persistence within the study area for the reasons stated under “Appropriate Use of PVA” in Appendix A. Additional details of the PVA are also provided in Appendix A.

2.3 SPECIES COVERAGE ANALYSIS

Based on the above quantification assumptions, the MHCP Biological Goals, Standards, and Guidelines (Ogden 1998), and basic preserve design and conservation biology principles, CBI and AMEC biologists evaluated the expected effects of the plan on each vegetation community and species. Effects of the plan reflect not only the levels of conservation and take projected for each resource, but also how preserve configuration, management, and other factors are expected to influence the ability of the MHCP to sustain viable populations.

2.3.1 Steps for Species Evaluation

The following general evaluation steps were followed for each species. This systematic approach to reviewing available information ensures that all species are sufficiently evaluated relative to basic principles of preserve design and conservation biology.

1. Review available data, including the following:
 - *Legal status of the species*—Species status determines the regulatory requirements for each species, although all MHCP species are assessed relative to state and federal take authorization standards as well as the MHCP Biological Goals, Standards, and Guidelines (Ogden 1998).
 - *Accuracy and completeness of the MHCP database*—Where little is known about a species’ biology or its distribution and abundance in the study area, extra caution is required in assessing plan effects. An understanding of the accuracy and completeness of the database also helps identify research and monitoring priorities.
 - *Overall distribution of the species*—Species that are widespread or more abundant outside the MHCP study area may not be as strongly affected by the plan as species narrowly restricted to the study area (e.g., narrow endemics). Nevertheless, the goal of the MHCP is to ensure persistence of all species within the seven-city study area. Species that are rare or localized throughout their range may require more intensive management to ensure persistence than more abundant or widespread species.
 - *MHCP distribution of the species*—Species that are extremely rare or localized within the study area may require more intensive management than others to ensure persistence within the study area.

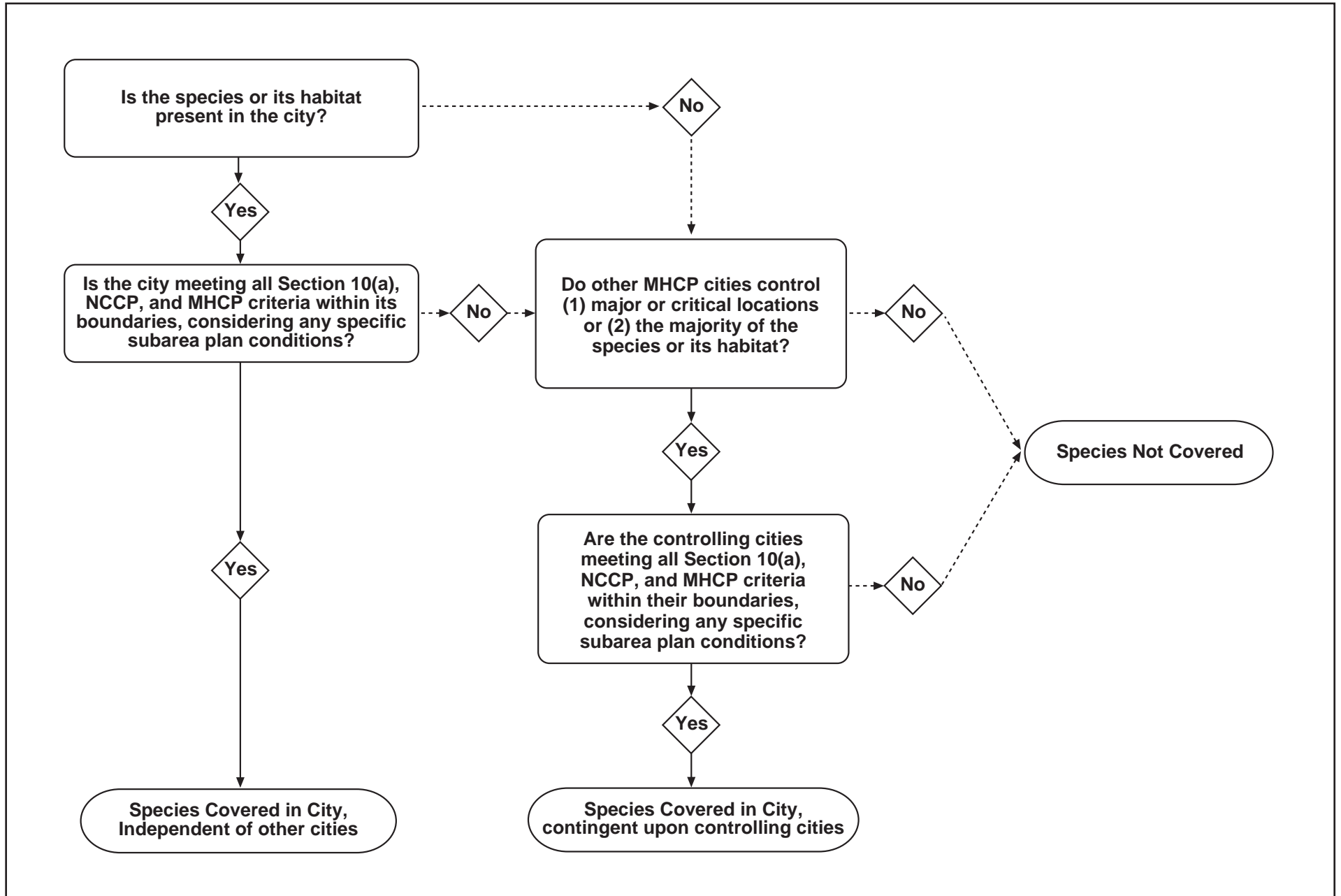
- *Locations of major or critical populations*—Major and critical populations, as listed in Ogden (1998) and this document, must be substantially conserved and managed to meet the MHCP biological goals and state and federal take authorization standards.
 - *Locations or populations known to occur but not represented in the MHCP database*—Not all species locations are recorded in the database (for example known nest locations that could be subject to vandalism if mapped), although all relevant data should be considered in evaluating the preserve system.
 - *Estimates of population decline*—Population declines suggest that management actions may be necessary to ensure species viability and recovery.
 - *Habitat requirements*—All life requisites for a species (e.g., habitats and microhabitats needed for reproduction, cover, and feeding) must be met within a contiguous area of the preserve, or within areas that can be covered by the normal ranging abilities of individuals of the species.
 - *Threats to the species*—Identified or suspected threats to species viability of recovery should be monitored and countered by management actions.
 - *Information from local experts*—Local experts offer a valuable resource for unpublished species and habitat information on species distribution, habitat needs, and management recommendations.
2. Categorize species according to the most appropriate scale for conservation planning and analysis (not necessarily mutually exclusive):
 - *Rangewide*—Broad ranging species or species not likely to occur in study area.
 - *Landscape or habitat based*—Species best conserved by protecting habitat according to preserve design principles (e.g., wetland habitats, grasslands, and vernal pools).
 - *Species-specific management actions*—Conservation requires site- or species-specific population management (e.g., transplantation, reintroduction), protection of particular sites (e.g., nest sites or roosting areas), or other specific actions to control limiting factors (e.g., control of predators, competitors, or parasites).
 3. Evaluate level of conservation for each vegetation community based on the FPA and other calculation assumptions listed above.
 4. Evaluate level of conservation for ecological communities, based on conservation of the vegetation communities comprising an ecological community (e.g., the coastal scrub ecological community is comprised of coastal sage scrub, maritime succulent scrub,

southern coastal bluff scrub, and mixed coastal sage scrub/chaparral vegetation communities). Evaluate levels of conservation and management for animal species reliant on these ecological communities as part of the landscape and habitat based analysis.

5. Evaluate level of conservation and management for each species, relative to state and federal take authorization standards and MHCP standards and guidelines (Ogden 1998). For covered species, these levels of conservation and management will be incorporated into the implementing agreement. The species justifications included in this document present conservation levels in various ways, including whichever of the following measures seem most appropriate for a particular species:
 - acres of preferred habitat conserved and impacted;
 - acres of the BCLA conserved and impacted;
 - number and proportion of location points conserved and impacted;
 - number and proportion of major and critical populations conserved and impacted;
 - number and proportion of estimated population carrying capacities; and
 - acres and proportion of modeled habitat values conserved.
6. Compare the amount and configuration of habitat proposed for preservation to species breeding, foraging, and other needs. Determine if critical locations (e.g., habitat linkages) are adequately conserved.
7. Identify specific management or enhancement conditions or other specific measures needed for coverage, including restoration and enhancement of habitats. Identify those actions assumed by the analysis to be implemented or considered conditions for coverage of that species.
8. Identify monitoring requirements for covered species.
9. For species not covered, identify additional information or additional conservation measures needed to provide coverage.

The above steps were followed for each of the 77 MHCP species to determine what conditions appear to be necessary for the MHCP and constituent subarea plans to adequately conserve the species and meet state and federal take authorization requirements. However, the final determination of whether a species is adequately conserved, and therefore qualifies for take authorizations, is made by the USFWS and CDFG for each city requesting such authorizations. Each city must ensure via their subarea plan implementing agreement that all necessary conditions are met for the full list of species granted authorizations. For many species, granting of a take authorization to a particular city may be contingent on adequate conservation of that species in another city, as illustrated in Figure 2-5. The conditions summarized for each species in this document were prepared by the wildlife agencies or were modified by CBI and AMEC based on comments from the wildlife agencies. This document also contains several appendices prepared by the wildlife agencies that summarize general conditions that will apply to certain

groups of species or for certain permitting issues (e.g., wetlands permits subject to Section 7 consultations with the USFWS).



FIGURE

Process for Determining Species Coverage for a City

SECTION 3.0

CONSERVATION OF VEGETATION AND ECOLOGICAL COMMUNITIES

3.0 CONSERVATION OF VEGETATION AND ECOLOGICAL COMMUNITIES

This section summarizes expected conservation of biological resources by the MHCP. It first summarizes conservation levels for the major vegetation community types and the overall preserve configuration. Next, we summarize conservation of ecological communities, or groups of species that tend to co-occur in similar habitat types. These analyses are presented primarily in support for the final section, which analyzes each of the 77 MHCP species independently. The species evaluations also provide the species-specific permit conditions, including management and monitoring conditions, that must be met for the MHCP to ensure species persistence and qualify for take authorizations.

3.1 CONSERVATION OF VEGETATION COMMUNITIES

This section briefly summarizes the level of conservation for each vegetation community in the MHCP study area, along with the landscape configuration that would result at ultimate “build out” of the preserve. This information serves as a foundation for the species-specific analyses that form the bulk of this document.

3.1.1 Conservation Levels

Table 3-1 summarizes the level of conservation estimated using the October 2002 FPA. It summarizes total acreages and percentages (relative to total acreage in the study area) by each vegetation community type within the FPA. It also summarizes the acreages and proportion of the BCLA that would be conserved for each vegetation community. The BCLA conservation figures represent conservation of the biologically most valuable lands.

Existing Vegetation—The study area (111,908 acres) currently supports approximately 29,962 acres of natural vegetation (or about 27% of the area) as depicted in Figure 2-2. The distribution of the natural vegetation communities is described in the MHCP Biological Goals, Standards, and Guidelines document (Ogden 1998), which also provides conservation goals and management guidelines for each vegetation community. The largest blocks of natural vegetation (greater than 1,000 contiguous acres each) occur in north Escondido (Daley Ranch) and in the hilly areas of southeast Carlsbad and southwest San Marcos. Other relatively large blocks of habitat (at least several hundred contiguous acres each) occur along the northern boundary of Oceanside (adjacent to Camp Pendleton), and in scattered areas in east and central Carlsbad, north San Marcos, and south Escondido. Otherwise, natural habitats in the MHCP area are already highly fragmented and occur primarily in small (less than 200-acre), scattered patches surrounded by development or agriculture. The remnant natural vegetation occurs disproportionately on developmentally constrained lands, such as steep slopes and canyons, and lands at the periphery of incorporated cities.

Approximately 8,656 acres (8% of study area) of Diegan coastal sage scrub remain in the study area. The largest blocks are in southeast Carlsbad (La Costa area), central Carlsbad (Macario Canyon/Agua Hedionda area), and northeast Carlsbad (Calavera/Carlsbad Highlands area).

Table 3-1

**CONSERVATION ACREAGES OF NATURAL
VEGETATION COMMUNITIES IN THE MHCP**

Vegetation Community	Total Existing in Study Area	Conservation inside FPA	Total Conserved in Study Area	Total Net Conservation inside the BCLA ¹
Southern coastal bluff scrub	2	0	0 (0%)	0 (0%)
Maritime succulent scrub	32	29	29 (90%)	29 (93%)
Coastal sage scrub	8,656	5,334	5,334 (62%)	4,948 (69%)
Chaparral	8,324	5,806	5,806 (70%)	5,615 (73%)
Southern maritime chaparral	968	748	748 (77%)	717 (79%)
Coastal sage/chaparral mix	462	246	246 (53%)	237 (54%)
Grassland	5,219	1,687	1,687 (32%)	1,565 (47%)
Southern coastal salt marsh	272	251	272 (100%)	270 (100%)
Alkali marsh	165	157	165 (100%)	165 (100%)
Freshwater marsh	518	428	518 (100%)	442 (100%)
Riparian forest	676	533	676 (100%)	404 (100%)
Riparian woodland	250	180	250 (100%)	133 (100%)
Riparian scrub	1,739	1,283	1,739 (100%)	1,191 (100%)
Engelmann oak woodland	230	188	188 (82%)	185 (89%)
Coast live oak woodland	650	511	511 (79%)	483 (83%)
Other oak woodlands	1	1	1 (100%)	1 (100%)
Freshwater	444	401	444 (100%)	396 (100%)
Estuarine	955	947	955 (100%)	954 (100%)
Disturbed wetland	202	121	202 (100%)	87 (100%)
Natural floodchannel/streambed	142	142	142 (100%)	130 (100%)
Beach	48	7	8 (16%)	8 (33%)
Saltpan/Mudflats	8	7	8 (100%)	8 (100%)
Vernal pool ²	22	9	22 (100%)	17 (100%)
Total	29,962	19,007	19,928 (67%)	17,966 (73%)

¹ Acreage and percentage of each vegetation community inside the biological core and linkage area that will be conserved.

² Vernal pools were mapped as an overlay to other vegetation communities and thus their acreage is not included in this total. The MHCP study area does not include the San Marcos Major Amendment Area.

Numbers may not sum to total as shown due to rounding and because vernal pool acreages are excluded.

Source: Vegetation acreage calculations from October 2002 SANDAG GIS calculations.

Smaller remnants of coastal sage scrub are scattered across Oceanside to Camp Pendleton, and on steeper slopes and canyons scattered throughout the coastal cities. Other significant stands of coastal sage scrub in the study area are found in north Oceanside (near the mouth of the San Luis Rey River and adjacent to Camp Pendleton), north San Marcos, and scattered areas around the outskirts of Escondido.

Several sizable patches of coastal sage scrub in the study area are dominated by black sage (*Salvia mellifera*), a shrub also often associated with chaparral vegetation. Black sage-dominated coastal sage scrub is thought to be of lesser habitat value to the California gnatcatcher (*Polioptila californica*) than other subassociations of coastal sage scrub, such as *Artemisia*-dominated or *Eriogonum*-dominated coastal sage scrub. Significant areas of known black sage-dominated coastal sage scrub occur in northeast Carlsbad, in southwest and north San Marcos, and west Escondido.

Only about 32 acres of maritime succulent scrub remain in the study area, on steep, south-facing slopes near lagoons in Carlsbad. Only about 2 acres of coastal bluff scrub are mapped in the City of Solana Beach. Chaparral communities, particularly southern mixed chaparral and chamise chaparral, dominate on higher and steeper slopes in south San Marcos, northeast Carlsbad, and north Escondido. In addition, 968 acres of a rare chaparral assemblage—southern maritime chaparral—occur on slopes and terraces in the coastal cities of Encinitas and Carlsbad.

Grassland habitats are scattered throughout the study area (5,219 acres), with the largest stands in north Oceanside (along the boundary with Camp Pendleton) and in central Carlsbad. Significant grassland areas are also found in the valleys of Daley Ranch in north Escondido. See Appendix F for how the MHCP defines annual grassland vegetation.

There are about 5,371 acres of wetland vegetation communities in the MHCP study area, including a variety of riparian, marsh, and other wetland communities. The four coastal lagoons support a mixture of salt marsh and freshwater marsh habitats, along with open water. Riparian forests, woodlands, and scrub communities are found along many of the drainages in the study area, with the most significant stands found associated with Pilgrim Creek, the San Luis Rey River, Guajome Lake, and Loma Alta Creek in Oceanside; Buena Vista Creek upstream from Buena Vista Lagoon along the Oceanside/Carlsbad border; Agua Hedionda Creek and Macario Canyon, upstream from Agua Hedionda Lagoon in Carlsbad; Encinitas Creek near the Carlsbad/Encinitas border; San Marcos Creek and Twin Oaks Valley in San Marcos; Kit Carson Park in Escondido; and Escondido Creek in south Encinitas.

In the MHCP study area, vernal pools are highly restricted in distribution, with concentrations in two critical locations and a few scattered pools outside these areas. A narrow, linear configuration of pools exists along a railroad right-of-way in west Carlsbad (the Poinsettia Lane pools), which is a critical location for several narrow endemic species. The second critical location includes a large number of scattered pools and pool complexes in central, urbanized San Marcos. This location, which also supports critical populations of several narrow endemic species, is not included in the current MHCP plan or San Marcos Subarea Plan, but is a Major

Amendment Area on which conservation planning may be done later. Outside of these two locations, scattered vernal pools, with lesser concentrations of MHCP species, are located in central Carlsbad and possibly in other cities.

The majority of oak woodlands in the study area are Engelmann oak woodlands (230 acres) and coast live oak woodlands (650 acres). Most of the extensive oak woodland habitat occurs in the northern portions of Escondido, although there are a number of small patches in several other MHCP cities.

Sizable agricultural areas remain in northeast Oceanside, central and east Carlsbad, central Encinitas (Ecke Ranch), and around the margins of Escondido. In some places, these fields function as foraging habitat or habitat linkages for a variety of MHCP species. They also help buffer native habitats and species against adverse effects from other land uses, such as edge effects from residential development.

Future Vegetation—Table 3-1 summarizes the acreages of vegetation expected to remain at ultimate build-out of the study area under the assumptions outlined above. Development is expected to remove up to about 10,034 acres (33%) of the currently remaining natural vegetation communities, with about 19,928 acres (67%) of natural habitats conserved. The conserved acres include about 19,007 acres within the FPA plus about 921 acres of wetland vegetation communities outside the FPA.

The level of conservation varies greatly among the various natural vegetation types. Overall conservation of upland vegetation communities varies from a low of 16% for beach to a high of 90% for maritime succulent scrub. (The low conservation of beach communities is misleading, however, because nearly all beach areas in the coastal cities are managed recreational beaches, with little or no natural beach vegetation or habitat value.) Conservation of grasslands is generally low, with 32% of total grasslands and 47% of grasslands in the BCLA estimated to be conserved. Conservation of chaparral and woodland communities ranges from 70% to 82% of the total acreage in the study area and from 73% to 89% of the acreage within the BCLA, depending on community type.

Overall conservation of wetland vegetation communities is very high due to the MHCP no net loss policy. However, only those wetland vegetation communities inside of the FPA (about 83% of wetlands in the study area) are presumed to be managed as part of the preserve system, so habitat values and species conservation in the 17% of wetlands outside the FPA are not assured.

The net conservation of coastal sage scrub in the FPA is 5,334 acres, which represents 62% of the coastal sage scrub in the MHCP study area and 6% of the coastal sage scrub in the BCLA. The majority of the conserved habitat occurs in the eastern portions of the City of Carlsbad where most of the habitat is in hardline areas. Another significant patch is conserved in the northern sections of the City of San Marcos; however, the majority of this area currently has a softline FPA designation. Many smaller patches of coastal sage scrub are also conserved throughout the MHCP study area with most occurring in the western half. An additional 462

acres of coastal sage/chaparral mix occur in the study area, of which about 246 acres (53%) will be conserved, mostly in hardline FPA.

Of the 32 acres of maritime succulent scrub in the area, 29 acres (90%) will be conserved within the FPA, including 93% of this type in the BCLA. None of the coastal bluff scrub is conserved by the FPA.

The MHCP will conserve about 5,806 acres (70%) of the 8,324 acres of chaparral in the MHCP study area, including 73% of the chaparral within the BCLA. The largest patches of chaparral conserved are in north Escondido and south San Marcos. Significant portions of the larger patches are currently softline FPA areas. Approximately 748 acres (77%) of southern maritime chaparral will be conserved, including 79% of this community within the BCLA.

Net conservation of grasslands is expected to be only about 1,687 acres (32%), including 47% of the grasslands in the BCLA. The largest continuous patches of grassland conserved occur in north Escondido.

Although only 4,450 acres of the wetland vegetation communities are contained in the FPA, all of these habitats are considered conserved at 100% because they are covered by MHCP policy rules for no net loss of wetland habitat acreages regardless of location inside or outside of the FPA. Note that 100% conservation of wetland habitat does not necessarily mean 100% avoidance of impacts because some unavoidable impact may occur as long as this is mitigated by restoration elsewhere to achieve no net loss.

The net FPA conservation of Engelmann oak woodlands is 188 acres (82%), including 89% of these woodlands in the BCLA. The net FPA conservation of coast live oak woodlands is 511 acres (79%), including 83% of these woodlands in the BCLA. A considerable portion of the oak woodlands are within softline FPAs.

The vernal pools at Poinsettia Lane are 100% conserved. Other scattered pools known to occur in central Carlsbad are also expected to be conserved in hardline areas. The vernal pools in San Marcos are primarily within the San Marcos Major Amendment Area (about 29 mapped acres), in which conservation planning may be done at a later date. A few properties in San Marcos support vernal pools outside the Major Amendment Area and outside the FPA (about 17 mapped acres), and their conservation is uncertain.

Agricultural areas were excluded from the FPA acreage calculations; however, they are included in the FPA boundaries where they function as important corridor linkages, foraging habitat, and buffer areas. Some agricultural areas are expected to be conserved, and a small proportion eventually restored to natural vegetation during MHCP implementation.

FPA conservation of coastal sage scrub is estimated at 62% of the total in the study area, and 69% of the coastal sage scrub in the BCLA. However, other significant contributions to coastal sage scrub conservation are not included in this minimal estimate based on the FPA. Once the following contributions are more carefully estimated and accounted for, coastal sage scrub conservation will be higher than estimated via FPA calculations alone:

- *Restoration*—Approximately 338 acres of expected coastal sage scrub restoration have been identified within the FPA in Oceanside, Carlsbad, and San Marcos.
- *Unincorporated Core Area*—Approximately 400 to 500 acres of additional coastal sage scrub are being conserved by MHCP contributions within the unincorporated area southeast of the MHCP boundary. These represent offsite contributions from already permitted projects within the study area; existing offsite mitigation obligations for projects; subarea plan policies to apply within city sphere of influence, in the case of annexation; or additional acquisitions using state, federal, or regional sources.
- *Unquantified Offsite Mitigation or Acquisition*—Some additional coastal sage scrub may be conserved inside the FPA as a result of offsite mitigation for project impacts outside the FPA or additional acquisition using state, federal, or regional funds. The amount and location of the offsite mitigation component has not yet been fully quantified, and may result in increased acquisition of habitat inside the FPA in some cities.

3.1.2 Preserve Configuration

Given the existing high degree of habitat fragmentation in the study area, it is not possible to achieve a biologically ideal preserve design consisting of large contiguous blocks of habitat connected by broad, unbroken landscape linkages. However, the MHCP will conserve as contiguous and functional a preserve system as possible given all of the legal, financial, and physical constraints to preserve design. In particular, the MHCP will (1) conserve and manage the majority (cumulatively, approximately 73%) of remaining BCLA; (2) help conserve a large core area contiguous with but outside the study area boundary in a regionally significant location; (3) conserve most east-west movement corridors between upland areas and coastal lagoon systems; (4) conserve a regionally significant north-south stepping stone corridor for bird species, especially the California gnatcatcher; (5) preserve significant landscape linkages between the study area and adjoining jurisdictions; and (6) restore and enhance linkage function in some critical locations. Nevertheless, many of these linkages and other habitat areas will be narrow and subject to severe edge effects. Consequently, active management to control edge effects and ensure ecosystem function will be required to achieve MHCP biological goals.

Conservation of the BCLA—Because the BCLA was delineated to capture the best remaining habitat areas, including all the largest remaining blocks of habitat and critical linkages between them, it is a relevant model against which to quantitatively compare the proposed preserve configuration. Overall, the MHCP will conserve about 73% of the natural habitats within the BCLA. This includes 100% of the remaining wetland vegetation communities, along with 69% of the extant coastal sage scrub, 73% of chaparral, 47% of grasslands, and 85% of oak woodlands remaining within the BCLA (Table 3-1).

Core Habitat Areas—In general, the largest remaining blocks of habitat (more than a few hundred acres each) will be substantially conserved, particularly in northeast Escondido (Daley Ranch and Escondido Water District lands), north Oceanside (adjacent to Camp Pendleton), northeast Carlsbad (the Calavera Highlands area), and in north and southwest San Marcos. In addition, the relatively large blocks of wetland habitats associated with the coastal lagoons are

substantially conserved. However, the majority of preserve areas consists of small and edge-affected habitat patches.

Only about 4,473 acres of conserved habitat, or about 24% of the total conserved habitat, will lie more than 200 meters (656 feet) from preserve boundaries or habitat edges, as illustrated earlier in Figure 2-4. In other words, over 75% of the preserve acreage is expected to experience edge effects that penetrate 200 meters (656 feet) from adjoining areas, such as nonnative predators, exotic ants, weeds, and trampling. For example, Argentine ants, whose presence can have severe adverse effects on native flora and fauna, penetrate up to 200 meters (656 feet) into native habitat from the urban edge or irrigated landscaping (Suarez et al. 1998). Certain types of edge effects may not penetrate this far. Edge effects penetrating only 50 meters (164 feet) into preserve areas would affect about 34% of the MHCP preserve area, leaving about 66% of the area unaffected.

Most large remaining blocks of habitat that will not be substantially conserved are in areas already authorized for take under existing Section 10(a) or Section 7 agreements (e.g., the former Fieldstone HCP lands) or lands holding development agreements with local cities (e.g., San Elijo Ranch, University Commons). On some other large blocks of habitat, the MHCP or subarea plans cannot guarantee conservation due to existing legal development agreements (e.g., the Escondido Highlands area in northwest Escondido).

Few portions of the study area contain sufficiently large and contiguous blocks of coastal sage scrub to qualify as core breeding areas for the California gnatcatcher, and the largest such area (the La Costa area of southeast Carlsbad) is already subject to a Section 10(a) agreement that will decrease and fragment this core habitat. Largely due to this situation, the MHCP will help conserve a core gnatcatcher breeding area outside of the MHCP boundary, in the unincorporated County of San Diego, south of San Marcos and east of Encinitas and Carlsbad. Conservation of this offsite core area of 400 to 500 acres of high quality gnatcatcher breeding habitat is expected to contribute to persistence of the gnatcatcher within the MHCP study area by providing a supply of dispersing birds in most years. This should also help maintain the functionality of the regionally important stepping-stone corridor across the study area, which is described below.

Landscape Linkages and Movement Corridors—The adequacy of habitat linkages and movement corridors must be assessed on a species-by-species basis. Most existing landscape linkages that connect the larger preserve blocks, either to each other or to core areas outside of the study area, will be substantially conserved, and some will be enhanced through habitat restoration. However, some important linkages will be further constrained by development outside the FPA, notably in southwest and southeast San Marcos.

East-west linkages, primarily along narrow riparian corridors, will be maintained to most of the coastal lagoons. These linkages are important to maintaining ecological balance in these lagoon and marsh ecosystems by allowing access by larger predators. These large predators help control populations of smaller predators that otherwise prey heavily on rare birds, mammals, and reptiles, including many MHCP priority species.

North-south connectivity across the study area is currently only functional for birds, due to intervening areas of development. The MHCP plan will allow for continued “stepping-stone” connectivity north-south across the study area for bird species, including the California gnatcatcher. The stepping-stone linkage consists of a large number of habitat patches, dominated by coastal sage scrub in an admixture of other natural habitats, from Camp Pendleton, south through central Oceanside and east Carlsbad, to south San Marcos and the unincorporated areas beyond. Although fragmented and subject to edge effects, these patches support a variety of MHCP species, including breeding California gnatcatcher populations. A variety of evidence suggests that gnatcatchers do successfully breed and disperse among these patches, thereby maintaining genetic and demographic connectivity for the species across this highly fragmented study area to the larger core habitat areas north and south of the study area (Spencer 1997). To a large degree, the MHCP preserve design strives to maintain and even enhance the functionality of this stepping-stone linkage. Restoration of coastal sage scrub in some critical stepping stone areas is expected to improve functionality of this regionally important north-south linkage.

Linkages for small mammals, reptiles, amphibians, and invertebrates are mostly nonexistent between many habitat blocks due to existing roads and urban and agricultural areas. However, some large blocks of habitat inside the study area (e.g., south San Marcos, north Escondido, and north Oceanside) are contiguous with larger blocks beyond the MHCP boundaries. These preserve areas are expected to sustain populations of many MHCP species that will otherwise be lost from more isolated portions of the MHCP preserve system. For example, San Diego horned lizards may be extirpated from interior preserve areas in the coastal cities, but are expected to persist on Daley Ranch, south San Marcos, and north Oceanside due to more extensive populations in adjacent habitats, outside of MHCP boundaries.

Small and Isolated Preserve Areas—The MHCP preserve system will include a large number of smaller preserve areas that are surrounded by urban lands or otherwise isolated from biological core areas. Many of these tiny preserves are nevertheless critical to coverage of MHCP species, particularly narrow endemic species. For example, vernal pool preserves and their associated watersheds in west Carlsbad and central San Marcos (in the Major Amendment Area) are critical to conserving fairy shrimp species and a number of narrow endemic plant species, and a large number of plant preserves are scattered throughout the coastal cities. Despite their small size, these “postage-stamp” preserves include many of the major and critical populations of priority MHCP species and are expected to sustain these populations so long as they are adequately managed to protect the functionality of their watersheds and to minimize edge effects.

3.2 CONSERVATION OF ECOLOGICAL COMMUNITIES AND SUBCOMMUNITIES

Table 3-2 summarizes overall levels of conservation estimated for MHCP ecological communities based on the FPA calculations. Wetland ecological communities, such as the lagoon and marsh community and riparian community, will be highly conserved due to the no net loss policy. Consequently, species comprising those communities should be relatively well conserved by the plan, provided that species-specific or site-specific conservation and

management needs are adequately addressed. In contrast, the grassland community is conserved at a relatively low level (32% overall and 47% of grasslands within the BCLA). Consequently, it is more difficult to justify coverage for grassland-dependent species, and more intensive monitoring and management may be required to ensure persistence of some grassland residents in the study area.

Other upland communities will be conserved at intermediate levels, with chaparral and oak woodland ecological communities conserved at about the 71% and 79% levels, respectively (73% and 85% of these communities within the BCLA). The coastal scrub community will be conserved by the FPA at about the 61% level, including about 68% of the community within the BCLA. Additional conservation, not accounted for in these estimates, will occur for the coastal scrub community via restoration of coastal sage scrub in key locations, conservation of lands in the unincorporated area to the southeast (the “MHCP core area”), and additional conservation expected through acquisitions and offsite mitigation requirements. These contributions are not yet fully accounted for, but will increase coastal scrub community conservation over that shown in Table 3-2.

Table 3-3 summarizes overall levels of conservation estimated for MHCP ecological subcommunities considered important to MHCP species. Subcommunities on sandstone soils and gabbro-derived soils are relatively well conserved, while those on clay soils are relatively poorly conserved. The only 2 acres of coastal bluff scrub in the study area are not conserved.

The following sections detail how resident animal species and plant species within each of these ecological communities may be affected as a group by the plan.

3.2.1 Lagoon and Marsh Ecological Community

The species occurring in the lagoon and marsh ecological community rely on the wetland vegetation and open water habitats in and immediately around the coastal lagoons and other large marshy or open water areas. Habitat types within the lagoon and marsh ecological community include southern coastal salt marsh, alkali marsh, freshwater marsh, open freshwater, estuarine, and saltpan/mudflats. Table 3-4 lists MHCP animal species that rely on this community for at least some life requisites or life stages. In addition, San Diego marsh-elder (*Iva hayesiana*) is associated with alkali marshes in the study area.

Due to the MHCP no net loss policy for wetland vegetation and existing conservation and management activities in this ecological community, lagoon and marsh species are likely to be highly conserved (Table 3-5). Very limited taking of these species or their habitats may occur due to specific projects, but mitigation and management policies will ensure no net loss of habitat value to support the species. However, lagoon and marsh habitats outside of the FPA may not be actively managed as part of the preserve.

Table 3-2

**LEVELS OF CONSERVATION ESTIMATED FOR
PRIMARY ECOLOGICAL COMMUNITIES
IN THE MHCP STUDY AREA**

Ecological Community	Gross Acres in MHCP Study Area	Acres (%) Conserved		
		Inside FPA acres (%)	Outside FPA acres (%)	Total acres (%)
Lagoon and marsh ¹	2,362	2,192 (93%)	170 (7%)	2,362 (100%)
Riparian ²	2,806	2,137 (76%)	669 (24%)	2,806 (100%)
Grasslands	5,219	1,687 (32%)	0 (0%)	1,687 (32%)
Coastal scrub ³	9,152	5,609 (61%)	0 (0%)	5,609 (61%)
Oak woodland ⁴	881	700 (79%)	0 (0%)	700 (79%)
Chaparral ⁵	9,292	6,554 (71%)	0 (0%)	6,554 (71%)
Vernal pools ⁶	22	9 (41%)	0 (0%)	9 (41%)
Total⁷	29,734	18,888 (64%)	839 (3%)	19,727 (66%)

Note: Numbers may not sum to totals as shown due to rounding.

Source: Aggregation of vegetation acreages from October 2002 SANDAG GIS calculations.

¹ Southern coastal salt marsh, alkali marsh, freshwater marsh, freshwater, estuarine, and saltpan/mudflat.

² Riparian forest, riparian woodland, riparian scrub, and natural flood channel/streambed.

³ Southern coastal bluff scrub, maritime succulent scrub, coastal sage scrub, and coastal sage/chaparral mixed.

⁴ Engelmann oak woodland, coast live oak woodland, and other oak woodland.

⁵ Chaparral and southern maritime chaparral.

⁶ Habitat conserved inside the FPA will be managed for biological value.

⁷ Wetland habitat conserved outside the FPA per the no net loss policy won't necessarily be managed for biological value.

⁸ Acreage and percentage of each vegetation community inside the biological core and linkage area that will be conserved.

⁹ Includes approximately 5 acres of vernal pool habitat in Carlsbad and 17 acres in the San Marcos. Approximately 29 acres of additional mapped vernal pool habitat is known from the San Marcos Major Amendment Area, which is not addressed in this plan.

Table 3-3

**LEVELS OF CONSERVATION ESTIMATED FOR
THE ECOLOGICAL SUBCOMMUNITIES
IN THE MHCP STUDY AREA**

Ecological Subcommunity	Gross Acres in MHCP Study Area	Net Conservation Inside FPA Acres (%)
Grassland on clay soils	1,148	304 (27%)
Coastal sage scrub on sandstone soils	1,684	1,154 (69%)
Coastal sage scrub on clay soils	624	304 (49%)
Coastal sage scrub on gabbro-derived	464	329 (71%)
Coastal bluff scrub	2	0 (0%)
Chaparral on sandstone soils	1,106	799 (72%)
Chaparral on gabbro-derived soils	617	477 (77%)

Table 3-4

**LAGOON AND MARSH ECOLOGICAL COMMUNITY USE BY
REPRESENTATIVE ANIMAL SPECIES¹**

Species	Required for ²		
	Reproduction	Foraging	Cover
Harbison's dun skipper (<i>Euphyes vestris harbisoni</i>)	X	X	X
Saltmarsh skipper (<i>Panoquina errans</i>)	X	X	X
Oblivious tiger beetle (<i>Cicindela latesignata obliviosa</i>)	X	X	X
Southwestern pond turtle (<i>Clemmys marmorata pallida</i>)	X	X	X
California brown pelican (<i>Pelecanus occidentalis californicus</i>)		X	X
White-faced ibis (<i>Plegadis chihi</i>)	X	X	X
Northern harrier (<i>Circus cyaneus</i>)	X	X	X
Osprey (<i>Pandion haliaetus</i>)		X	
Peregrine falcon (<i>Falco peregrinus anatum</i>)		X	
Light-footed clapper rail (<i>Rallus longirostris levipes</i>)	X	X	X
Western snowy plover (<i>Charadrius alexandrinus nivosus</i>)		X	X
Long-billed curlew (<i>Numenius americanus</i>)		X	X
Elegant tern (<i>Sterna elegans</i>)		X	X
California least tern (<i>Sterna antillarum browni</i>)	X	X	X
Belding's Savannah sparrow (<i>Passerculus sandwichensis beldingi</i>)	X	X	X
Large-billed Savannah sparrow (<i>Passerculus sandwichensis rostratus</i>)	X	X	X
Tricolored blackbird (<i>Agelaius tricolor</i>)	X	X	X
Townsend's western big-eared bat (<i>Corynorhinus townsendii pallescens</i>)		X	
California western mastiff bat (<i>Eumops perotis californicus</i>)		X	

¹ In addition, San Diego marsh-elder (*Iva hayesiana*) is associated with alkali marshes in the study area.

² Reproduction includes breeding, nesting, egg laying, rearing activities; Foraging includes hunting and feeding activities; and Cover includes roosting, burrowing, hiding, and estivating activities.

Table 3-5

**CONSERVATION LEVELS FOR THE LAGOON AND
MARSH ECOLOGICAL COMMUNITY**

City	Gross Acres in MHCP Study Area	Net Acres Conserved (%) ²		
		Inside FPA acres (%)	Outside FPA ¹ acres (%)	Total acres (%)
Carlsbad	1,176	1,118 (95%)	58 (5%)	1,176 (100%)
Encinitas	546	532 (97%)	14 (3%)	546 (100%)
Escondido	276	265 (96%)	11 (4%)	276 (100%)
Oceanside	340	270 (79%)	70 (21%)	340 (100%)
San Marcos	11	1 (10%)	10 (90%)	11 (100%)
Solana Beach	10	6 (55%)	5 (45%)	10 (100%)
Vista	2	0 (0%)	2 (100%)	2 (100%)
Total	2,362	2,192 (93%)	170 (7%)	2,362 (100%)

¹ Note that 100% conservation is assumed both inside and outside of the FPA, but wetland areas outside of the FPA are not necessarily managed as preserve.

² Numbers may not sum to total as shown due to rounding.

The MHCP preserve design is expected to allow continued access to all lagoons by large predators (e.g., coyotes), which is important to maintaining ecological balance and avoiding deleterious effects of “meso-predator release” (the increase in smaller predators such as opossums, skunks, foxes, and raccoons [Soulé 1986]) on birds nesting within this community. Species-specific conservation and management conditions are addressed as appropriate in the individual species justifications.

3.2.2 Riparian Ecological Community

Species occurring in the riparian ecological community rely on habitats along rivers, streams, and watercourses, or on the instream habitats. Vegetation types comprising this ecological community include riparian forest, riparian woodland, riparian scrub, and natural floodchannel/streambed vegetation. These habitats are often dominated by willows (*Salix* spp.), cottonwoods (*Populus* spp.), or other water-dependent woody vegetation. The riparian ecological community is closely linked to the lagoon and marsh ecological community by water flow and associated processes. Conservation and management actions that affect the riparian community may thus also benefit the lagoon and marsh community.

The riparian ecological community provides movement corridors for a number of species. The natural linear configuration of this ecological community forms continuous linkages between other habitats, and it sometimes provides the only remaining movement corridors through urban or agricultural areas. The riparian ecological community has exceptionally high species diversity. Therefore, conservation of riparian habitat types helps protect these valuable habitat linkages and “hotspots” of species diversity. Table 3-6 lists MHCP animal species that rely upon the

riparian ecological community for at least some component of their life history. In addition, Orcutt's brodiaea and San Diego marsh-elder are found along seasonal streams, while San Diego ambrosia utilizes natural floodchannel (e.g., floodplain) habitat.

Due to the MHCP no net loss policy for wetland vegetation and existing conservation and management activities in this ecological community, riparian species are likely to be highly conserved (Table 3-7). Very limited taking of these species or their habitats may occur due to specific projects, but mitigation and management policies will ensure no net loss of habitat value to support the species. However, riparian habitats outside of the FPA may not be actively managed as part of the preserve. While many of the habitats in the riparian community will be protected, some more specialized species may still be vulnerable to changes in hydrology, flow regime, water quality, or other factors affecting the habitat quality (e.g., urban or agricultural runoff containing pollutants, erosion and sedimentation, changes in fluvial processes, and invasive nonnative species). Riparian species may also be affected by impacts in adjacent uplands that are often used by these species for foraging. Species-specific conservation and management conditions are addressed as appropriate in the individual species evaluations.

Table 3-6

**RIPARIAN ECOLOGICAL COMMUNITIES USE BY
REPRESENTATIVE ANIMAL SPECIES¹**

Species	Required for ²		
	Reproduction	Foraging	Cover
Harbison's dun skipper butterfly (<i>Euphys vestris harbisoni</i>)	X	X	X
California red-legged frog (<i>Rana aurora draytonii</i>)	X	X	X
Arroyo southwestern toad (<i>Bufo microscaphus californicus</i>)	X	X	X
Southwestern pond turtle (<i>Clemmys marmorata pallida</i>)	X	X	X
White-faced ibis (<i>Plegadis chihi</i>)		X	X
Cooper's hawk (<i>Accipiter cooperii</i>)	X	X	X
Peregrine falcon (<i>Falco peregrinus anatum</i>)		X	
Southwestern willow flycatcher (<i>Empidonax traillii</i>)	X	X	X
Least Bell's vireo (<i>Vireo bellii pusillus</i>)	X	X	X
Yellow-breasted chat (<i>Icteria virens</i>)	X	X	X
Tricolored blackbird (<i>Agelaius tricolor</i>)	X	X	X
Townsend's western big-eared bat (<i>Corynorhinus townsendii pallescens</i>)		X	
Mountain lion (<i>Felis concolor</i>)	X	X	X
Mule deer (<i>Odocoileus hemionus fuliginata</i>)	X	X	X

¹ In addition, Orcutt's brodiaea (*Brodiaea orcuttii*) and San Diego marsh-elder are found along seasonal streams, while San Diego ambrosia (*Ambrosia pumila*) uses natural floodchannel (e.g., floodplain) habitat.

² Reproduction includes breeding, nesting, egg laying, rearing activities; Foraging includes hunting and feeding activities; and Cover includes roosting, burrowing, hiding, and estivating activities.

Table 3-7

**CONSERVATION LEVELS FOR THE RIPARIAN
ECOLOGICAL COMMUNITY**

City	Gross Acres in MHCP Study Area	Net Acres Conserved (%) ²		
		Inside FPA acres (%)	Outside FPA ¹ acres (%)	Total acres (%)
Carlsbad	459	389 (85%)	70 (15%)	459 (100%)
Encinitas	274	243 (88%)	31 (12%)	274 (100%)
Escondido	442	291 (66%)	151 (34%)	442 (100%)
Oceanside	1,189	950 (80%)	239 (20%)	1,189 (100%)
San Marcos	186	117 (63%)	69 (37%)	186 (100%)
Solana Beach	1	0 (0%)	1 (100%)	1 (100%)
Vista	255	148 (58%)	108 (42%)	255 (100%)
Total	2,806	2,137 (76%)	669 (24%)	2,806 (100%)

¹ Note that 100% conservation is assumed both inside and outside of the FPA, but wetland areas outside of the FPA are not necessarily managed as preserve.

² Numbers may not sum to total as shown due to rounding.

3.2.3 Grassland Ecological Community

Most grasslands in southern California are now dominated by nonnative annual grasses (see Appendix F for definition). Although some native perennial grasslands are scattered throughout the study area, these rare habitat types have not been systematically mapped. The study area lacks large, contiguous grassland areas (i.e., hundreds or thousands of acres), and consequently it is not a “hotspot” for grassland-dependent species. This is especially true for species like the badger that require very large habitat areas. Most grasslands in the MHCP area are small and scattered and often occur in a mosaic with other community types, such as coastal scrubs or oak woodlands. Species typical of the coastal scrub community, such as the California gnatcatcher, often use grassland in such mosaic situations, which occur commonly in the coastal plains of Oceanside and Carlsbad. Grasslands in the study area are also important to foraging raptors and provide linkages between other habitats for a variety of species. Vernal pools and ponded areas in grasslands represent important watering and breeding locations for many species, such as toads. Grasslands on sandy loams or soils low in clay content are important to burrowing mammals, such as the Stephens’ kangaroo rat, and many MHCP plant species require grasslands with particular soil characteristics. Table 3-8 lists MHCP animal species that rely upon the grassland ecological community for at least some component of their life history. Table 3-9 lists MHCP plant species that are found in grasslands or grassland subcommunities.

Table 3-8

**GRASSLANDS ECOLOGICAL COMMUNITY USE BY
REPRESENTATIVE ANIMAL SPECIES**

Species	Required for ¹		
	Reproduction	Foraging	Cover
Quino checkerspot butterfly (<i>Euphydryas editha quino</i>)	X	X	X
Western spadefoot toad (<i>Scaphiopus hammondi</i>)	X	X	X
Arroyo southwestern toad (<i>Bufo microscaphus californicus</i>)		X	X
San Diego horned lizard (<i>Phrynosoma coronatum blainvillei</i>)	X	X	X
Orange-throated whiptail (<i>Cnemidophorus hyperythrus beldingi</i>)	X	X	X
Northern harrier (<i>Circus cyaneus</i>)	X	X	X
Golden eagle (<i>Aquila chrysaetos</i>)		X	
Long-billed curlew (<i>Numenius americanus</i>)	X	X	X
Tricolored blackbird (<i>Agelaius tricolor</i>)		X	
Burrowing owl (<i>Athene cunicularia</i>)	X	X	X
Western bluebird (<i>Sialia mexicana</i>)		X	
Grasshopper sparrow (<i>Ammodramus savannarum</i>)	X	X	X
Stephens' kangaroo rat (<i>Dipodomys stephensi</i>)	X	X	X
Pacific little pocket mouse (<i>Perognathus longimembris pacificus</i>)	X	X	X
San Diego black-tailed jackrabbit (<i>Lepus californicus bennettii</i>)	X	X	X

¹ Reproduction includes breeding, nesting, egg laying, rearing activities; Foraging includes hunting and feeding activities; and Cover includes roosting, burrowing, hiding, and estivating activities.

Table 3-9

**GRASSLAND ECOLOGICAL COMMUNITY USE
BY MHCP PLANT SPECIES**

Species	GL ¹	CL ¹
San Diego thorn-mint (<i>Acanthomintha ilicifolia</i>)		X
San Diego ambrosia (<i>Ambrosia pumila</i>)	X	
Thread-leaved brodiaea (<i>Brodiaea filifolia</i>)		X ²
Orcutt's brodiaea (<i>Brodiaea orcuttii</i>)		X ²
San Diego button-celery (<i>Eryngium aristulatum</i> var. <i>parishii</i>)		X ²
San Diego goldenstar (<i>Muilla clevelandii</i>)		X
Engelmann oak (<i>Quercus engelmannii</i>)	X	

¹ GL = Undifferentiated grassland; CL = grassland communities on clay soils.

² Restricted to mesic portions of grasslands.

The quality and habitat value of grasslands vary greatly across the study area. Some grassland areas are fairly intact and dominated by native grasses, while many others are highly disturbed or in some state of recovery (e.g., fallow agricultural fields or fuel reduction zones). Although annual grasslands have not traditionally been a conservation target in the MHCP area, some grassland conservation is required to meet take authorization standards for some MHCP species and for the MHCP to meet NCCP planning tenets for multiple habitat preserve design. Approximately 32% of the 5,219 acres of grasslands in the MHCP study area will be conserved by the FPA (Table 3-10). However, some grasslands included in this estimate may be converted to coastal sage scrub to meet MHCP biological goals, either through natural ecological succession or active restoration. Species-specific conservation and management conditions are addressed as appropriate in the individual species evaluations (Section 4.0).

Table 3-11 summarizes levels of conservation expected for those grassland subcommunities used by grassland-dependent sensitive plant species and for which data are available. Grasslands on heavy clay soils support a number of MHCP plant species, including San Diego thorn-mint, Orcutt's brodiaea, San Diego button-celery, and San Diego goldenstar. Native grasslands are also most likely to be found in this subcommunity. Conservation of grasslands on clay soils is relatively low, with about 304 acres (27% of total in the study area) expected to be conserved.

3.2.4 Coastal Scrub Ecological Community

Habitat types in the coastal scrub ecological community include southern coastal bluff scrub, maritime succulent scrub, Diegan coastal sage scrub, and coastal sage scrub-chaparral mix.

This community, and especially Diegan coastal sage scrub vegetation, is a focus for MHCP conservation because it is the primary habitat for the California gnatcatcher, among other species. Table 3-12 lists MHCP animal species that rely upon the coastal scrub ecological community for at least some component of their life history. Table 3-13 lists MHCP plant species that are found in various types of coastal sage scrub or coastal sage scrub subcommunities. Although some species are more likely to be found in coastal scrub habitats, many of the animal and plant species found in this community also occur in chaparral habitats.

Table 3-10

**CONSERVATION LEVELS FOR THE GRASSLAND
ECOLOGICAL COMMUNITY**

City	Gross Acres in MHCP Study Area	Net Acres Conserved (%) ²		
		Inside FPA acres (%)	Outside FPA ¹ acres (%)	Total acres (%)
Carlsbad	1,299	490 (38%)	0 (0%)	490 (38%)
Encinitas	206	109 (53%)	0 (0%)	109 (53%)
Escondido	597	401 (67%)	0 (0%)	401 (67%)
Oceanside	1,724	570 (33%)	0 (0%)	570 (33%)
San Marcos	702	91 (13%)	0 (0%)	91 (13%)
Solana Beach	–	–	–	–
Vista	691	27 (4%)	0 (0%)	27 (6%)
Total	5,219	1,687 (32%)	0 (0%)	1,687 (32%)

¹ Grasslands outside the FPA are considered taken. Current MHCP policies do not require mitigation for grassland impacts outside the FPA, although some subarea plans may require mitigation for such take.

² Numbers may not sum to total as shown due to rounding.

Table 3-11

**CONSERVATION LEVELS FOR GRASSLAND
ECOLOGICAL SUBCOMMUNITIES**

City	Net Acres Conserved (%) ^{1,2}		
	GL (% of GL)	CL (% of CL)	Total (% of total)
Carlsbad	324 (37%)	166 (39%)	490 (38%)
Encinitas	99 (65%)	10 (19%)	109 (53%)
Escondido	371 (62%)	0 (0%)	401 (67%)
Oceanside	433 (33%)	110 (27%)	570 (33%)
San Marcos	70 (13%)	15 (10%)	91 (13%)
Solana Beach	–	–	–
Vista	28 (5%)	3 (3%)	27 (6%)
Total	1,309 (32%)	304 (27%)	1,687 (32%)

¹ GL = Grasslands (excluding grasslands on clay soils); CL = Grasslands on clay soils.

² Numbers may not total due to rounding.

Some shrubs in coastal scrub habitats contain volatile compounds, which make fire a regular natural disturbance; however, most plant species in the community are capable of continual seedling reproduction and maintenance of a vigorous, viable community in the absence of fire. If the fire recurrence interval becomes too frequent (as is possible with increased human presence), the scrub community could be converted into a nonnative grassland with lower habitat value.

The coastal scrub ecological community forms the backbone of the MHCP preserve. It is distributed as a series of patches that form a generally north-south stepping-stone linkage across the study area. This stepping-stone corridor links between much larger contiguous blocks of this community on Camp Pendleton to the north and in the unincorporated area and the MSCP preserve to the south. Other ecological community types, especially grasslands and riparian areas, help form local linkages between these stepping stones to improve overall habitat connectivity.

Table 3-12

**COASTAL SCRUB ECOLOGICAL COMMUNITY USE
BY REPRESENTATIVE ANIMAL SPECIES**

Species	Required for ¹		
	Reproduction	Foraging	Cover
Hermes copper butterfly (<i>Lycaena hermes</i>)	X	X	X
Quino checkerspot butterfly (<i>Euphydryas editha quino</i>)	X	X	X
Arroyo southwestern toad (<i>Bufo microscaphus californicus</i>)		X	X
Western spadefoot toad (<i>Scaphiopus hammondi</i>)		X	X
San Diego horned lizard (<i>Phrynosoma coronatum blainvillei</i>)	X	X	X
Orange-throated whiptail (<i>Cnemidophorus hyperythrus beldingi</i>)	X	X	X
Northern harrier (<i>Circus cyaneus</i>)	X	X	X
Cooper's hawk (<i>Accipiter cooperii</i>)		X	
Golden eagle (<i>Aquila chrysaetos</i>)		X	
Coastal cactus wren (<i>Campylorhynchus brunneicapillus cousei</i>)	X	X	X
Coastal California gnatcatcher (<i>Polioptila californica californica</i>)	X	X	X
So. California rufous-crowned sparrow (<i>Aimophila ruficeps canescens</i>)	X	X	X
Bell's sage sparrow (<i>Amphispiza belli belli</i>)	X	X	X
Stephens' kangaroo rat (<i>Dipodomys stephensi</i>)	X	X	X
Northwestern San Diego pocket mouse (<i>Chaetodipus fallax fallax</i>)	X	X	X
Pacific pocket mouse (<i>Perognathus longimembris pacificus</i>)	X	X	X
San Diego black-tailed jackrabbit (<i>Lepus californicus bennettii</i>)	X	X	X
Mountain lion (<i>Felis concolor</i>)	X	X	X
Mule deer (<i>Odocoileus hemionus fuliginata</i>)	X	X	X

¹ Reproduction includes breeding, nesting, egg laying, rearing activities; Foraging includes hunting and feeding activities; and Cover includes roosting, burrowing, hiding, and estivating activities.

Table 3-14 summarizes levels of conservation expected for the coastal scrub ecological community. Although only about 61% of the extant acreage is expected to be conserved by the FPA (including 68% of this community within the BCLA), increased conservation is expected from additional contributions, which are roughly estimated in Table 3-14.

Specifically, the coastal scrub ecological community will benefit from (1) habitat restoration efforts targeted at key stepping stone and linkage areas and from (2) additional MHCP conservation in the unincorporated area southeast of the MHCP boundary. The unincorporated core area is expected to add 400 to 500 acres of high quality gnatcatcher breeding habitat capable of supporting 16 to 23 pairs of gnatcatchers to the preserve system. In addition, offsite mitigation contributions to compensate for removal of coastal sage scrub outside of the FPA have yet to be fully accounted for in some cities. These offsite mitigation contributions will be estimated in subarea plan analyses and in the MHCP preserve assembly and financing analyses. Species-specific conservation and management conditions are addressed as appropriate in the individual species evaluations.

Table 3-13

**COASTAL SCRUB ECOLOGICAL COMMUNITY USE
BY MHCP PLANT SPECIES¹**

Species	CSS	SS	CL	GB	CBS	MSS
San Diego thorn-mint (<i>Acanthomintha ilicifolia</i>)			X			
San Diego ambrosia (<i>Ambrosia pumila</i>)	X					
Aphanisma (<i>Aphanisma blitoides</i>)	X ²				X	
Del Mar Mesa sand aster (<i>Corethrogyne filaginifolia</i> var. <i>linifolia</i>)		X				
Blochman's dudleya (<i>Dudleya blochmaniae</i> ssp. <i>blochmaniae</i>)			X		X	
Variiegated dudleya (<i>Dudleya variegata</i>)			X			
Sticky dudleya (<i>Dudleya viscida</i>)	X ³					
Cliff spurge (<i>Euphorbia misera</i>)	X ²				X ²	X ²
San Diego barrel cactus (<i>Ferocactus viridescens</i>)	X					
Orcutt's hazardia (<i>Hazardia orcuttii</i>)	X					
Nuttall's lotus (<i>Lotus nuttallianus</i>)					X ²	
San Diego goldenstar (<i>Muilla clevelandii</i>)			X			
Nuttall's scrub oak (<i>Quercus dumosa</i>)	X ²					
Parry's tetracoccus (<i>Tetracoccus dioicus</i>)				X		

¹ CSS = Undifferentiated coastal sage scrub; SS = Coastal sage scrub on sandstone soils; CL = Coastal sage scrub on clay soils; GB = Coastal sage scrub on gabbro-derived soils; CBS = Coastal bluff scrub; MSS = Maritime succulent scrub.

² Primarily or entirely restricted to the immediate coastal zone.

³ Primarily found on steep slopes or cliffs.

Table 3-14

**CONSERVATION LEVELS FOR THE COASTAL SCRUB
ECOLOGICAL COMMUNITY¹**

City	Gross Acres in MHCP Study Area	Net Acres Conserved (%) ⁵			Additional Contributions	
		Inside FPA acres (%)	Outside FPA ² acres (%)	Total acres (%)	Restoration ³	Core Area ⁴
Carlsbad	2,298	1,499 (65%)	0 (0%)	1,499 (65%)	104	
Encinitas	943	631 (67%)	0 (0%)	631 (67%)		
Escondido	2,304	1,576 (68%)	0 (0%)	1,576 (68%)		
Oceanside	1,348	692 (51%)	0 (0%)	692 (51%)	164	
San Marcos	1,990	1,065 (53%)	0 (0%)	1,065 (53%)	70	
Solana Beach	13	6 (46%)	0 (0%)	6 (46%)		
Vista	255	140 (55%)	0 (0%)	140 (55%)		
Total	9,152	5,609 (61%)	0 (0%)	5,609 (61%)	338	400-500⁶

¹ Includes coastal bluff scrub, maritime succulent scrub, coastal sage scrub, and coastal sage/chaparral mix.

² Coastal scrub outside of the FPA is considered to be lost to development, although some proportion will likely remain.

³ Additional coastal sage scrub acreage estimated will be created by restoration in key biological core and linkage areas. Acres listed by city are not necessarily the responsibility of that city.

⁴ Not yet apportioned to show individual city or wildlife agency responsibilities.

⁵ Numbers may not sum to total as shown due to rounding.

⁶ Acres of high quality gnatcatcher breeding habitat. Gross acres of land conserved may be higher.

Table 3-15 summarizes levels of conservation expected for those coastal sage scrub subcommunities used by sensitive plant species and for which data are available. Although the overall conservation of scrub types used by MHCP plant species will be conserved at an estimated 61% level, conservation of subcommunities ranges from 0% conservation (coastal bluff scrub) to 90% conservation for maritime succulent scrub.

Del Mar Mesa sand-aster is sometimes found in coastal sage scrub on sandstone soils, of which about 1,154 acres (69% of total) are expected to be conserved. Coastal sage scrub on clay soils supports at least four MHCP plant species: San Diego thorn-mint, Blochman's dudleya, variegated dudleya, and San Diego goldenstar. Approximately 304 acres (49% of total) of this subcommunity are expected to be conserved. At least one MHCP species, Parry's tetracoccus, is apparently confined to gabbro-derived soils. Coastal sage scrub on gabbro-derived soils are conserved at a relatively high level, with about 329 acres (71% of total) expected to be conserved in the study area.

Coastal bluff scrub, considered a subcommunity of coastal sage scrub, is very rare in the study area, with only about 2 acres mapped in Solana Beach. This subcommunity, restricted to poorly developed soils in the immediate vicinity of the coast, has the potential to support four MHCP plant species: aphanisma, Blochman's dudleya, cliff spurge, and Nuttall's lotus. The 2

acres of coastal bluff scrub mapped in the study area are outside the FPA and considered not to be conserved.

3.2.5 Oak Woodland Ecological Community

Oak woodlands support a diverse community of animal species adapted to exploiting the structural complexity, microhabitat characteristics, and abundance of food and cover occurring in these woodlands. The community also helps link or buffer other community types, such as riparian and chaparral ecological communities. Dominant tree species in the study area are Engelmann and coast live oak, while the understory is often dominated by annual grasslands or a broad-leaved herbaceous cover in more mesic sites. Table 3-16 lists MHCP animal species that rely upon the oak woodland ecological community for at least some component of their life history. In addition, Engelmann oak (*Quercus engelmannii*) is the dominant tree in Engelmann oak woodland habitat.

Coast live oak has adapted to fire by crown- or stump-sprouting. Low intensity fires are more beneficial to this species than infrequent but higher intensity fires. Engelmann oak seedlings are tolerant of fire, but mature trees may be killed if trunks have prolonged contact with flames. Coast live oak typically occurs at lower elevations. The majority of coast live oak woodland occurs in Vista, San Marcos, and Escondido, while Engelmann oak woodlands in the MHCP study area are largely restricted to foothills and mountains in Escondido.

Table 3-17 summarizes levels of conservation for this ecological community. The FPA is expected to conserve approximately 79% of the oak woodland community, although subarea plan policies may increase this level. This includes 82% conservation of Engelmann oak woodland. Species-specific conservation and management conditions are addressed as appropriate in the individual species evaluations.

Table 3-15

CONSERVATION LEVELS FOR COASTAL SCRUB ECOLOGICAL SUBCOMMUNITIES

City	Net Acres Conserved (%) ^{1,2,3}						Total (% of total)
	CSS (% of CSS)	SS (% of SS)	CL (% of CL)	GB (% of GB)	CBS (% of CBS)	MSS (% of MSS)	
Carlsbad	850 (78%)	405 (70%)	174 (61%)	41 (100%)	–	29 (90%)	1,499 (65%)
Encinitas	298 (63%)	279 (77%)	54 (52%)	–	–	–	631 (67%)
Escondido	1,294 (68%)	–	7 (48%)	275 (82%)	–	–	1,576 (68%)
Oceanside	167 (39%)	463 (64%)	62 (33%)	0 (0%)	–	–	692 (51%)
San Marcos	1,047 (58%)	0 (0%)	5 (16%)	13 (43%)	–	–	1,065 (53%)
Solana Beach	0 (0%)	6 (57%)	–	–	0 (0%)	–	6 (46%)
Vista	137 (76%)	1 (8%)	2 (45%)	0 (0%)	–	–	140 (55%)
Total	3,793 (64%)	1,154 (69%)	304 (49%)	329 (71%)	0 (0%)	29 (90%)	5,609 (61%)

¹ Gross acres = all coastal scrub types (coastal sage scrub, coastal bluff scrub, maritime succulent scrub) exclusive of coastal sage scrub/chaparral mix, which is not included in this analysis because it does not appear to be used to any great degree by MHCP plant species.

² CSS = All coastal sage scrub exclusive of coastal sage scrub occurring on sandstone, clay, or gabbro soils; SS = Coastal sage scrub on sandstone soils; CL soils = Coastal sage scrub on clay soils; GB = Coastal sage scrub on gabbro-derived soils; CBS = Coastal bluff scrub; MSS = Maritime succulent scrub.

³ Numbers may not total as shown due to rounding.

Table 3-16

**OAK WOODLAND ECOLOGICAL COMMUNITY USE
BY REPRESENTATIVE ANIMAL SPECIES¹**

Species	Required for ²		
	Reproduction	Foraging	Cover
Harbison's dun skipper butterfly (<i>Euphys vestris harbisoni</i>)	X	X	X
Cooper's hawk (<i>Accipiter cooperii</i>)	X	X	X
Golden eagle (<i>Aquila chrysaetos</i>)	X	X	X
Western bluebird (<i>Sialia mexicana</i>)	X	X	X
Mountain lion (<i>Felis concolor</i>)	X	X	X
Mule deer (<i>Odocoileus hemionus fuliginata</i>)	X	X	X

¹ In addition, Engelmann oak (*Quercus engelmannii*) is an important component of this community.

² Reproduction includes breeding, nesting, egg laying, rearing activities; Foraging includes hunting and feeding activities; and Cover includes roosting, burrowing, hiding, and estivating activities.

Table 3-17

**CONSERVATION LEVELS FOR THE OAK WOODLAND
ECOLOGICAL COMMUNITY¹**

City	Gross Acres in MHCP Study Area	Net Acres Conserved (%) ³		
		Inside FPA acres (%)	Outside FPA ² Acres (%)	Total acres (%)
Carlsbad	24	19 (79%)	0 (0%)	19 (79%)
Encinitas	—	—	—	—
Escondido	807	655 (81%)	0 (0%)	655 (81%)
Oceanside	4	4 (95%)	0 (0%)	4 (95%)
San Marcos	27	22 (81%)	0 (0%)	22 (81%)
Solana Beach	—	—	—	—
Vista	18	0 (0%)	0 (0%)	0 (0%)
Total	881	700 (79%)	0 (0%)	700 (79%)

¹ Includes oak woodlands dominated by Engelmann oak, coast live oak, and other oaks.

² Oak woodlands outside the FPA are considered taken, although local subarea plan policies may increase conservation over FPA levels.

³ Numbers may not total due to rounding.

3.2.6 Chaparral Ecological Community

The chaparral community is typically found on more mesic sites than the coastal scrub community and frequently dominates moderate to steep north-facing slopes. Habitat types in the chaparral ecological community include southern mixed chaparral and southern maritime chaparral. Southern maritime chaparral is considered a rare upland vegetation community by the MHCP and supports a diversity of narrow endemic plant species. Many of the species characteristic of the coastal scrub community also occur in the chaparral community. Table 3-18 lists MHCP animal species that rely upon the chaparral ecological community for at least some component of their life history. Table 3-19 lists MHCP plant species that are found in various types of chaparral or chaparral subcommunities.

Table 3-18

**CHAPARRAL ECOLOGICAL COMMUNITY USE BY
REPRESENTATIVE ANIMAL SPECIES**

Species	Required for ¹		
	Reproduction	Foraging	Cover
Hermes copper butterfly (<i>Lycaena hermes</i>)	X	X	X
San Diego horned lizard (<i>Phrynosoma coronatum blainvillei</i>)	X	X	X
Orange-throated whiptail (<i>Cnemidophorus hyperythrus beldingi</i>)	X	X	X
Northern harrier (<i>Circus cyaneus</i>)		X	
Cooper's hawk (<i>Accipiter cooperii</i>)		X	
Golden eagle (<i>Aquila chrysaetos</i>)		X	
So. California rufous-crowned sparrow (<i>Aimophila ruficeps canescens</i>)	X	X	X
Bell's sage sparrow (<i>Amphispiza belli belli</i>)	X	X	X
San Diego black-tailed jackrabbit (<i>Lepus californicus bennettii</i>)	X	X	X
Mountain lion (<i>Felis concolor</i>)	X	X	X
Mule deer (<i>Odocoileus hemionus fuliginata</i>)	X	X	X

¹ Reproduction includes breeding, nesting, egg laying, rearing activities; Foraging includes hunting and feeding activities; and Cover includes roosting, burrowing, hiding, and estivating activities.

Table 3-19

**CHAPARRAL ECOLOGICAL COMMUNITY USE
BY MHCP PLANT SPECIES**

Species	CHP ¹	SS ¹	GB ¹	CLF ¹
San Diego thorn-mint (<i>Acanthomintha ilicifolia</i>)			X	
Del Mar manzanita (<i>Arctostaphylos glandulosa</i> ssp. <i>crassifolia</i>)		X ²		
Encinitas baccharis (<i>Baccharis vanessae</i>)	X	X		
Wart-stemmed ceanothus (<i>Ceanothus verrucosus</i>)	X	X		
Orcutt's spineflower (<i>Chorizanthe orcuttiana</i>)		X ²		
Summer holly (<i>Comarostaphylis diversifolia</i> ssp. <i>diversifolia</i>)	X			
Del Mar Mesa sand-aster (<i>Corethrogyne filaginifolia</i> var. <i>linifolia</i>)	X	X		
Short-leaved dudleya (<i>Dudleya blochmaniae</i> ssp. <i>brevifolia</i>)		X ²		
Sticky dudleya (<i>Dudleya viscida</i>)				X
Orcutt's hazardia (<i>Hazardia orcuttii</i>)	X			
Torrey pine (<i>Pinus torreyana</i>)		X ²		
Nuttall's scrub oak (<i>Quercus dumosa</i>)		X ²		
Engelmann oak (<i>Quercus engelmannii</i>)	X			
Parry's tetracoccus (<i>Tetracoccus dioicus</i>)			X	

¹ CHP = undifferentiated chaparral; SS = sandstone soils (primarily but not exclusively southern maritime chaparral); GB = gabbro-derived soils; CLF = steep slopes or cliffs.

² Restricted to southern maritime chaparral.

The dominant shrubs in this community are highly adapted to fire and often have serotinous seed casings or seeds that require scarification or leaching by burnt plant compounds to stimulate germination. Many of the larger shrubs have adapted to fire through basal resprouting. Chaparral is a wide-ranging vegetation community and occurs from coastal areas to the high mountains of the east county. Major stands within the MHCP area occur in Carlsbad, San Marcos, and Escondido. Chaparral stands occurring in San Marcos (Mt. Whitney-Double Peak) and Escondido (north of Dixon Reservoir) are considered critical to the MHCP preserve design.

Table 3-20 summarizes conservation of this ecological community in the study area. The FPA would conserve approximately 71% of all chaparral in the study area, including about 66% of southern mixed chaparral and 80% of southern maritime chaparral. Species-specific conservation and management conditions are addressed as appropriate in the individual species evaluations.

Table 3-21 summarizes levels of conservation expected for those chaparral types or subcommunities used by sensitive plant species and for which data are available. Chaparral occurring on sandstone soils is found primarily along the coast and supports a number of rare and narrow endemic MHCP plant species, including Del Mar manzanita, Encinitas baccharis,

wart-stemmed ceanothus, Orcutt's spineflower, Del Mar sand-aster, short-leaved dudleya, Torrey pine, and Nuttall's scrub oak. This subcommunity is relatively well conserved, with 799 acres (72% of total) expected to be conserved within the FPA. Chaparral occurring on gabbro-derived soils, which are high in magnesium and iron content, is found primarily in inland areas, especially Escondido, with some also found in Carlsbad. Parry's tetraococcus is restricted to gabbro-derived soils, which are also associated with a large number of endemic plant species further inland from the MHCP study area. About 477 acres (77% of total) of chaparral on gabbro-derived soils are expected to be conserved in the FPA.

Table 3-20

**CONSERVATION LEVELS FOR THE CHAPARRAL
ECOLOGICAL COMMUNITY¹**

City	Net Acres Conserved (%) ³		
	Inside FPA acres (%)	Outside FPA ² acres (%)	Total acres (%)
Carlsbad	680 (71%)	0 (0%)	680 (71%)
Encinitas	636 (83%)	0 (0%)	636 (83%)
Escondido	3,819 (80%)	0 (0%)	3,819 (80%)
Oceanside	21 (47%)	0 (0%)	21 (47%)
San Marcos	1,193 (50%)	0 (0%)	1,193 (50%)
Solana Beach	24 (33%)	0 (0%)	24 (33%)
Vista	181 (62%)	0 (0%)	181 (62%)
Total	6,554 (71%)	0 (0%)	6,554 (71%)

¹ Includes chaparral and southern maritime chaparral.

² Chaparral outside of the FPA is considered taken, although some proportion will likely remain.

³ Numbers may not sum to total as shown due to rounding.

Table 3-21

**CONSERVATION LEVELS FOR CHAPARRAL
ECOLOGICAL SUBCOMMUNITIES**

City	Net Acres Conserved (%) ^{1,2}			
	CHP (% of CHP)	SS (% of SS)	GB (% of GB)	Total (% of total)
Carlsbad	289 (70%)	363 (69%)	28 (100%)	680 (71%)
Encinitas	227 (81%)	404 (82%)	–	636 (83%)
Escondido	3,108 (74%)	–	445 (80%)	3,819 (80%)
Oceanside	8 (30%)	9 (54%)	–	21 (47%)
San Marcos	1,159 (48%)	–	–	1,193 (50%)
Solana Beach	0 (0%)	23 (34%)	–	24 (33%)
Vista	189 (75%)	0 (0%)	4 (13%)	181 (62%)
Total	4,982 (66%)	799 (72%)	477 (77%)	6,554 (71%)

¹ CHP = Chaparral (southern mixed chaparral and southern maritime chaparral except where they occur on sandstone or gabbro soils); SS = Chaparral on sandstone soils (including both southern mixed and southern maritime chaparral); GB = Chaparral on gabbro-derived soils.

² Numbers may not sum to total as shown due to rounding.

3.2.7 Vernal Pool Ecological Community

Vernal pools are a highly restricted, unique form of seasonal wetland that contain high numbers of sensitive and endemic plant and animal species. Within the MHCP, vernal pools support 9 MHCP species. Of this total, 7 species are considered narrow endemics, and 6 of the 9 species are listed as either federally or state endangered or threatened. Vernal pools typically occur within a matrix of other vegetation types (e.g., grassland, coastal sage scrub, chaparral), and some vernal pool species (e.g., western spadefoot toad) rely on adjacent, upland habitats to complete some portion of their life cycle. However, other species (e.g., Riverside fairy shrimp [*Streptocephalus woottoni*], California Orcutt grass [*Orcuttia californica*]) are completely restricted to pool habitat. Table 3-22 lists MHCP animal species that rely upon the vernal pool ecological community for at least some component of their life history.

MHCP plant species found in vernal pools include thread-leaved brodiaea, Orcutt's brodiaea, San Diego button-celery, little mousetail, spreading navarretia, and California Orcutt grass.

Vernal pools are known to be concentrated in two areas within the MHCP: Carlsbad (Poinsettia Lane vernal pools) and San Marcos. Pools in Carlsbad comprise 5 acres, all of which will be conserved within the FPA. Vernal pools in San Marcos occur in a Major Amendment Area, and are not included in the FPA. A few other scattered pools of unknown acreage are also expected to be conserved in central Carlsbad.

Table 3-22

**VERNAL POOL ECOLOGICAL COMMUNITY USE
BY REPRESENTATIVE ANIMAL SPECIES**

Species	Required for ¹		
	Reproduction	Foraging	Cover
Riverside fairy shrimp (<i>Streptocephalus woottoni</i>)	X	X	X
San Diego fairy shrimp (<i>Branchinecta sandiegoensis</i>)	X	X	X
Western spadefoot toad (<i>Scaphiopus hammondi</i>)	X		

¹ Reproduction includes breeding, nesting, egg laying, rearing activities; Foraging includes hunting and feeding activities; and Cover includes roosting, burrowing, hiding, and estivating activities.

SECTION 4.0

SPECIES-SPECIFIC CONSERVATION ANALYSES AND CONDITIONS FOR COVERAGE

4.0 SPECIES-SPECIFIC CONSERVATION ANALYSES AND CONDITIONS FOR COVERAGE

This section details the species-specific conservation analyses for each of the 77 MHCP species (29 plants and 48 animals) based on the assumptions and methods detailed in Section 2. The analyses therefore assume effective implementation of all final MHCP policies. They also reflect current subarea plan policies as contained in Public Review Draft subarea plan documents.

Each species is categorized in one of four ways for the Coverage Determination (Table 4-1) based on the Final MHCP and Public Review Draft Subarea Plans:

- **Covered.** Considered adequately conserved for subarea plans to apply for take authorizations, pursuant to all MHCP policies (e.g., Narrow Endemic, Critical Location, and Wetlands policies). This also assumes that the MHCP management and monitoring program will be fully implemented in a coordinated way across the subregion.
- **Covered, subject to species-specific conditions.** Considered adequately conserved for subarea plans to apply for take authorizations, pursuant to all above assumptions plus additional species-specific conditions that require emphasis to ensure they are adequately implemented.
- **Not covered, unless subarea plans adopt additional measures.** These species are not considered adequately conserved by public review drafts of city subarea plans as currently drafted. However, if final subarea plans implement the additional listed measures, the species would be considered adequately conserved for the cities to apply for take authorizations. Included in this category are species with major or critical populations outside the FPA. The previous analysis (Public Review Draft) generally assumed that these populations would be protected by MHCP policies (Narrow Endemic, Critical Location, or Wetlands policies). However, uncertainties remain concerning whether the policies alone are sufficient to guarantee adequate protection during subarea plan implementation. Therefore, in this analysis, strict enforcement of the intent of these policies is made an explicit, species-specific and location-specific permit condition.
- **Not covered.** This category differs from the preceding in that we can foresee no reasonable and feasible measures that can be implemented by participating cities to overcome deficiencies in species conservation. These species are further categorized as (1) extirpated from the study area (with little or no opportunity for reintroduction), (2) insufficient information to determine plan effects, or (c) insufficient conservation under the plan to meet take authorization standards or MHCP biological goals.

Table 4-1

SUMMARY OF COVERAGE DETERMINATION FOR MHCP SPECIES

Species	Covered	Covered, Subject to Species-specific Conditions	Not Covered, Unless Subarea Plans Adopt Additional Measures	Not Covered
Plants				
** San Diego thorn-mint		X		
** San Diego ambrosia		X		
Aphanisma				X
** Del Mar manzanita	X			
** Encinitas baccharis	X			
** Thread-leaved brodiaea			X	
Orcutt's brodiaea				X
Wart-stemmed ceanothus		X		
** Orcutt's spineflower		X		
Summer holly		X		
** Del Mar Mesa sand aster		X		
Blochman's dudleya			X	
** Short-leaved dudleya			X	
** Variegated dudleya				X
Sticky dudleya			X	
** San Diego button-celery			X	
Cliff spurge	X			
San Diego barrel cactus		X		
** Orcutt's hazardia		X		
San Diego marsh-elder		X		
** Nuttall's lotus		X		
** San Diego goldenstar				X
** Little mousetail		X		
** Spreading navarettia		X		
** California Orcutt grass		X		
Torrey pine	X			
Nuttall's scrub oak		X		
Engelmann oak		X		
Parry's tetraococcus	X			
Plant Summary	5	15	5	4
Animals				
** Riverside fairy shrimp		X		
** San Diego fairy shrimp			X	
Sandy beach tiger beetle				X
** Oblivious tiger beetle				X
Globose dune beetle				X
Harbison's dun skipper		X		
* Salt marsh skipper		X		
Hermes copper				X
Quino checkerspot			X	

Table 4-1 (Continued)

SUMMARY OF COVERAGE DETERMINATION FOR MHCP SPECIES

Species	Covered	Covered, Subject to Species-specific Conditions	Not Covered, Unless Subarea Plans Adopt Additional Measures	Not Covered
Western spadefoot toad		X		
Arroyo toad			X	
California red-legged frog				X
* Southwestern pond turtle		X		
San Diego horned lizard			X	
Orange-throated whiptail	X			
* California brown pelican	X			
* White-faced ibis	X			
Northern harrier				X
Cooper's hawk	X			
* Osprey	X			
Golden eagle		X		
American Peregrine falcon	X			
* Light-footed clapper rail	X			
Western snowy plover	X			
Long-billed curlew				X
* Elegant tern	X			
California least tern	X			
Burrowing owl				X
* Southwestern willow flycatcher		X		
* Least Bell's vireo		X		
** Coastal cactus wren		X		
Coastal California gnatcatcher		X		
Western bluebird	X			
* Yellow-breasted chat		X		
So. Cal. rufous-crowned sparrow	X			
* Belding's Savannah sparrow		X		
* Large-billed Savannah sparrow	X			
Bell's sage sparrow	X			
Grasshopper sparrow				X
Tricolored blackbird				X
Townsend's western big-eared bat				X
California mastiff bat				X
Stephens' kangaroo rat		X		
** Pacific pocket mouse			X	
Northwestern San Diego pocket	X			
San Diego black-tailed jackrabbit	X			
Mountain lion		X		
Southern mule deer		X		
Animal Summary	16	15	5	12
OVERALL SUMMARY	21	30	10	16

* Wetland species conserved at 100% inside the FPA due to no net loss policy.

** Narrow endemic species conserved at 100% in FPA hardline areas, 95% in FPA softline/criteria/standards area, and 80% outside the FPA.

In addition to the specific conditions listed for each species, *all* MHCP policies included in Volume I of this plan apply, although we do not repeat all conditions in each species account. The species-specific conditions illustrate only those terms and conditions that deserve special emphasis for a particular species, or that may be unique or additional to the final MHCP policies included in Volume 1. Thus, the following policies and conditions *always* apply when relevant, although they may not be repeated for every species:

Policies Approved by the MHCP Advisory Committee and Included in MHCP Volume I:

- MHCP policies for wetland vegetation communities, narrow endemic species, and grasslands (Sections 3.6 and 3.7 of Volume I)
- MHCP mitigation ratios and guidelines (Section 4.3 of Volume I)
- MHCP avoidance, minimization, and mitigation policies (Sections 3.6 and 3.7 of Volume I)
- Management to sustain populations, habitat value, and essential ecosystem processes under the MHCP Monitoring and Management Program (Volume III). This requires full and coordinated implementation of management and monitoring actions described in that document, as well as all species-specific actions described in MHCP Volume II. Examples include implementation of fire management plans, mapping and protection of vernal pool watersheds, and managing riparian habitats to mimic effects of natural fluvial processes.

Policies or Conditions Provided by the Wildlife Agencies:

- Standard Best Management Practices (Appendix B to this Volume)
- General Outline for Revegetation Plans (Appendix C)
- Narrow Endemic Species Policy and Critical Population Policy (Appendix D)
- Conditions for Estuarine Species (Appendix E)

Other Existing Policies Assumed to Apply:

- CEQA requirements for quantifying and mitigating project impacts on biological resources, including the need for species surveys where potential habitat exists

SECTION 4.1

PLANTS

4.1 PLANTS

Of the 29 plant species evaluated for coverage, 20 species are considered adequately conserved by the MHCP, provided that all permit conditions are met. The remaining 9 species include 5 that could be covered with additional measures, and 4 species for which no feasible conservation conditions are apparent.

- **Not covered, unless subarea plans adopt additional measures.** These species might be covered in cities that incorporate additional species-specific measures in their subarea plans: thread-leaved brodiaea, Blochman's dudleya, short-leaved dudleya, sticky dudleya, and San Diego button-celery
- **Not covered.** The plan does not meet take authorization standards or MHCP biological goals for the following species, and there is little opportunity to improve conservation for them within the study area: aphanisma, Orcutt's brodiaea, variegated dudleya, and San Diego goldenstar.

4.1.1 Key to Reading Plant Species Evaluations

It is important that the reader understands the format and the limitations of the species evaluation contents. Each species evaluation is organized as follows:

Conservation Goals – This brief statement is tailored to reflect functional, attainable goals that the MHCP should strive for to contribute to the species' regional viability. For example, the MHCP cannot by itself prevent extinction or recover all populations of the San Diego thorn-mint, but it can promote species persistence within the MHCP area. The goals must be substantially met for subarea plans to gain coverage for a species.

Conservation Strategy – This section briefly lays out the overall strategy that would be necessary to achieve the goals, such as conserving critical populations and managing them to remove threats and increase population size.

Coverage Determination and Conditions for Coverage – This section summarizes results of the analysis of species coverage, including how well the plan is expected to achieve the Conservation Goals and Conservation Strategy defined above. It also provides species-specific permitting conditions that must be met for a city to receive take authorizations for the species or its habitat.

1. Coverage Determination. This places the species in one of the four categories defined (page 4-1): (1) covered; (2) covered, subject to species-specific conditions; (3) not covered, unless subarea plans adopt additional measures; and (4) not covered. Note that these determinations are not binding on the wildlife agencies and do not constitute their legal Findings under state and federal endangered species acts. However, these Coverage Determinations were reviewed by the agencies, and their future Findings for subarea plan Biological Opinions are expected to be generally consistent with these Determinations.

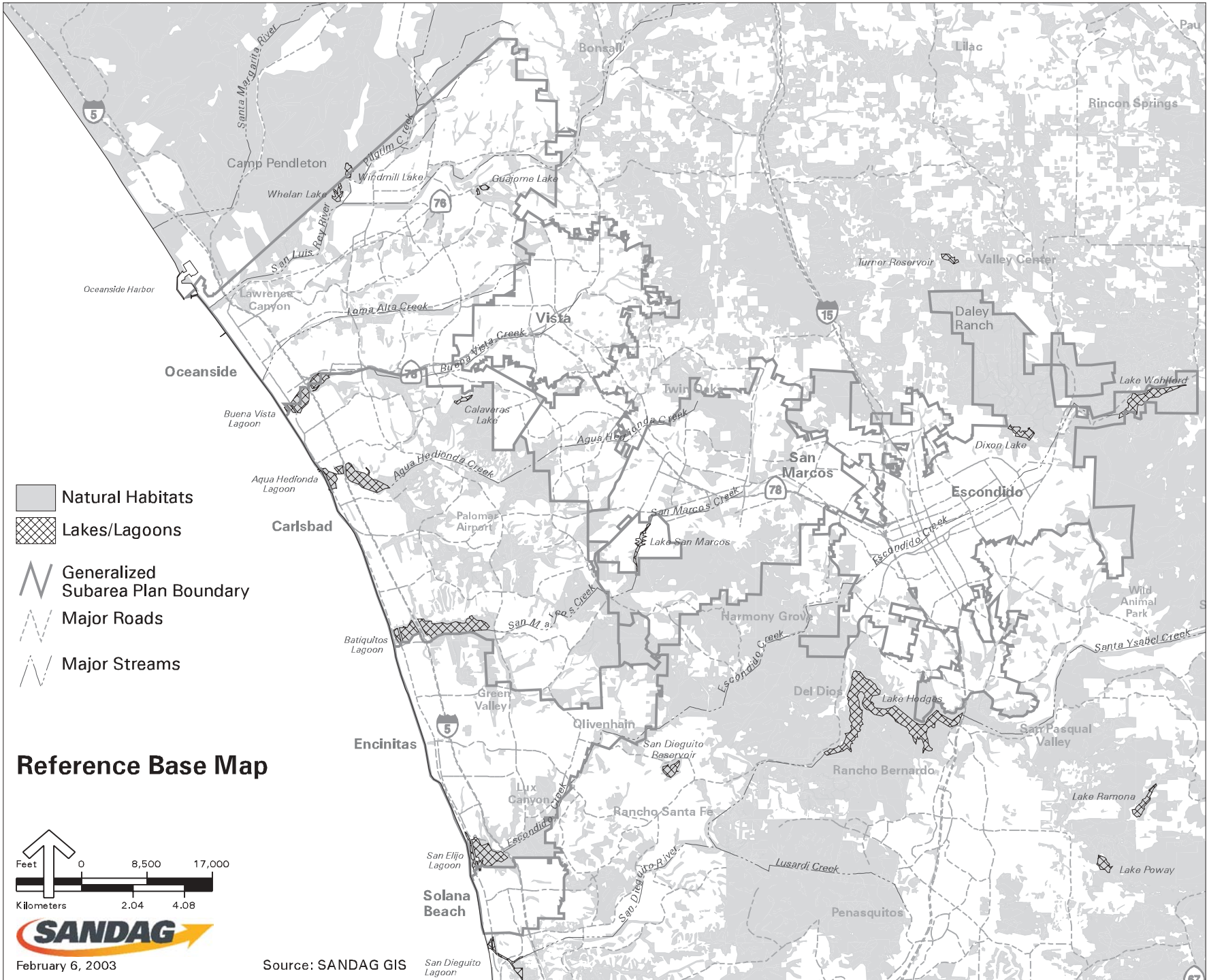
2. Rationale. Justifies the coverage determination by summarizing levels of conservation and take expected under the MHCP, and describing how well the plan reflects the conservation goals and strategies defined earlier for that species. In the event that some goals and strategies are not effectively met by the plan, additional permitting conditions become necessary.
3. Conditions. This is the most important section of each evaluation. It lists the permitting conditions that must be met for the participating cities to receive take authorizations for that species, keeping in mind that other MHCP policies also apply, even if they are not reiterated for each species.

Background – This section summarizes biological information pertinent to conservation planning and management for the species, including its distribution, abundance, and population trends; threats to the species and factors limiting its abundance; and special considerations for conserving, monitoring, and managing the species. Examples of special considerations might include information on the species' pollination biology or responses to fire, or difficulties in surveying for the species. A map showing MHCP database locations and major and critical population locations is included for each species having database records.

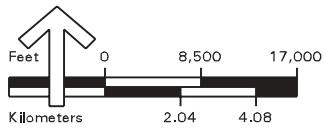
The background information provided in the species descriptions often references specific place names and locations within the MHCP area. The Reference Base Map depicts the place names and locations commonly used in the MHCP species accounts.

Conservation Analysis – This section summarizes the levels of conservation and take expected for the species, based on all the calculation methods and assumptions described in Section 2. For most species, one or more tables summarize the quantified levels of conservation expected under the FPA and MHCP policies. These tables must be interpreted with caution, due to the inherent limitations and biases in the biological database. For example, point counts do not represent population estimates, and points may be absent from some areas, due to lack of adequate surveys, even though the species occurs there. In light of such uncertainties, the conservation tables often contain the following terms:

- None known. Used where no point localities or major or critical populations have been detected, but there is a reasonable potential for the species to be present (e.g., suitable habitat present, point localities nearby).
- None present. Used where no point localities or major or critical populations have been identified, and there is a low potential for the species to be present (e.g., no or little suitable habitat, no known populations nearby).
- None in database. Used where sources indicate that the species has been found, but the data are not in the GIS database.
- None identified. Used only for major or critical populations, where point localities are present but have not been identified as major or critical populations.
- Unknown. Used for major or critical populations where percent conservation is unknown because locations are not in the database.



Reference Base Map



February 6, 2003

Source: SANDAG GIS

San Dieguito Lagoon

The conservation analysis section also discusses how the MHCP preserve configuration is expected to affect species viability via hypothesized effects on seed dispersal, pollination, and other pertinent issues. Finally, this section describes special considerations for conserving the species, such as managing to avoid overly frequent or infrequent fires.

Adaptive Management Program – In the Public Review Draft of this document, this section described priorities for monitoring and managing the species to guide development of the MHCP Biological Monitoring and Management Plan (which was not yet completed). Because the Monitoring and Management Plan is now available (see Volume III), this section now simply refers to that document for the various management and monitoring actions to be implemented for MHCP species. Where necessary, some monitoring and management actions are included in the species-specific permit conditions described earlier.

San Diego Thorn-mint*Acanthomintha ilicifolia***USFWS: Threatened****CDFG: Endangered****MHCP: Narrow Endemic****Conservation Goals**

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat of San Diego thorn-mint.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat, unoccupied habitat that may allow for population fluctuations, and adjacent habitat that supports pollinators and seed dispersal agents). Implement species-specific management actions as necessary to enhance or protect habitat quality and increase population size. These may include developing fire management guidelines, enhancing declining populations and restoring damaged habitat, and establishing a seed bank for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions. However, coverage could be revoked in the future depending on resolution of species conservation in the San Marcos Major Amendment Area.

Rationale. The MHCP will contribute to the conservation of this species within the area by conserving 92% of point locations (14 of 22 locations are within the FPA) and conserving the 91% of the critical locations and major populations within the study area. Excluding the San Marcos Major Amendment Area, 52% of the potentially suitable habitat for the species will be conserved by the MHCP. A majority of one major and critical population is in the San Marcos Major Amendment Area, which is not addressed in this plan.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. The major populations and critical locations of San Diego thorn-mint in Carlsbad and in San Marcos must be conserved at a level consistent with the critical location policy and managed as part of the preserve system.

2. Fire management plans must be implemented for all conserved populations to protect them from frequent or high-intensity fires and fire suppression activities. Fire management plans should include emergency access plans for conserved areas to protect populations from fires and disturbances associated with fire suppression.
3. As part of the project review process (e.g., CEQA) for individual projects within the MHCP area, a qualified biologist must survey for this species in all potential habitat areas.
4. The MHCP Narrow Endemic Policy must be applied to any populations of this species, including those already known and any found in the future.
5. Declining populations must be enhanced, and damaged habitat restored, if determined necessary through monitoring.
6. If not already established in the region by another entity, the MHCP management program must establish a seed bank as a guarantee against extinction and to provide source material for conservation and research activities. A seed bank must be established within 15 years of permit issuance. Collections should be based on established guidelines and subject to seed availability. Collected seed should be stored at an established seed bank facility (e.g., Rancho Santa Ana Botanic Garden or San Diego Wild Animal Park).
7. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

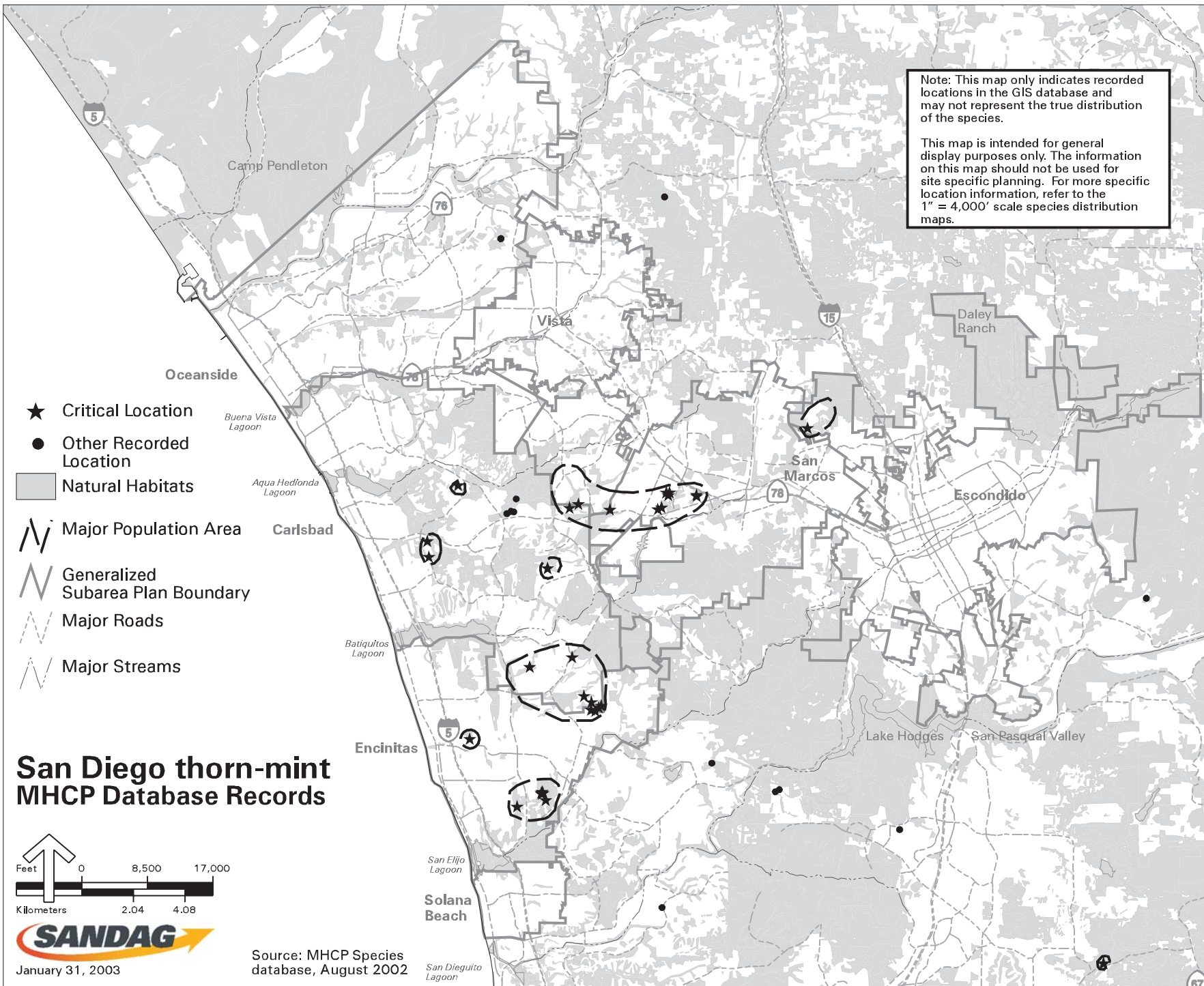
Background

Distribution, Abundance, and Trends. San Diego thorn-mint is restricted in distribution to San Diego County and northern Baja California, Mexico (Skinner and Pavlik 1994; USFWS 1998a). In San Diego County, the species is known from Carlsbad and San Marcos south to Sweetwater and Otay Mesa, and east to Alpine (Beauchamp 1986; USFWS 1998a). Large populations occur in Carlsbad, Encinitas, San Marcos, Sycamore Canyon, Poway, the Lake Hodges area, El Capitan, and Jamul. Within the MHCP, the species is found in Carlsbad (north of Palomar Airport, south and east of Agua Hedionda, La Costa area), Encinitas (Quail Park Botanical Gardens, Lux Canyon), San Marcos, Vista, and Escondido (see MHCP Database Records Map). This species is restricted to calcareous marine sediments, clay, or gabbro-derived soils and is associated with coastal sage scrub, chaparral, and grassland.

An estimated 52 historic populations of this species are known in the United States, of which 32 populations are extant. The USFWS (1998) estimates that these 32 populations support 150,000 to 170,000 individuals and occupy approximately 400 acres. According

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



★ Critical Location

● Other Recorded Location

■ Natural Habitats

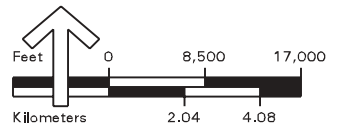
▭ Major Population Area

▭ Generalized Subarea Plan Boundary

▭ Major Roads

▭ Major Streams

San Diego thorn-mint MHCP Database Records



Source: MHCP Species database, August 2002

to the USFWS (1998), about 60% of the estimated individuals occur in four major populations¹ that are found to the south of the MHCP study area.

Within the MHCP, major populations of this species are found in Carlsbad (near the junction of El Camino Real and College Boulevard, south of Palomar Airport Road, north of Alga Road, north of Olivenhain, and San Marcos West), Encinitas (Quail Botanical Gardens and Lux Canyon and vicinity), San Marcos (San Marcos West), Vista (San Marcos West), and Escondido. All major populations are considered critical locations.

Threats and Limiting Factors. Threats to this species include cumulative habitat loss and degradation, trampling, vehicular traffic and road construction, illegal dumping, livestock grazing, invasive exotic plants, collecting, edge effects, and, possibly, genetic isolation and herbivory (Skinner and Pavlik 1994; USFWS 1998a).

Special Considerations. San Diego thorn-mint is an annual plant that may experience yearly fluctuations in population size and location. This species appears to be an outcrosser that is insect-pollinated (e.g., bees, Wyatt 1983), and may rely on animal vectors, in part, for seed dispersal.² This species also appears to be susceptible to both fire damage (USFWS 1998a) and soil surface disturbance. The level of survey effort for this species in the study area is considered relatively high; however, annual plants germinate in response to specific climatic conditions, so this species could be missed during a poor survey year.

Conservation Analysis

Conservation and Take Levels. The expected level of take of known locations of San Diego thorn-mint is relatively low (Table 4-2). The majority of points (70%) falls within the FPA and will be conserved at levels of 95 or 100%. Points that fall outside the FPA will be conserved at a minimum 80% level based on narrow endemic policy. Additional conservation may occur through application of the critical location policy.

Overall, 91% of the major populations and critical locations of this species in the study area will be conserved under the current FPA design. However, all critical locations must be 100% conserved under the permit conditions. Of the eight major populations (all critical locations), five will be entirely conserved within the FPA (north of Alga Road,

¹ The USFWS defines major populations of this species as consisting of at least 3,000 individuals. The MHCP defines major populations both by size and importance to species survival, so that MHCP major populations may be smaller than USFWS major populations and do not necessarily correspond to USFWS major populations. Per the MHCP, major populations are those considered sufficiently large to be self-sustaining with a minimum of active or intensive management intervention (especially for plants) or that at least support enough breeding individuals to contribute reliably to the overall metapopulation stability of the species (especially for animals).

² In the absence of direct evidence, assumptions regarding reproductive strategy, pollinators, and seed dispersal agents are based primarily on morphological characters or floral syndromes. These include (but are not necessarily limited to) flower and inflorescence structure and location, flower color, flower shape, flower depth, presence of nectar guides or rewards, pollen, and seed size and ornamentation (e.g., hairs, barbs, wings).

Quail Botanical Gardens, Lux Canyon and vicinity, and Escondido). Populations at El Camino Real/College Boulevard (Carlsbad) and south of Palomar Airport Road (Carlsbad) will be conserved at levels of 80%, as will those portions of the Olivenhain-La Costa (Carlsbad) and San Marcos West (San Marcos) populations that fall within the analysis area. The majority of the Olivenhain-La Costa population (88%) occurs on an already permitted property (i.e., the Fieldstone HCP property), and was not considered in this analysis. The portion of the San Marcos West population conserved by this plan comprises an estimated 29% of the total point localities in this population; the remaining point localities occur in a Major Amendment Area and were not considered in the analysis of conservation and take levels.

In addition to conserved point localities, an estimated 3,403 acres (52%) of potentially suitable habitat will be conserved as a result of the existing preserve design and preserve policies (Table 4-2); therefore, up to 48% of potential habitat could be considered impacted under this plan.

Preserve Configuration Issues. Populations of San Diego thorn-mint are scattered throughout the study area, and the proposed preserve design conserves the majority of these populations in a configuration that will not adversely affect the potential exchange of genetic material between populations, relative to existing conditions. Several of the extant populations (particularly, those in Encinitas, Escondido, and Vista) occur within relatively large blocks of intact habitat (>50 acres) that may provide opportunities for population expansion and support appropriate pollinators or dispersal agents. Most conserved populations of this species are potentially subject to edge effects. For example, portions of the Carlsbad and Escondido populations occur at the edge of conserved habitat, adjacent to disturbed or developed areas. Likewise, the San Marcos population occurs in small, relatively isolated stands of habitat and is nearly surrounded by development.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species and therefore contribute to species recovery. The MHCP conserves the majority of known locations (including major populations and critical locations), while MHCP policies address threats that have resulted in the decline of this species throughout the study area. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Special Considerations. San Diego thorn-mint appears to be susceptible to both fire damage (USFWS 1998a) and soil surface disturbance. Therefore, effective conservation of this species must include a fire management plan that protects conserved populations from frequent or high-intensity fires, and from equipment associated with fire suppression activities (e.g., vehicles). Conserved populations should also be protected from other types of vehicular traffic (e.g., off-road vehicles), excessive foot traffic, or other activities that result in soil surface disturbance.

Table 4-2

**SUMMARY OF NET CONSERVATION FOR
SAN DIEGO THORN-MINT**

City	Habitat Acreage Conserved ^{1,2}	Location Points Conserved ³	Major Populations Conserved	Critical Locations Conserved	Other Considerations
Carlsbad	1,169 (55%)	5 of 6 (87%)	88% ⁴	88% ⁴	The majority of the Olivenhain-La Costa population occurs on an already permitted property
Encinitas	517 (68%)	7 of 7 (100%)	100%	100%	–
Escondido	745 (80%)	1 of 1 (100%)	100%	100%	–
Oceanside	906 (45%)	2 of 2 (95%)	None known	None known	–
San Marcos	35 (15%)	4 of 4 (90%)	90% ⁵	90% ⁵	The majority of the San Marcos West population occurs in a Major Amendment Area
Solana Beach	14 (41%)	None known	None known	None known	–
Vista	17 (4%)	2 of 2 (80%)	80% ⁶	80% ⁶	–
MHCP Total ⁷	3,403 (52%)	20 of 22 (92%)	91%	91%	–

¹ Habitat for San Diego thorn-mint includes calcareous marine sediments, clays, or gabbro-derived soils in coastal sage scrub, chaparral, and grassland.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting both suitable vegetation *and* soil types) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ Includes 3 major populations (El Camino Real/College Boulevard, south of Palomar Airport Road, and north of Alga Road) and only that portion of the “San Marcos West” population (1 point locality) that occurs within the Carlsbad city limits.

⁵ Includes only the portion of the “San Marcos West” population (2 point localities) that occurs within the San Marcos city limits *and* within the analysis area (i.e., it excludes the Major Amendment Area).

⁶ Includes only the portion of the “San Marcos West” population (2 point localities) that occurs within the Vista city limits.

⁷ Numbers may not total due to rounding.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved area in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for San Diego thorn-mint. Conduct demographic and ecological research on San Diego thorn-mint, and identify management requirements for this species. Specific studies might focus on reproductive and pollination biology, seed dispersal strategies, seed bank ecology, seedling mortality, specific habitat requirements, and management techniques for maintaining viable populations.

San Diego Ambrosia*Ambrosia pumila***USFWS: Endangered****CDFG: None****MHCP: Narrow Endemic****Conservation Goals**

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat of San Diego ambrosia.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat, unoccupied habitat that may allow for population expansion, and adjacent habitat that supports seed dispersal agents). Implement species-specific management actions as necessary to enhance or protect habitat quality and increase population size. These may include prohibiting adverse activities within preserve areas, developing fire management guidelines, and enhancing declining populations and restoring damaged habitat.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP will adequately conserve this species by conserving 88% of point locations (all 4 locations are within the FPA) and 95% of the critical location and major population in Oceanside. About 51% of the potentially suitable habitat for the species will be conserved under the MHCP. The MHCP Narrow Endemic Policy is expected to protect any additional populations found in the future.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. The major population and critical location near Mission Boulevard in east Oceanside must be conserved at a level consistent with the critical location policy and managed as part of the preserve system.
2. As part of the project review process (e.g., CEQA) for individual projects within the MHCP area, a qualified biologist must survey for this species in all potential habitat areas.
3. Fire management plans must be implemented for all conserved populations to protect them from frequent or high-intensity fires and fire suppression activities.

4. The MHCP Narrow Endemic Policy must be applied to any populations of this species, including those already known and any found in the future.
5. Declining populations must be enhanced, and damaged habitat restored, if determined necessary through monitoring. Enhancement may include introduction of plant materials to existing populations, while restoration may include site-specific habitat improvement actions. Unless analyses determine that there is no significant genetic variation between populations, introduced plant materials must be from the parental population or a population in proximity.
6. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. San Diego ambrosia is restricted to western Riverside County, southwestern San Diego County, and northern Baja California, Mexico (Skinner and Pavlik 1994; Wiggins 1980; USFWS 1999a). In San Diego County, the species has been reported from scattered locations along or adjacent to the San Luis Rey, San Diego, and Sweetwater rivers. Within the MHCP, it has been reported from two areas in Oceanside (near El Camino Real and near Mission Boulevard in east Oceanside) (see MHCP Database Records Map). This species is typically associated with upper terraces of rivers and drainages, but is also found in open coastal sage scrub, grassland, or disturbed habitats.

The USFWS, in their final rule for listing this species as endangered, provides the following account of historic and current distribution for San Diego ambrosia (USFWS 2002a). Approximately 49 historic and extant populations of San Diego ambrosia have been documented throughout the species' range. Of these documented occurrences, 6 were misidentifications and 3 occurrences were transplanted from other locations and have subsequently been eliminated. Of the 40 verified native occurrences, 21 have been extirpated by urban development. Of the remaining 19 occurrences, 4 were from old records or from single specimen localities and are not considered extant occurrences. Of the remaining 15 native extant occurrences, 12 are in San Diego County and 3 are in Riverside County.

Within the MHCP, a major population of this species occurs in east Oceanside, near Mission Boulevard. This population is considered a critical location.

Threats and Limiting Factors. Threats to this species include primarily urbanization and associated edge effects (including invasive exotic plants). San Diego ambrosia may be adversely affected by fire and competition from other plants and appears vulnerable to random environmental or demographic events (USFWS 1999a).

Special Considerations. San Diego ambrosia is a wind-pollinated perennial herb (Hickman 1993). This species also reproduces asexually by rhizomes, and

transplantation/reintroduction of rhizomes may be an effective method of enhancing populations (PSBS 1995). San Diego ambrosia presumably relies on animal vectors, in part, for seed dispersal, and is possibly tolerant of some soil surface disturbance. The level of survey effort for this species in the study area is considered relatively low due primarily to (1) the difficulty of identifying this species when not in fruit and (2) timing of survey efforts (e.g., many surveys are conducted in spring or early summer, whereas ambrosia blooms in late summer and fall).

Conservation Analysis

Conservation and Take Levels. Half of the identified points fall within the FPA and will be conserved at a level of 95%, whereas points that fall outside the FPA will be conserved at a minimum 80% level based on the narrow endemic policy (Table 4-3). Additional conservation would occur through application of the critical location policy. It is thought that this species has not been adequately surveyed in the study area.

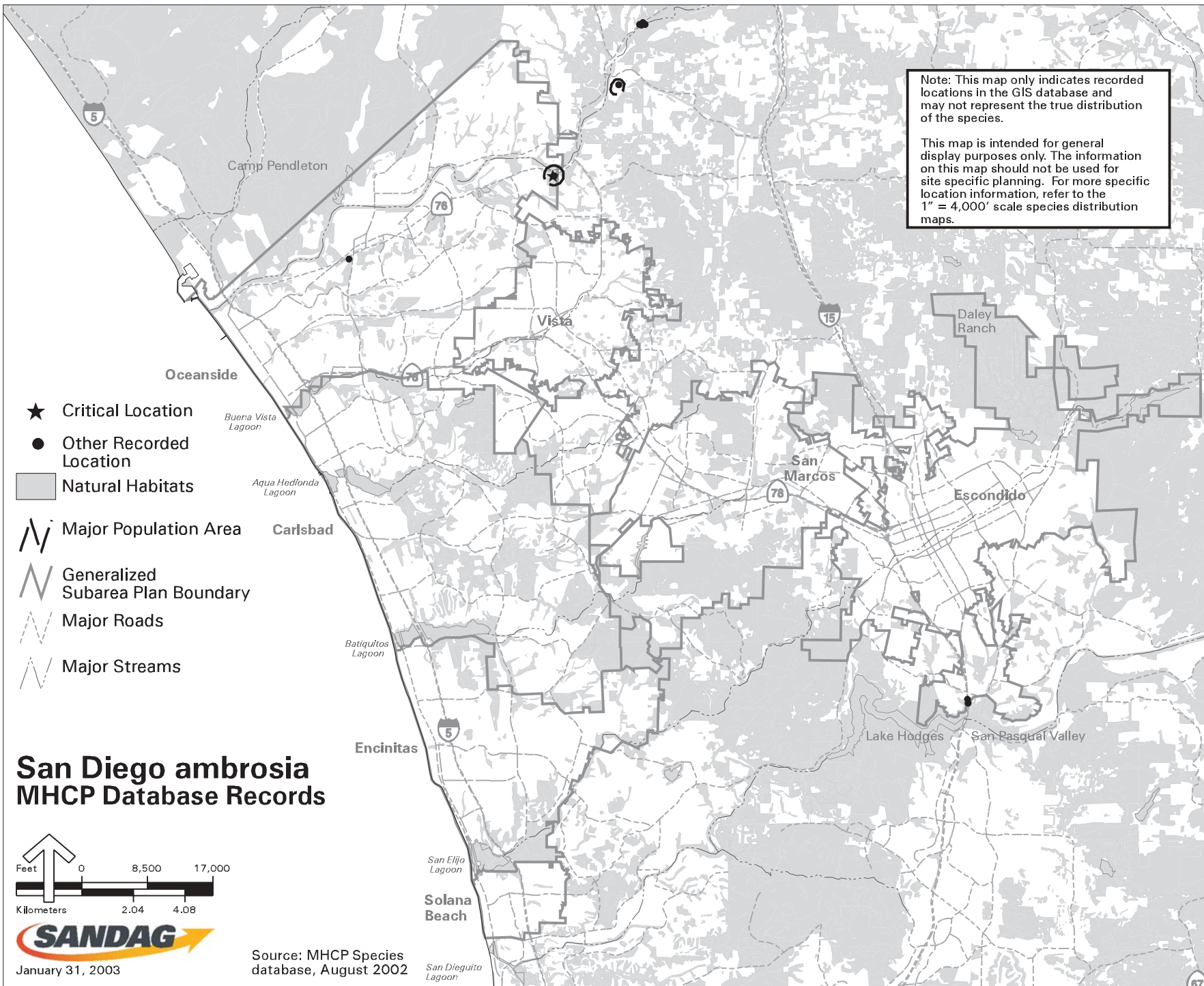
The major population and critical location near Mission Boulevard in east Oceanside is currently conserved at a 95% level, and the El Camino Real population in Oceanside, which was not identified as a major population or critical location, is also conserved within the FPA at a 95% level. The two locations in the city of Escondido are not located within the FPA and will be conserved at an 80% level.

In addition to conserved point localities, an estimated 7,021 acres (51% of the total available) of potentially suitable habitat will also be conserved as a result of the existing preserve design and preserve guidelines (Table 4-3). Estimated acreage is likely an overestimation since it is based solely on general habitat types. Microhabitat requirements that would allow a more precise estimation of potentially suitable habitat have not been well defined for this species.

Preserve Configuration Issues. Populations of San Diego ambrosia are found in Oceanside where they occur in upland habitat south of Highway 76. The major population in east Oceanside, which is also a critical location, occurs just south of the San Luis Rey River and is inside the FPA. Although a residential area is adjacent to this population to the west, lands to the east and south are currently undeveloped or sparsely developed. In addition, this population lies within a fairly large block (>50 acres) of currently intact habitat that could provide opportunities for population expansion, support appropriate dispersal agents, and minimize edge effects. The El Camino Real population, which is considered neither major nor a critical location, occurs inside the FPA. However, plants are situated at the edge of conserved habitat and are thus susceptible to edge effects. In addition, this population is surrounded by development. The El Camino Real population also occurs within a fairly large block (>50 acres) of intact habitat that could provide opportunities for population expansion and support appropriate dispersal agents.

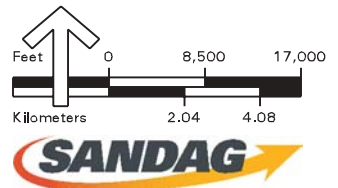
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- ▭ Major Population Area
- ▭ Generalized Subarea Plan Boundary
- ▭ Major Roads
- ▭ Major Streams

San Diego ambrosia MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Diego Lagoon

Table 4-3

**SUMMARY OF NET CONSERVATION FOR
SAN DIEGO AMBROSIA**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved
Carlsbad	1,856 (56%)	None known	None known	None known
Encinitas	740 (64%)	None known	None known	None known
Escondido	1,934 (68%)	2 of 2 (80%)	None known	None known
Oceanside	1,262 (41%)	2 of 2 (95%)	95%	95%
San Marcos	1,061 (41%)	None known	None known	None known
Solana Beach	6 (53%)	None known	None known	None known
Vista	162 (17%)	None known	None known	None known
MHCP Total⁴	7,021 (51%)	4 of 4 (88%)	95%	95%

¹ Habitat for San Diego ambrosia includes coastal sage scrub, grassland, or disturbed habitat.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting suitable vegetation types) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved. Note that (1) disturbed habitat is not conserved so is not included in these calculations and (2) not all conserved habitat will be suitable for this species due to cover, topography, or other site factors.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ Numbers may not total due to rounding.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species, particularly if 100% conservation of the east Oceanside population is achieved via the subarea plan. Maximum protection of this species and adjacent habitat in the MHCP would contribute to species recovery. The MHCP preserve design and avoidance policies conserve the majority of known point localities (including the major population and critical location), while MHCP management practices will address threats that have resulted in the decline of this species throughout the study area. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Special Considerations. San Diego ambrosia reproduces, in part, asexually by rhizomes. Effective conservation of this species should include conservation of extant populations, as well as adjacent habitat to allow for population expansion. There is some evidence that transplantation/reintroduction of rhizomes may be an effective method of enhancing populations.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved area in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for San Diego ambrosia. Conduct demographic and ecological research on San Diego ambrosia, and identify management requirements for this species. Specific studies might focus on reproductive strategies (e.g., the importance of sexual versus asexual reproduction in maintaining or increasing population size), seed and pollen viability, germination requirements, seedling establishment, seed dispersal strategies, and management techniques for maintaining viable populations.

Aphanisma

Aphanisma blitoides

USFWS: Federal Species of Concern (former Category 2 candidate)

CDFG: None

MHCP: None

Conservation Goals

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat of aphanisma.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat and unoccupied habitat that may support a persistent seed bank). Implement species-specific management actions as necessary to enhance or protect habitat quality and increase population size. These may include prohibiting adverse activities within preserve areas, enhancing declining populations and restoring damaged habitat, and establishing a seed bank for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, due to insufficient conservation.

Rationale. Levels of conservation expected under the current MHCP subarea plans do not meet the conservation goals for this species. *Aphanisma* is not currently known from the study area. Although the amount of potentially suitable habitat that will be conserved for this species in the FPA is adequate (68%), only a very small portion of the potentially suitable habitat would likely be occupied by *Aphanisma*, if it is present in the study area. The potentially suitable habitat in the study area occurs in small, disjunct stands along the coast where it will likely be subject to edge effects.

Conditions. Not applicable

Background

Distribution, Abundance, and Trends. Historically, *aphanisma* occurred from Ventura County southward to Baja California, Mexico, and on most of the Channel Islands. It is now apparently extirpated in much of the northern portion of its range and is facing steep declines in all other mainland locations as well (Skinner and Pavlik 1994). In San Diego County, this species has been reported in scattered locations along the coast from San Onofre southward to San Dieguito Creek, La Jolla, the Silver Strand, and Imperial Beach. No locations have been reported for this species within the MHCP; however, it has some potential for occurrence based on the presence of suitable habitat. This species

occurs on coastal bluffs and coastal strand (sand) habitats, where it is associated with coastal bluff scrub, coastal sage scrub, and southern foredunes (beach).

No major populations of aphanisma occur in the MHCP study area, nor have any critical locations been identified to date for this species (no known localities in database).

Threats and Limiting Factors. Threats to this species include urbanization, recreational development, and foot traffic (Skinner and Pavlik 1994).

Special Considerations. Aphanisma is an annual plant that may experience yearly fluctuations in population size. This species is presumably wind-pollinated (McArthur and Sanderson 1984) and seeds are presumably self-dispersed. The level of survey effort for this species in the study area is unknown.

Conservation Analysis

Conservation and Take Levels. Aphanisma is not currently known from the MHCP study area, although the species does occur north and south of this area. Table 4-4 indicates that 1,154 acres (68%) of potentially suitable habitat occurs for this species in the FPA. This acreage is likely an overestimation, since it includes all coastal sage scrub on sandstone substrates, whereas aphanisma appears to be confined in distribution to the immediate coast. A rough assessment of coastal sage scrub on sandstone substrates in the immediate vicinity of the coast (i.e., west of Interstate 5)³ indicates that less than 75 acres of this habitat type will be conserved for this species in the FPA. No coastal bluff scrub habitat will be conserved in the FPA, however, only 2 acres of each of this habitat type has been mapped within the study area.

Preserve Configuration Issues. The current and historical distribution of this species indicates that only a small portion of “potentially suitable” habitat would likely be occupied by aphanisma, if present in the study area. Within the immediate coastal area, most of this acreage occurs as relatively small stands of habitat (e.g., 3 to 25 acres) that may not allow for population fluctuations and would likely be subject to edge effects.

Effects on Population Viability and Species Recovery. It is not certain if protection and conservation through implementation of the MHCP would necessarily enhance population viability or further species recovery. The MHCP study area supports little suitable habitat for this species (as defined by habitat type *and* location), relative to areas to the north (Camp Pendleton) or south (MSCP study area). Further, most of the suitable habitat occurs in small, disjunct stands. In most cases, preserved habitat may not be sufficiently large to support viable populations of this species or to buffer populations from adverse edge effects.

³ The use of Interstate 5 as a boundary for calculating suitable habitat for this species is somewhat arbitrary and is not meant to infer that the species absolutely could not be found east of this area. Its use is meant to provide a more realistic assessment of potentially suitable habitat for this species in the absence of a definitive distribution boundary or definitive habitat requirements by excluding habitat that is away from the coast and that occurs in more upland locations.

Table 4-4
SUMMARY OF NET CONSERVATION FOR
APHANISMA

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved
Carlsbad	405 (70%)	None known	None known	None known
Encinitas	279 (77%)	None known	None known	None known
Escondido	0 (0%)	None present	None present	None present
Oceanside	463 (64%)	None known	None known	None known
San Marcos	0 (0%)	None present	None present	None present
Solana Beach	6 (50%)	None known	None known	None known
Vista	1 (8%)	None present	None present	None present
MHCP Total ⁴	1,154 (68%) ⁵	None known	None known	None known

¹ Habitat for aphanisma includes coastal scrub (e.g., coastal bluff scrub, coastal sage scrub) on coastal bluffs and coastal strand (beach) habitat.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting both suitable vegetation *and* soil types) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ Numbers may not total due to rounding.

⁵ Refer to the text (above) for a discussion of that portion of this habitat acreage that would be most likely to support this species.

Special Considerations. Effective conservation of preserved populations must include enough habitat to (1) accommodate fluctuations in population size and (2) buffer conserved populations against edge effects.

Adaptive Management Program

Not applicable.

Del Mar Manzanita*Arctostaphylos glandulosa* ssp. *crassifolia***USFWS: Endangered****CDFG: None****MHCP: Narrow Endemic****Conservation Goals**

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat of Del Mar manzanita in a configuration that maintains both genetic connectivity with populations outside the plan area and a regional metapopulation.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat and adjacent habitat that supports pollinators and seed dispersal agents). Implement species-specific management actions as necessary to enhance or protect habitat quality. These may include prohibiting adverse activities within preserve areas and developing fire management guidelines.

Coverage Determination and Permit Conditions

Coverage Determination. Covered.

Rationale. The MHCP will adequately conserve this species by conserving 72% of potential habitat, 96% of point locations (120 of 145 locations are within the FPA), and 97% of critical locations and major populations. The MHCP Narrow Endemic Policy is expected to protect any additional populations found in the future.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. The MHCP Narrow Endemic Policy must be applied to any populations of this species, including those already known and any found in the future.
2. Fire management plans must be implemented for all conserved populations that promote biological goals (e.g., regeneration) while protecting individual plants and habitat from frequent or high-intensity fires and fire suppression activities. Develop fire management guidelines within conserved areas that incorporate controlled burns (or other fuel reduction methods in urban areas), while limiting fire frequency and emergency access.
3. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. Del Mar manzanita is restricted to San Diego County and northwestern Baja California, Mexico (Skinner and Pavlik 1994; USFWS 1996a). In San Diego County, this species is found on coastal bluffs from Oceanside (south of San Luis Rey River, not mapped) south to La Jolla (Wells 1986), and inland to San Marcos, Lake Hodges, Los Peñasquitos Canyon, and possibly Miramar Reservoir. Within the MHCP, Del Mar manzanita occurs in Carlsbad, Encinitas, San Marcos, and Solana Beach (see MHCP Database Records Map). This species occurs on sandstone terraces and bluffs and is associated with southern maritime chaparral.

Del Mar manzanita formerly occurred in about 26 populations throughout its range. Currently, 22 populations are believed to be extant in the United States, and support an estimated 7,100 to 9,700 individuals (USFWS 1996a). The majority of Del Mar manzanita populations have been reduced and fragmented by urban and agricultural development, resulting in a 50% decline in overall number of stands and number of individuals since 1982. Approximately 75% of extant individuals are concentrated in 6 populations. Four of these populations occur in the MHCP study area, in Carlsbad and Encinitas. Most of the remaining plants occur in highly fragmented habitat along the margins of residential development, where they are subject to edge effects (USFWS 1996a).

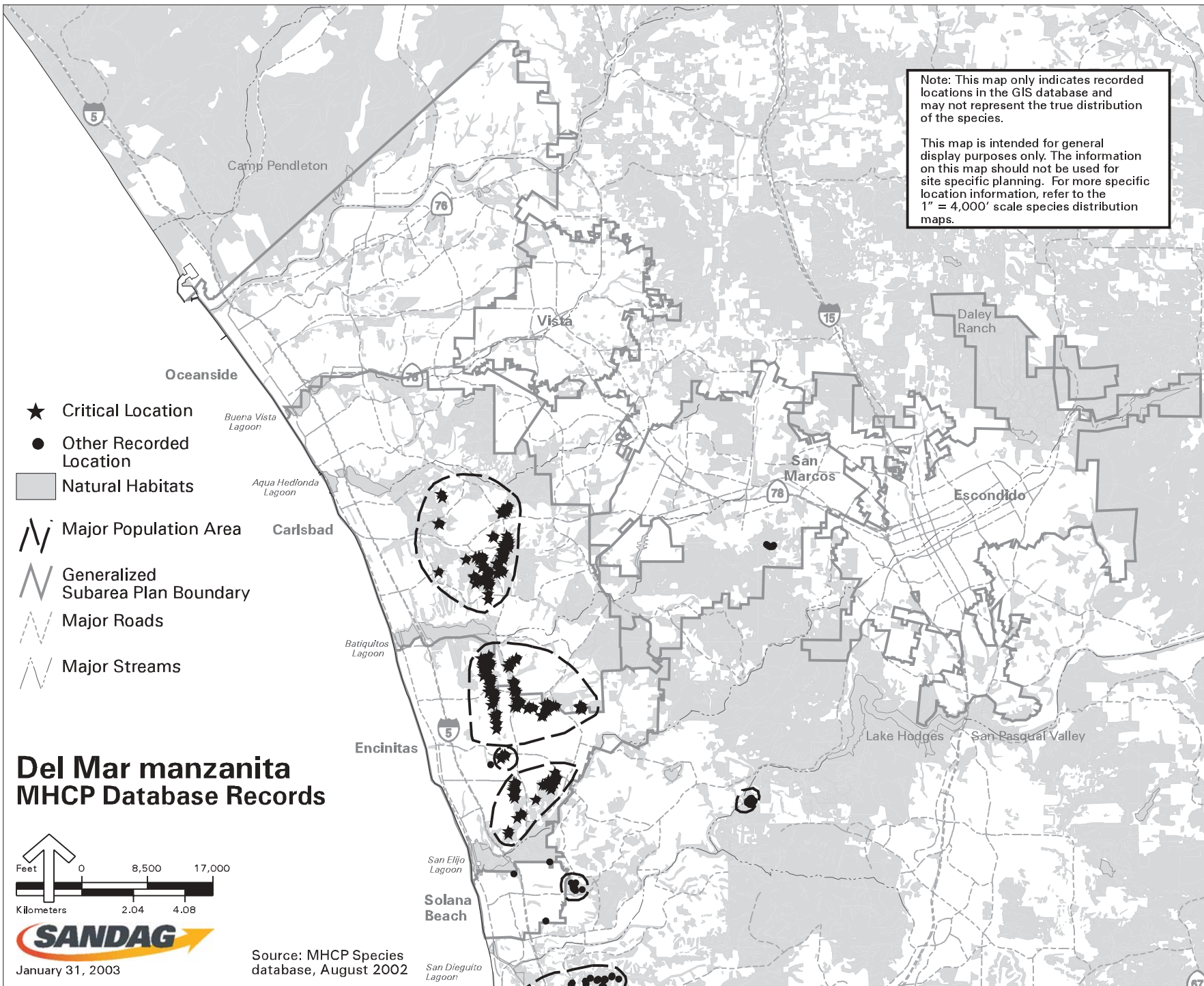
Within the MHCP, major populations of this species occur in Carlsbad (Agua Hedionda [north of College Boulevard, east of the junction of El Camino Real and Palomar Airport Road, east and west of El Camino Real between Palomar Airport Road and Alga Road], Green Valley-Olivenhain) and Encinitas (Lux Canyon and vicinity, Green Valley-Olivenhain, Oak Crest Park). All major populations are considered critical locations.

Threats and Limiting Factors. Threats to this species include agricultural conversion, development on coastal bluffs, habitat fragmentation, and edge effects (including fuel modification, fire suppression, trampling, and invasive exotic plants).

Special Considerations. Del Mar manzanita is a burl-forming shrub that is fire-adapted (e.g., it sprouts from the burl, which is the base of the stem or root-crown, after fire or cutting) (Wells 1986; Conrad 1987). Despite its fire adaptations, it is adversely affected by frequent burning. Del Mar manzanita has a mixed breeding system and is both insect and bird-pollinated (e.g., bees and hummingbirds; Grant and Grant 1965). It may rely on animal vectors, in part, for seed dispersal. Because of the basal burl, and thus the potential for repeated sprouting, individuals are typically long-lived and populations generally experience relatively slow rates of individual turnover (Wells 1986). In addition, individuals are expected to have relatively low seed set (Kelly and Parker 1991). The level of survey effort for this species in the study area is considered relatively high.

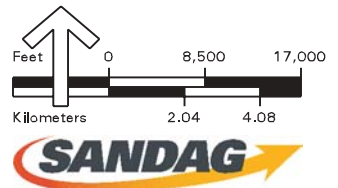
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- ▭ Major Population Area
- ▭ Generalized Subarea Plan Boundary
- ▭ Major Roads
- ▭ Major Streams

Del Mar manzanita MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Diego Lagoon

Conservation Analysis

Conservation and Take Levels. The expected level of take of Del Mar manzanita is relatively low (Table 4-5). The majority of points falls within the FPA and will be conserved at levels of 95 or 100%. Points that fall outside the FPA will be conserved at a minimum 80% level based on the narrow endemic policy. Additional conservation may occur through application of the critical location policy.

Overall, 96% of the major populations and critical locations of this species will be conserved in the study area. Of the four major populations (all critical locations) identified in the MHCP, one (Oak Crest in Encinitas) will be entirely conserved within the FPA. The remaining three populations will be conserved at the following levels: 92% conservation of the Agua Hedionda population (Carlsbad), 98% conservation of the Green Valley-Olivenhain population (Carlsbad, Encinitas), and 95% of the Lux Canyon population (Encinitas). Those portions of the Green Valley-Olivenhain and Agua Hedionda populations that occur on already permitted properties (i.e., Fieldstone HCP property) were not considered in the analysis of conservation and take levels.

In addition to conserved point localities, an estimated 453 acres (72%) of potentially suitable habitat will be conserved in the FPA as a result of the existing preserve design and preserve policies (Table 4-5).

Preserve Configuration Issues. Populations of Del Mar manzanita are concentrated in coastal locations, and the preserve design conserves the majority of these populations in a configuration that will not adversely affect the potential exchange of genetic material between populations, relative to existing conditions. The existing preserve design also provides a continuum between populations in the MHCP study area and populations to the south, in the MSCP study area. At least two of the conserved populations (Green Valley-Olivenhain and Lux Canyon) occur in relatively large blocks of intact habitat (e.g., >200 acres) that likely support appropriate pollinators or dispersal agents. Many of the individual plants occur at the edge of conserved areas and may be subject to edge effects.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species and therefore contribute to species recovery. The MHCP preserve design and avoidance policies conserve the majority of known point localities (including major, critical populations), while MHCP management practices will address threats that have resulted in the decline of this species throughout the study area. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Table 4-5

**SUMMARY OF NET CONSERVATION FOR
DEL MAR MANZANITA**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved
Carlsbad	150 (63%)	46 of 49 (94%)	96% ⁴	96% ⁴
Encinitas	288 (84%)	87 of 89 (97%)	98% ⁵	98% ⁵
Escondido	None present	None present	None present	None present
Oceanside	None present	None present	None present	None present
San Marcos	None known	5 of 5 (95%)	None identified	None identified
Solana Beach	15 (34%)	2 of 2 (90%)	None identified	None identified
Vista	None present	None present	None present	None present
MHCP Total ⁶	453 (72%)	140 of 145 (97%)	97%	97%

¹ Habitat for Del Mar manzanita includes sandstone substrates in southern maritime chaparral.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting suitable vegetation *and* soil types) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ Includes only the portion of the GreenValley-Olivenhain population that occurs within the Carlsbad city limits.

⁵ Includes only the portion of the Green Valley-Olivenhain population that occurs within the Encinitas city limits.

⁶ Numbers may not total due to rounding.

Special Considerations. Del Mar manzanita is a fire-adapted shrub that is nonetheless adversely affected by frequent burning. Effective conservation of this species must include a fire management plan that protects conserved populations from frequent or high-intensity fires. In addition, adequate preserve design for this species must include sufficient habitat to support pollinators and seed dispersal agents.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved area in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for Del Mar manzanita. Conduct demographic and ecological research on Del Mar manzanita, and identify management requirements for this species. Specific studies might focus on interpopulational genetic analyses, reproductive and pollinator studies, specific habitat requirements, and management techniques (e.g., controlled burning) for maintaining viable populations.

Encinitas Baccharis*Baccharis vanessae***USFWS: Threatened****CDFG: Endangered****MHCP: Narrow Endemic****Conservation Goals**

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat of Encinitas baccharis.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat and adjacent habitat that supports pollinators). Implement species-specific management actions as necessary to enhance or protect habitat quality. These may include prohibiting adverse activities within preserve areas and developing fire management guidelines.

Coverage Determination and Permit Conditions

Coverage Determination. Covered.

Rationale. The MHCP will adequately conserve this species by conserving 71% of potential habitat, 99% of point locations (20 of 21 locations are within the FPA), and 99% of critical locations and major populations. The MHCP Narrow Endemic Policy is expected to protect any additional populations found in the future.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. Fire management plans must be implemented for all conserved populations that promote biological goals (e.g., regeneration) while protecting individual plants and habitat from frequent or high-intensity fires and fire suppression activities. Develop fire management guidelines within conserved areas that incorporate controlled burns (or other fuel reduction methods in urban areas), while limiting fire frequency and emergency access.
2. The MHCP Narrow Endemic Policy must be applied to any populations of this species, including those already known and any found in the future.
3. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. Encinitas baccharis is a San Diego County endemic plant that is now limited to approximately 14 highly restricted populations throughout its range, including Encinitas, Carmel Mountain, Mt. Israel-Del Dios, 4S Ranch, Mt. Woodson-Iron Mountain, Poway (Van Dam Peak), and Mira Mesa (Beauchamp 1986; USFWS 1996a). The latter two locations consisted of one plant each as of 1987 and are too small to constitute viable populations. A small population has also been found in the southern Santa Ana Mountains in northern San Diego County (Boyd et al. 1993). Within the MHCP, this species is known from Carlsbad, Encinitas, and Escondido (see MHCP Database Records Map). Encinitas baccharis occurs in southern maritime chaparral and dense southern mixed chaparral. It is estimated that the 14 remaining populations of Encinitas baccharis contain a total of about 2,000 individuals.

Five of these populations have fewer than 6 plants each, and no population is known to support more than 300 individuals (USFWS 1996a).

Within the MHCP, a major population of this species is found in Carlsbad and Encinitas, on the slopes above Green Valley. This population is considered a critical location. In addition, a smaller population in Encinitas (Lux Canyon) is also considered a critical location. In Escondido, a major population is found in the vicinity of Mt. Israel.

Threats and Limiting Factors. Threats to this species include development, recreation, edge effects (including fuel modification, fire suppression, and invasion of nonnative plants), and small population size.

Special Considerations. Encinitas baccharis is a dioecious (i.e., male and female flowers are on separate plants), broom-like shrub. It is likely a fire-adapted species that is enhanced by fire; however, the exact fire-response mechanism is not known. It is presumably insect-pollinated (e.g., bees and/or butterflies, Wyatt 1983), and seeds are presumably wind-dispersed. The level of survey effort for this species in the study area is considered relatively high, particularly in coastal locations.

Conservation Analysis

Conservation and Take Levels. The expected level of take of known locations of Encinitas baccharis is relatively low (Table 4-6). The majority of points (99%) falls within the FPA and will be conserved at levels of 95 or 100%. Points that fall outside the FPA will be conserved at a minimum 80% level based on the narrow endemic policy. Additional conservation may occur through application of the critical location policy.

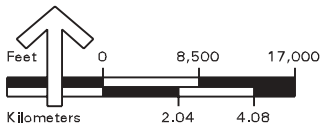
Overall, 99% of major populations and critical locations will be conserved for this species in the study area. This includes an estimated 99% of the major population (also a critical location) above Green Valley, and 98% of the critical location at Lux Canyon, and 100% of the major population at Mt. Israel.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.

- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- ▭ Major Population Area
- ▭ Generalized Subarea Plan Boundary
- ▭ Major Roads
- ▭ Major Streams

Encinitas baccharis MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

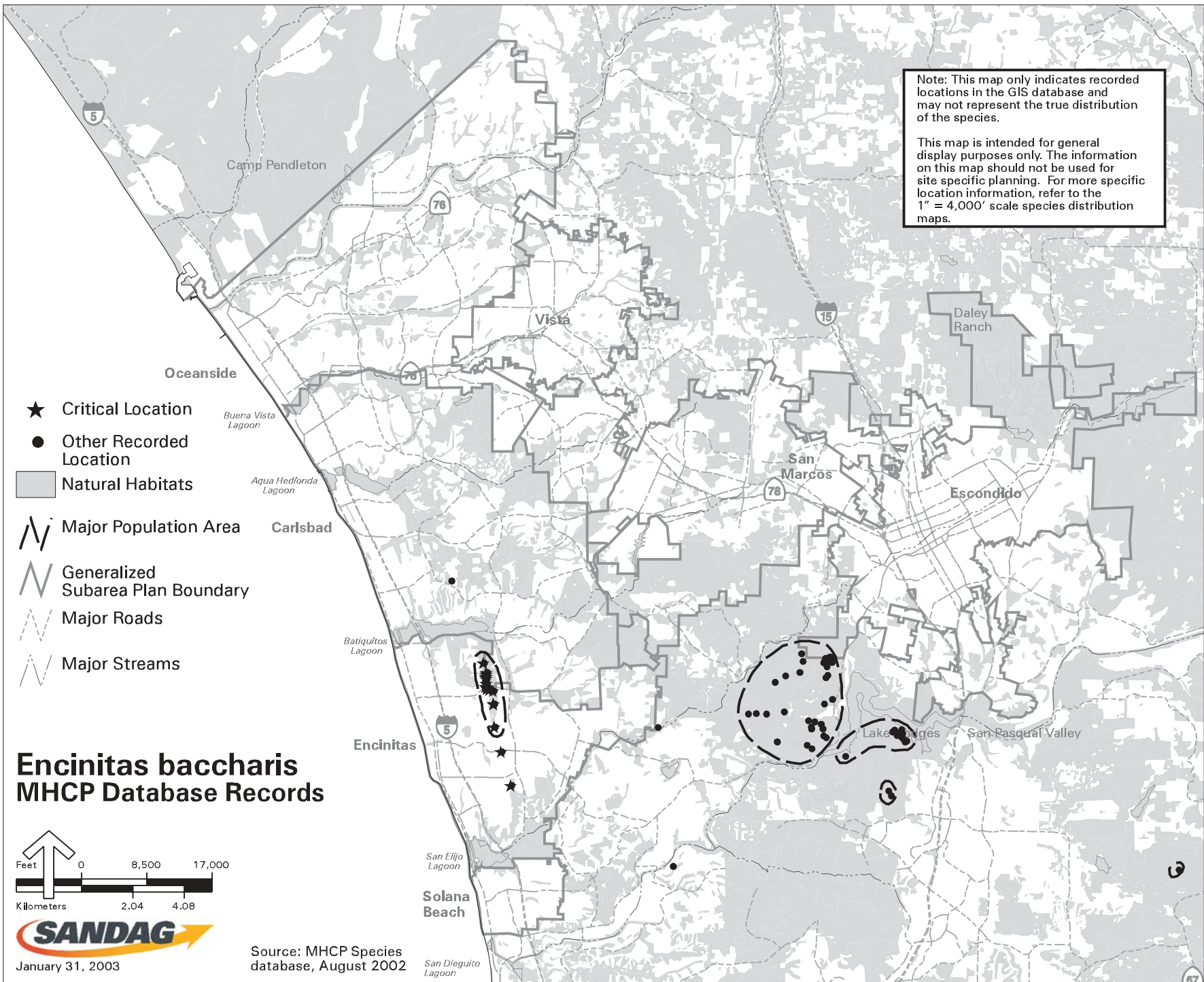


Table 4-6

**SUMMARY OF NET CONSERVATION FOR
ENCINITAS BACCHARIS**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved
Carlsbad	680 (71%)	7 of 7 (100%)	100% ⁴	100% ⁴
Encinitas	636 (83%)	12 of 12 (98%)	98% ⁵	98% ⁶
Escondido	3,819 (80%)	2 of 2 (100%)	100%	100%
Oceanside	21 (47%)	None known	None known	None known
San Marcos	1,193 (50%)	None known	None known	None known
Solana Beach	24 (33%)	None known	None known	None known
Vista	181 (62%)	None known	None known	None known
MHCP Total ⁷	6,554 (71%)	21 of 21 (99%)	99%	99% ⁸

¹ Habitat for Encinitas baccharis includes southern maritime chaparral and southern mixed chaparral.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting suitable vegetation types) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ Includes only the portion of the Green Valley population that occurs within the Carlsbad city limits.

⁵ Includes only the portion of the Green Valley population that occurs within the Encinitas city limits.

⁶ Includes the Lux Canyon population and that portion of the Green Valley population that occurs within the Encinitas city limits.

⁷ Numbers may not total due to rounding.

⁸ Includes the Lux Canyon critical location and the entire Green Valley critical location (e.g., Carlsbad and Encinitas).

In addition to conserved point localities, an estimated 6,554 acres (71%) of potentially suitable habitat will be conserved as a result of the existing preserve design and preserve policies (Table 4-6).

Preserve Configuration Issues. Within the MHCP study area, Encinitas baccharis occurs in Carlsbad, Encinitas, and Escondido. The proposed preserve design conserves the Green Valley major population in a relatively large block (>200 acres) of intact habitat that likely supports appropriate pollinators. Many of the conserved point localities occur at the edges of conserved habitat and are potentially subject to edge effects.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species and therefore contribute to recovery. The MHCP preserve design and avoidance policies conserve the majority of known point localities (including the major population and critical locations), while MHCP management practices will address threats that have resulted in the decline of this species throughout the study area. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Special Considerations. Encinitas baccharis is a fire-adapted shrub that is nonetheless adversely affected by frequent burning. Effective conservation of this species must include a fire management plan that protects conserved populations from frequent or high-intensity fires. In addition, adequate preserve design for this species must include sufficient habitat to support appropriate pollinators.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved area in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for Encinitas baccharis. Conduct demographic and ecological research on Encinitas baccharis, and identify management requirements for this species. Specific studies might focus on reproductive and pollinator biology, seed and pollen viability, germination requirements, specific habitat requirements, and management techniques for maintaining viable populations.

Thread-leaved Brodiaea

Brodiaea filifolia

USFWS: Threatened

CDFG: Endangered

MHCP: Narrow Endemic

Conservation Goals

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat of thread-leaved brodiaea.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat and adjacent habitat that supports pollinators). Implement species-specific management actions as necessary to enhance or protect habitat quality and increase population size. These may include prohibiting adverse activities within preserve areas, developing fire management guidelines, and enhancing declining populations and restoring damaged habitat.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, unless subarea plans adopt additional measures. Any city that demonstrates it is achieving the conditions listed below could request take authorization for this species, but such authorization could be revoked in the future, depending on conservation levels achieved in the San Marcos critical location, including those portions inside as well as outside of the Major Amendment Area.

Rationale. The MHCP may contribute to the conservation of this species within the area by conserving 93% of point locations (55 of 70 locations are within the FPA) and conserving the 92% of the critical locations and major populations within the study area. Although the conservation level for known locations in the study area is high, this assumes strict implementation of the narrow endemic policy, and only 27% of the potentially suitable habitat in the study area will be conserved. A majority of the San Marcos critical location is located in the San Marcos Major Amendment Area, which is not considered in this analysis.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. The major populations and critical locations of thread-leaved brodiaea in Oceanside, Carlsbad, and San Marcos must be conserved at a level consistent with the critical location policy and managed as part of the preserve system, regardless of the timing or method used to permit take for individual projects or locations.

2. The MHCP Narrow Endemic Policy must be applied to any populations of this species, including those already known and any found in the future.
3. Watershed management plans must be implemented to avoid or minimize adverse changes to vernal pool watersheds.
4. Fire management plans must be implemented for all conserved populations to protect them from frequent or high-intensity fires and fire suppression activities.
5. Declining populations must be enhanced, and damaged habitat restored, if determined necessary through monitoring. Enhancement may include introduction of plant materials (e.g., corms) to existing populations, while restoration may include site-specific habitat improvement activities. Unless analyses determine that there is no significant genetic variation between populations, introduced plant materials must be from the parental population or a population in proximity.
6. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. Thread-leaved brodiaea is known from Los Angeles, Orange, Riverside, San Bernardino, and San Diego counties (Skinner and Pavlik 1994). In San Diego County, the species has been reported from Camp Pendleton, Oceanside, Carlsbad, Vista, San Marcos, and the 4S Ranch. Within the MHCP, the species currently occurs in Oceanside, Carlsbad, and San Marcos (see MHCP Database Records Map). The majority of remaining populations of this species is concentrated on the Santa Rosa Plateau in western Riverside County and in the MHCP area (USFWS 1998a). This species generally occurs in heavy clay soils or soils with clay subsoils in grasslands or vernal pools.

Of the 46 reported populations of this species, 37 are presumed extant. Nearly 25% of the extant populations occur in the MHCP study area (Oceanside, San Marcos, and Carlsbad). The largest population of thread-leaved brodiaea, in terms of number of individuals, is in San Marcos, where an estimated 342,000 plants occur on a isolated, 40-acre parcel (USFWS 1998a). Most populations support fewer than 2,000 individuals. The USFWS (1998) estimates that nearly 150 acres of occupied habitat containing over 80,000 plants have been eliminated in San Marcos and Vista over the last 15 years, and urbanization continues to threaten this species throughout its range.

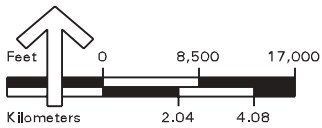
Within the MHCP study area, major populations of thread-leaved brodiaea are currently found in Carlsbad (Calavera Heights, Carlsbad Highlands, and El Camino Real), Oceanside, and San Marcos. All major populations are considered critical locations. The Rancho Carillo population in Carlsbad, which is considered both major and a critical location, occurs on an already permitted property (i.e., Carillo Ranch) and is not included in this analysis.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.

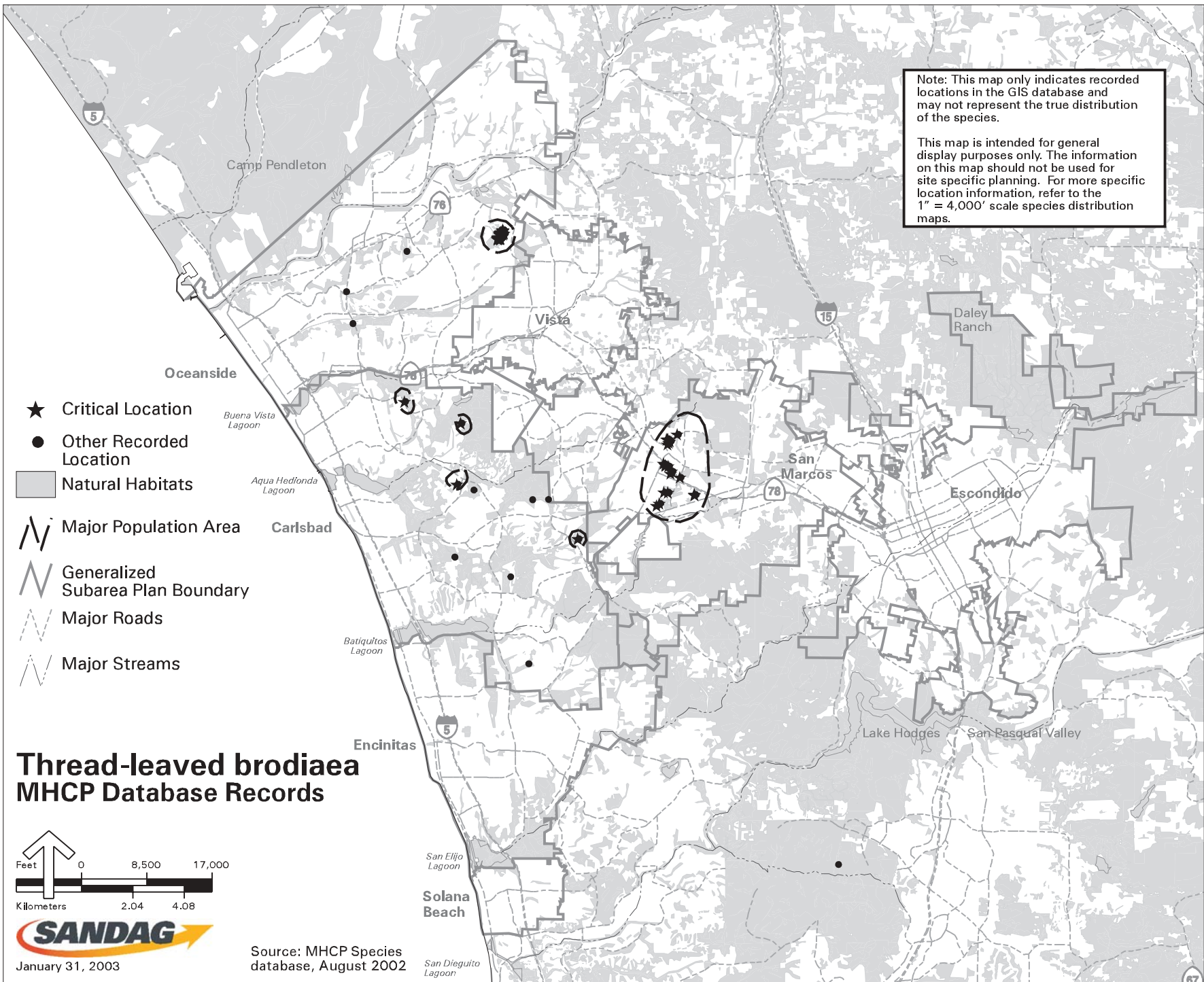
- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- ▮ Major Population Area
- ▮ Generalized Subarea Plan Boundary
- ▮ Major Roads
- ▮ Major Streams

Thread-leaved brodiaea MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002



Threats and Limiting Factors. Threats to this species include urbanization, agriculture, disking for fire and weed control, vehicular traffic, and edge effects.

Special Considerations. Thread-leaved brodiaea is an herbaceous perennial from a corm. It is presumably insect-pollinated (e.g., bees, Wyatt 1983), but also reproduces asexually by producing corm offsets. Transplantation/reintroduction of corms and corm offsets may be an effective way of enhancing populations (ERCE 1993). Seeds of this species are presumably self-dispersed.⁴ Thread-leaved brodiaea is often associated with wetland habitat. The level of survey effort for this species in the study area is considered relatively high; however, flowering of corm species depends on climatic conditions, so this species could be missed during a poor survey year.

Conservation Analysis

Conservation and Take Levels. The expected level of take of known locations of thread-leaved brodiaea is relatively low (Table 4-7). About 75% of the identified point localities fall within the FPA. Under the current FPA design, 92% of major populations and critical locations of this species will be conserved in the study area (Table 4-7). Of the 5 major populations (all critical locations) of this species that were identified in the study area, 2 will be entirely conserved within the FPA (Carlsbad Highlands and El Camino Real), 1 will be 95% conserved within the FPA (east Oceanside), and 2 are expected to be conserved at a minimum 80% level outside the FPA (Calavera Heights, San Marcos). Approximately 20% of a population of thread-leaved brodiaea, located in Carlsbad west of El Camino Real south of Aqua Hedionda and north of Palomar Airport Road, is to be translocated. The portion of the San Marcos population conserved by this plan comprises an estimated 38% of the total point localities in this population; the remaining point localities occur in a Major Amendment Area and were not considered in the analysis of conservation and take levels.

Although the level of habitat conservation for this species is relatively low, as depicted in Table 4-7, this acreage includes all grasslands, whereas thread-leaved brodiaea is restricted to the most mesic areas within grasslands. Of the mapped vernal pool in the MHCP study area, only 41% are conserved within the FPA. Additionally, 29 acres of mapped vernal pool habitat occurs in the San Marcos Major Amendment Area and is not addressed in this plan.

Preserve Configuration Issues. Populations of thread-leaved brodiaea are scattered throughout Oceanside and Carlsbad and into San Marcos, and the proposed preserve design conserves the majority of these populations in a configuration that will not adversely affect the potential exchange of genetic material between populations, relative to existing conditions. At least two of the major, critical populations (Calavera Heights and Carlsbad Highlands) occur within large blocks (>50 acres) of intact habitat that may

⁴ Self-dispersed seeds rely on gravity for dispersal (autochory) and typically do not disperse far from the parental plant. They do not use animal vectors for dispersal (zoochory), nor are they specialized for wind-dispersal (anemochory).

Table 4-7

**SUMMARY OF NET CONSERVATION FOR
THREAD-LEAVED BRODIAEA**

City	Habitat Acreage Conserved ^{1,2}	Location Points Conserved ³	Major Populations Conserved	Critical Locations Conserved	Other Considerations
Carlsbad	171 (40%)	7 of 7 (97%)	93%	93%	Does not include Rancho Carillo population ⁴
Encinitas	10 (19%)	None known	None known	None known	–
Escondido	None present	None present	None present	None present	–
Oceanside	110 (27%)	47 of 50 (95%)	95%	95%	–
San Marcos	19 (11%)	11 of 13 (85%)	85% ⁵	85% ⁵	Part of the San Marcos population occurs in a Major Amendment Area
Solana Beach	None present	None present	None present	None present	–
Vista	3 (3%)	None known	None known	None known	–
MHCP Total ⁶	313 (27%)	65 of 70 (93%)	92%	92%	–

¹ Habitat for thread-leaved brodiaea includes clay soils in grasslands and vernal pools.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting suitable vegetation *and* soil types) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ The Rancho Carillo population will be conserved in its entirety, according to the Carlsbad HMP.

⁵ Includes only that portion of the San Marcos population that occurs within the analysis area (i.e., does not include the Major Amendment Area).

⁶ Numbers may not total due to rounding.

support appropriate pollinators. The other three populations (East Oceanside, El Camino Real, and San Marcos) occur in small or fragmented areas. With the possible exception of the Carlsbad Highlands population, all conserved populations are potentially subject to edge effects.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species and therefore contribute to species recovery. The MHCP preserve design and avoidance policies conserve the majority of known point localities (including major populations and critical locations), while MHCP management practices will address threats that have resulted in the decline of this species throughout the study area. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Special Considerations. Thread-leaved brodiaea may be susceptible to both fire damage and changes in hydrological conditions. Therefore, effective conservation of this species must include a fire management plan that protects conserved populations from frequent or high-intensity fires and from equipment associated with fire suppression activities (e.g., vehicles). Management of both the watershed and water quality issues will also be necessary to maintain conserved populations. Transplantation/reintroduction of corms may be an effective means of population enhancement.

Adaptive Management Program

If a subarea meets all required conditions and receives coverage for this species, it will be managed and monitored in conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for thread-leaved brodiaea. Conduct demographic and ecological research on thread-leaved brodiaea, and identify management requirements for this species. Specific studies might focus on reproductive strategies (e.g., the importance of sexual versus asexual reproduction in maintaining or increasing population size) and management techniques for maintaining viable populations.

Orcutt's Brodiaea

Brodiaea orcuttii

USFWS: Federal Species of Concern (former Category 2 candidate)

CDFG: None

MHCP: None

Conservation Goals

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat of Orcutt's brodiaea.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat and adjacent habitat that supports pollinators). Implement species-specific management actions as necessary to enhance or protect habitat quality and increase population size. These may include prohibiting adverse activities within preserve areas and enhancing declining populations and restoring damaged habitat.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, due to insufficient conservation.

Rationale. Current levels of conservation expected under the current MHCP FPA and guidelines do not meet the conservation goals for this species. The MHCP is not expected to adequately conserve Orcutt's brodiaea based on low conservation of major populations and critical locations in San Marcos and low conservation of potential habitat in the MHCP. Conservation for this species includes 27% of potentially suitable habitat, 26% of point locations (7 of 28 locations are within the FPA), and 49% of critical locations and major populations.

Conditions. Not applicable. Coverage for this species would require that major populations and critical locations in San Marcos (downtown, Questhaven) be conserved in accordance with wetland and critical location policies and managed as part of the preserve system. All conserved populations would need to be adequately managed to control edge effects, and declining populations would need to be enhanced, and damaged habitat restored, if determined necessary through monitoring. Additional potential habitat would need to be conserved until adequate surveys were conducted.

Background

Distribution, Abundance, and Trends. Orcutt's brodiaea is found in Orange, Riverside, and San Diego counties, and in northern Baja California, Mexico (Skinner and Pavlik 1994; Wiggins 1980). In San Diego County, the species is infrequent, occurring in coastal and foothill regions below 1,500-meter (4,921 feet) elevation. Reported localities

include the Santa Margarita Mountains, Carlsbad, San Marcos, Carmel Mountain, Los Peñasquitos Canyon, Mira Mesa, Poway, Kearny Villa, Tierrasanta, Miramar Naval Air Station, Montgomery Field, La Mesa, Proctor Valley Creek, O'Neal Canyon, lower Otay Reservoir, Ramona, Henshaw Dam, Santa Ysabel, Cuyamaca Mountains, and Japatul (Beauchamp 1986; Ogden 1995; J. Brown pers. comm.).

Within the MHCP, Orcutt's brodiaea is found in Carlsbad (Poinsettia Lane, along El Camino Real [Manzanita Partners property], and along Rancho Santa Fe Road) and San Marcos (downtown and Questhaven) (see MHCP Database Records Map). A population on slopes above Agua Hedionda Creek is on County of San Diego property and is not considered part of the MHCP study area. This species occurs in association with vernal pool complexes, grasslands, and seasonal streams.

Within the MHCP study area, major populations of Orcutt's brodiaea occur in Carlsbad (Poinsettia Lane), Escondido (northeast), and San Marcos (downtown and Questhaven). All four populations are considered critical locations.

Threats and Limiting Factors. Threats to this species include development, vehicular traffic, road construction, illegal dumping, and edge effects.

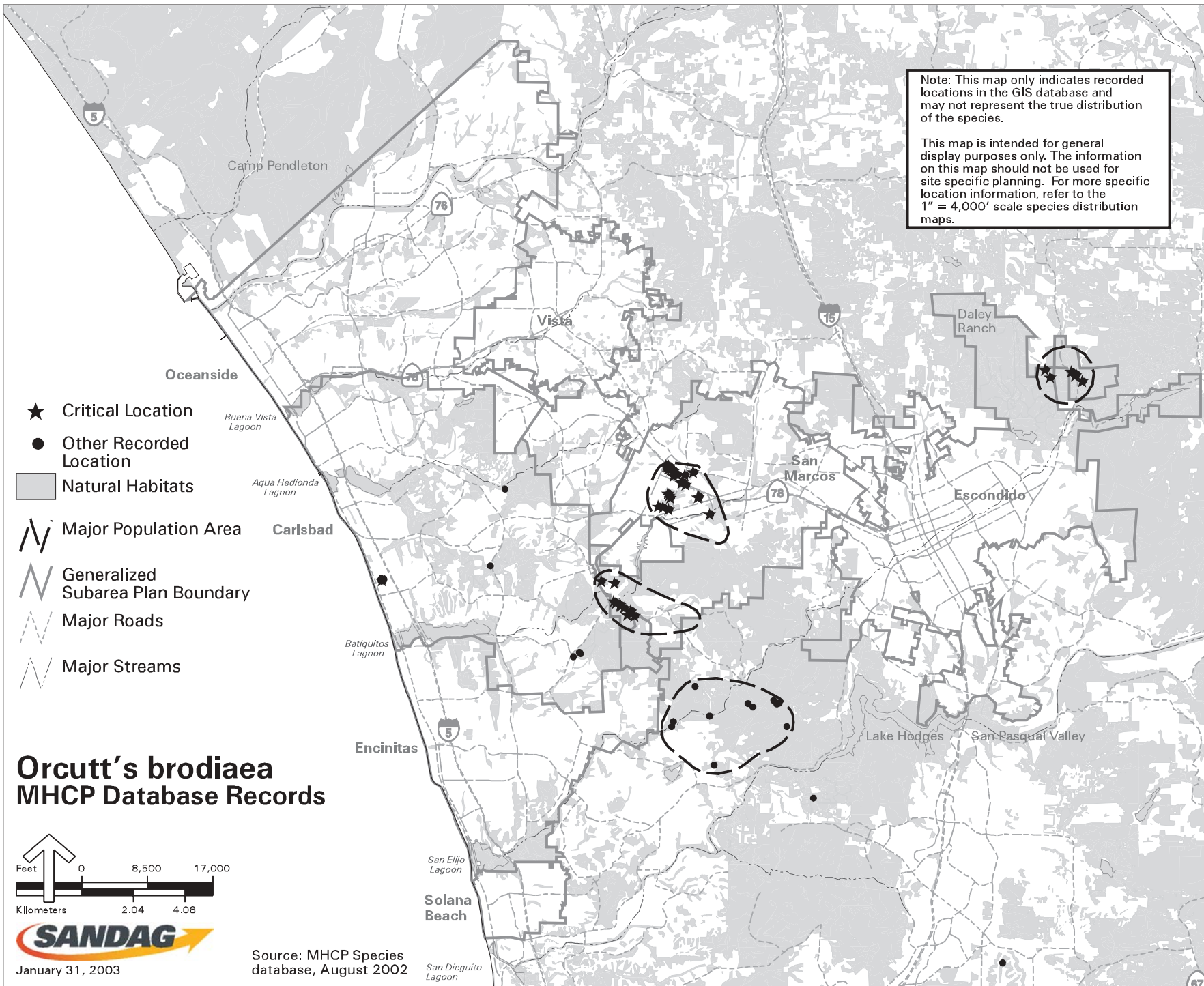
Special Considerations. Orcutt's brodiaea is an herbaceous perennial from a corm and reproduces asexually by producing corm offsets. This species is presumably insect-pollinated as well (e.g., bees, Wyatt 1983) and seeds are presumably self-dispersed. Orcutt's brodiaea is often associated with wetland habitat. The level of survey effort for this species in the study area is considered relatively high; however, flowering of corm species depends on climatic conditions, so this species could be missed during a poor survey year.

Conservation Analysis

Conservation and Take Levels. The expected level of take of Orcutt's brodiaea is relatively high (Table 4-8). The majority of points falls outside the FPA, where no conservation is required. Overall, 49% of major populations of this species will be conserved in the study area. The major population of Orcutt's brodiaea at Poinsettia Lane (Carlsbad), which is considered a critical location, will be conserved in its entirety. In San Marcos, an estimated 13% of the downtown population and 9% of the Questhaven population will be conserved in the FPA. That portion of the downtown population conserved by this plan comprises an estimated 25% of the total point localities in that population; the remaining point localities occur in a Major Amendment Area and were not considered in the analysis of conservation and take levels. Orcutt's brodiaea may receive additional protection in some areas through application of wetland and critical location policies (i.e., downtown San Marcos, Questhaven).

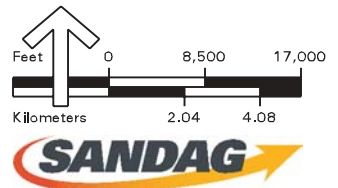
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- ▭ Major Population Area
- ▭ Generalized Subarea Plan Boundary
- ▭ Major Roads
- ▭ Major Streams

Orcutt's brodiaea MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Diego Lagoon

Table 4-8

**SUMMARY OF NET CONSERVATION FOR
ORCUTT'S BRODIAEA**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved
Carlsbad	171 (40%)	1 of 3 (33%)	100%	100%
Encinitas	10 (19%)	None known	None known	None known
Escondido	None present	4 of 6 (73%)	73%	73%
Oceanside	110 (27%)	None known	None known	None known
San Marcos	19 (11%)	2 of 19 (11%)	11%	11%
Solana Beach	None present	None present	None present	None present
Vista	3 (3%)	None known	None known	None known
MHCP Total⁴	313 (27%)	7 of 28 (26%)	49%	49%

¹ Habitat for Orcutt's brodiaea includes vernal pool complexes, grasslands, and seasonal streams; this species is often associated with clay soils.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting both suitable vegetation *and* soil types) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate). This species may receive additional protection through the no-net-loss of wetland habitat policy, where it occurs in wetlands.

⁴ Numbers may not total due to rounding.

Although the level of habitat conservation for this species is relatively low, as depicted in Table 4-8, this acreage includes all grasslands, whereas Orcutt's brodiaea is restricted to the most mesic areas within grasslands. Of the mapped vernal pool in the MHCP study area, only 41% are conserved within the FPA. Additionally, 29 acres of mapped vernal pool habitat occurs in the San Marcos Major Amendment Area and is not addressed in this plan.

Preserve Configuration Issues. Within the MHCP study area, populations of Orcutt's brodiaea occur in Carlsbad, Escondido, and San Marcos. Although the Carlsbad population at Poinsettia Lane is conserved in its entirety, it occurs in a narrow, linear strip of habitat that is bordered by the Poinsettia Train Station on one side and a road on the other side. In this case, habitat fragmentation has resulted in the vernal pool complex being separated from surrounding native vegetation or (more appropriately) areas restorable to native vegetation. As a consequence, the Poinsettia pools may not support appropriate pollinators or seed dispersal agents. The existing hydrology appears adequate to support a viable vernal pool resource, as indicated by robust populations of several sensitive vernal pool species.

It will be important to maintain the current hydrological regime to ensure that habitat becomes neither too dry (i.e., allowing invasion of the pool by grasses) nor too wet (i.e., allowing invasion of the pool by freshwater marsh species). This will entail preserving the watershed necessary to support these pools, as measured by topography and soils. Finally, because of its shape (i.e., high edge-to-area ratio) and adjacent land uses, this population is highly susceptible to edge effects (e.g., invasion of nonnative plants).

A watershed analysis was recently conducted on the parcel adjacent to the Poinsettia Lane vernal pools. This analysis was initiated because of the potential for proposed development to impact the vernal pool watershed. Results of this analysis found that the Poinsettia Lane vernal pools and immediately surrounding habitat are restricted to Huerhuero loam soils, and that these soils extend only slightly into the adjacent property (e.g., typically about 25 feet) (H. Wier pers. comm.). Huerhuero soils are moderately well drained loams with a clay subsoil that developed in sandy marine sediments. In undisturbed situations, they can support mimamounds (USDA-SCS 1973). The Huerhuero soils are replaced on the adjacent property by Marina loamy coarse sand (H. Wier pers. comm.). Marina soils are excessively drained, deep loamy coarse sands that are characterized by rapid permeability (USDA-SCS 1973). These soils do not have a clay subsoil, and are not expected to be important in maintaining pool hydrology because of their rapid permeability. The development proposal on this adjacent property includes a setback of 100 feet, which will be entirely on the Marina loamy coarse sands (H. Wier pers. comm.).

The portion of the downtown San Marcos population included in this analysis occurs on a relatively small parcel that is surrounded largely by development. This population is part of the San Marcos vernal pool complex and is in proximity to other vernal pools and stands of Orcutt's brodiaea within the complex. Despite the fragmented nature of the San Marcos vernal pool complex, it currently contains at least some of its original watershed and adjacent upland habitat, which may support some of the animal fauna necessary for the persistence of Orcutt's brodiaea (e.g., pollinators). The preserved population will be subject to edge effects.

The population of Orcutt's brodiaea along Questhaven Road is currently threatened by development. If preserved, this population will likely persist in a linear configuration with a large edge-to-area ratio, which will increase its susceptibility to habitat degradation. In addition, this population could be adversely affected by changes in hydrological conditions.

Populations of Orcutt's brodiaea at Poinsettia Lane and downtown San Marcos occur in association with vernal pools, and many of the genetic considerations that affect vernal pool species may affect this species, as well. Genetic consequences are a concern in preserve design for vernal pool species. Although gene flow between vernal pool complexes appears to be low (Fugate 1993, in USFWS 1998a; Davies 1996, in USFWS 1998a), flooding between pools within a complex is an important means of augmenting gene flow in populations already naturally low in variability (Davies 1996, in USFWS 1998a). Disruptions of the watershed that compromise gene exchange within a complex may result in a loss of genetic variability and an increased risk of extinction (Soulé 1986). From a genetic perspective, conservation of Orcutt's brodiaea within the Poinsettia Lane complex will require maintenance of the hydrological flow between pools. It should be recognized, however, that the existing variability might be too low to prevent adverse genetic consequences (e.g., inbreeding depression). The downtown San Marcos complex occupies a larger area, which includes at least a portion of the watershed surrounding extant pools. Although only a small area of that complex is included in this analysis (the rest is in the Major Amendment Area), effective conservation for this species will require connectivity to the larger watershed. In addition, conservation of additional vernal pools and watershed in this area will (1) increase the probability that propagules will be available for recolonization in the event of localized species extirpations and (2) provide potentially restorable vernal pool habitat.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for the Poinsettia Lane population of this species and therefore contribute to species recovery. The MHCP could provide similar benefits for the San Marcos populations if they are adequately protected through application of wetland and critical location policies. The MHCP preserve design and avoidance policies, if applied throughout the study area, will conserve the majority of known locations (including major populations and critical locations), while MHCP management practices will address threats that have resulted in the decline of this species throughout the study area. Management of both edge effects and the hydrological regimes of conserved pools or other habitat areas will be a critical component of

maintaining or enhancing population viability. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Special Considerations. Orcutt's brodiaea is often associated with wetland habitat and is therefore susceptible to changes in hydrological conditions. Effective conservation of this species must include management of the watershed. Transplantation/reintroduction of corms may be an effective means of population enhancement.

Adaptive Management Program

Not applicable.

Wart-stemmed Ceanothus

Ceanothus verrucosus

USFWS: Federal Species of Concern (former Category 2 candidate)

CDFG: None

MHCP: None

Conservation Goals

Ensure species persistence within the plan area by conserving major populations and required habitat of wart-stemmed ceanothus in a configuration that maintains a regional metapopulation.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat and adjacent habitat that supports pollinators). Implement species-specific management actions as necessary to enhance or protect habitat quality. These may include prohibiting adverse activities within preserve areas and developing fire management guidelines.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP will adequately conserve this species by conserving 71% of potential habitat, 75% of point locations (130 of 173 locations are within the FPA), and 78% of the major populations. Most conserved populations are in relatively large and connected habitat blocks that contribute to species viability.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. The major population in the Mt. Whitney-Double Peak area of San Marcos must be conserved at a minimum of 70% of the existing population.
2. Fire management plans must be implemented for all conserved populations to promote biological goals (e.g., regeneration) while protecting individual plants and habitat from frequent fires and fire suppression activities. Develop fire management guidelines within conserved areas that incorporate controlled burns (or other fuel reduction methods in urban areas), while limiting fire frequency and emergency access.
3. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. Wart-stemmed ceanothus is limited in distribution to western San Diego County and Baja California, Mexico (Skinner and Pavlik 1994). In San Diego County, it is found on the immediate coast from Carlsbad south to the U.S.-Mexican border. It also occurs inland towards San Marcos and Lake Hodges. Within the United States, large populations occur in Carlsbad, Encinitas, Torrey Pines State Reserve, Carmel Mountain-Carmel Valley, San Marcos, Escondido, and Point Loma. Smaller populations are known from Kearny Mesa-Clairemont Mesa-Miramar, Soledad, and Spooner's Mesa. Within the MHCP, this species occurs in Carlsbad, Encinitas, San Marcos, and Escondido (see MHCP Database Records Map). Wart-stemmed ceanothus is associated with southern maritime chaparral and southern mixed chaparral. It also forms nearly monotypic stands in some inland locations.

Within the MHCP, major populations of this species occur in Carlsbad (south of Palomar Airport Road, Agua Hedionda, slopes above Green Valley), Encinitas (slopes above Green Valley, Lux Canyon), San Marcos (Mt. Whitney-Double Peak), and Escondido (Del Dios, Lake Hodges-San Dieguito River Valley). No critical locations for this species have been identified to date in the MHCP study area.

Threats and Limiting Factors. Threats to this species include development and associated edge effects (including fuel modification, fuel suppression, and invasion of nonnative plants).

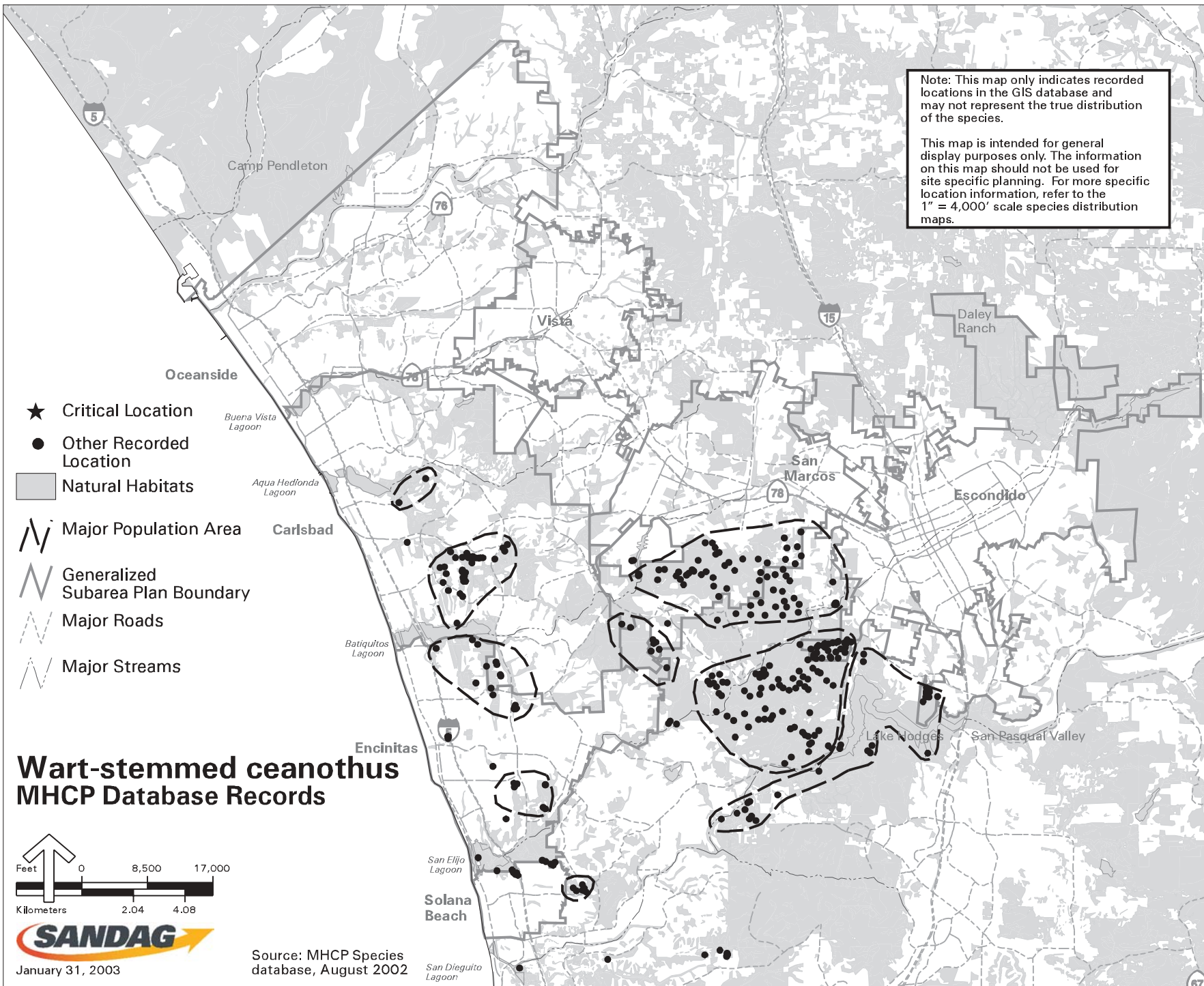
Special Considerations. Wart-stemmed ceanothus is an evergreen shrub. It is a highly fire-adapted species whose fire response is seed germination from a persistent seed bank after exposure to intense heat (e.g., an obligate seeder after fire) (Keeley 1991). This species is presumably insect-pollinated (e.g., bees or beesflies, Wyatt 1983; Conrad 1987), and seeds are self-dispersed (Keeley 1991). The level of survey effort for this species in the study area is considered relatively high.

Conservation Analysis

Conservation and Take Levels. The expected level of take of known locations of wart-stemmed ceanothus is relatively low (Table 4-9). It is thought that this species has been adequately surveyed for in the study area. The majority of points (75%) falls within the FPA and will be conserved at 100% in hardline areas and the FPA percentage (or mitigation ratio) in softline areas within the FPA. Because no critical locations have been identified for this species, and it is neither a narrow endemic nor a wetland species, conservation outside the FPA is not required.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location

■ Natural Habitats

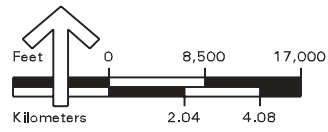
▭ Major Population Area

▭ Generalized Subarea Plan Boundary

— Major Roads

— Major Streams

Wart-stemmed ceanothus MHCP Database Records



Source: MHCP Species database, August 2002

San Dieguito Lagoon

Table 4-9

**SUMMARY OF NET CONSERVATION FOR
WART-STEMMED CEANOTHUS**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved
Carlsbad	680 (71%)	28 of 37 (76%)	74% ⁴	None identified
Encinitas	636 (83%)	41 of 47 (87%)	83% ⁵	None identified
Escondido	3,819 (80%)	37 of 37 (99%)	99%	None identified
Oceanside	21 (47%)	None known	None known	None known
San Marcos	1,193 (50%)	20 of 46 (44%)	36%	None identified
Solana Beach	24 (33%)	4 of 6 (67%)	None identified	None identified
Vista	181 (62%)	None known	None known	None known
MHCP Total⁶	6,554 (71%)	130 of 173 (75%)	78%	None identified

- ¹ Habitat for wart-stemmed ceanothus includes southern maritime chaparral and southern mixed chaparral.
- ² Number indicates the acreage of appropriate habitat (i.e., habitat supporting suitable vegetation) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.
- ³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).
- ⁴ Includes only the portion of the Green Valley population that occurs within the Carlsbad city limits.
- ⁵ Includes only the portion of the Green Valley population that occurs within the Encinitas city limits.
- ⁶ Numbers may not total due to rounding.

Overall, 78% of major populations of this species will be conserved in the study area. Of the seven major populations of this species that were identified in the study area, one will be entirely conserved within the FPA (Lake Hodges). Conservation of the remaining populations includes 98% of the Del Dios population (Escondido), 96% of the Green Valley population (Carlsbad, Encinitas), 72% of the population south of Palomar Airport Road (Carlsbad), 72% of the Lux Canyon population (Encinitas), 50% of the Aqua Hedionda population (Carlsbad), and 31% of the Mt. Whitney-Double Peak population (San Marcos).

In addition to conserved point localities, an estimated 6,554 acres (71%) of potentially suitable habitat will be conserved as a result of the existing preserve design and preserve policies (Table 4-9).

Preserve Configuration Issues. The preserve design conserves a portion of all major populations of wart-stemmed ceanothus in the study area. In at least one case (Del Dios), the preserve design ensures connectivity with populations in the MSCP study area to the south. At least two populations (Green Valley, Mt. Whitney-Double Peak) occur in relatively large blocks of intact habitat (~250 to 500 acres) that are expected to support appropriate pollinators. Many of the points within the Mt. Whitney-Double Peak population occur in softline areas; ensuring conservation of the majority of these points through site-specific standards could raise the level of conservation of this population to an acceptable level (e.g., >70%; Mock and Rocks 1999). For most populations, many of the individual plants occur at or near the edge of conserved areas and may be subject to edge effects.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species and therefore contribute to species recovery. The MHCP preserve design and avoidance policies conserve the majority of known locations (including major populations), while MHCP management practices will address threats that have resulted in the decline of this species throughout the study area. The exception is the Mt. Whitney-Double Peak population in San Marcos, which is currently proposed for conservation at a relatively low level (36%) for a major population. This population occupies an important location within the larger metapopulation, and its conservation would likely ensure genetic contiguity between populations in coastal (e.g., Carlsbad, Encinitas) and inland (Escondido) locations. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Special Considerations. Wart-stemmed ceanothus relies on fire for seed germination. Therefore, effective conservation of this species must include a fire management plan that incorporates controlled burns for regeneration. In addition, adequate preserve design for this species must include sufficient habitat to support pollinators.

Adaptive Management Program

If a subarea meets all required conditions and receives coverage for this species, it will be managed and monitored in conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for wart-stemmed ceanothus. Conduct demographic and ecological research on wart-stemmed ceanothus, and identify management requirements for this species. Specific studies might focus on reproductive and pollination biology, and management techniques (e.g., controlled burning) for maintaining viable populations.

Orcutt's Spineflower*Chorizanthe orcuttiana***USFWS: Endangered****CDFG: Endangered****MHCP: Narrow Endemic****Conservation Goals**

Promote species persistence within the plan area by conserving all populations of Orcutt's spineflower. In addition, conserve potentially suitable habitat to allow for population expansion, natural recolonization, or artificial reintroduction.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat, unoccupied habitat that may allow for population fluctuations or support a persistent seed bank, and adjacent habitat that supports pollinators). Implement species-specific management actions as necessary to enhance or protect habitat quality and increase population size. These may include surveys of potential habitat areas, prohibiting adverse activities within preserve areas, developing fire management guidelines, enhancing declining populations and restoring damaged habitat, establishing new populations, and establishing a seed bank for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP may adequately conserve this species by conserving 72% of potential habitat and 100% of the one known critical location and major population in Encinitas. Any additional populations found in the future are expected to be protected in accordance with the MHCP critical location and narrow endemic policies. However it is uncertain whether management can overcome deleterious effects of habitat fragmentation on the species, even if no further take is allowed.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. At least five self-sustaining, distinct populations⁵ must be conserved within the species geographic range (including 100% of extant populations and the majority of all newly discovered, naturally occurring populations and artificially initiated populations) before any incidental take is allowed.

⁵ The five self-sustaining populations do not necessarily need to be within the MHCP study area, but do need to be situated within the known distributional range of this species and/or within suitable habitat (i.e., MSCP and MHCP study areas).

2. The MHCP Narrow Endemic Policy must be applied to any populations of this species, including those already known and any found in the future.
3. All conserved populations must be managed for genetic considerations as a metapopulation.
4. Fire management plans must be implemented for all conserved populations to promote biological goals (e.g., germination if the species is determined to be fire-dependent) while protecting individual plants and habitat from frequent fires and fire suppression activities.
5. A seed bank must be established as a guarantee against extinction and to provide source material for conservation and research activities. Collections should be based on established guidelines and subject to seed availability. Collected seed should be stored at an established seed bank facility (e.g., Rancho Santa Ana Botanic Garden).
6. Declining populations must be enhanced, and damaged habitat restored, if determined necessary through monitoring. Enhancement may include introduction of plant materials to existing populations, while restoration may include site-specific habitat improvement activities. Unless analyses determine that there is no significant genetic variation between populations, introduced plant materials must be from the parental population or a population in proximity.
7. As part of the project review process (e.g., CEQA) for individual projects within the MHCP area, a qualified biologist must survey for this species in all potential habitat areas.
8. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

Self-sustaining populations are defined as those that retain genetic resources necessary to undergo adaptive evolutionary change (Guerrant 1996). Determination of a viable or self-sustaining population shall be assessed through long-term monitoring (e.g., 5 to 10 years) and shall include demographic measures (e.g., the number of individuals or viable seeds in a population is stable or increasing over time) and genetic measures (e.g., changes in overall genetic diversity as measured against a baseline genetic profile) (Primack 1996; Falk et al. 1996). Self-sustaining populations should contain a minimum of 1,000 individuals to reduce the risk of extinction from intrinsic or random events, unless research or monitoring indicates that higher or lower population numbers are appropriate for this species. In addition, self-sustaining populations should occur within blocks of natural habitat that are large enough (i.e., >50 acres) to support appropriate pollinators and buffer the conserved population from edge effects.

Background

Distribution, Abundance, and Trends. Orcutt's spineflower is endemic to south-central and southern coastal San Diego County. Its historical distribution included 10 locations in Encinitas, Del Mar, Point Loma, and Kearny Mesa (USFWS 1996a). A population has recently been rediscovered in Point Loma (V. Scheidt pers. comm.). However, the only confirmed extant MHCP location for this species in recent years is a very small population (<40 individuals) in Oak Crest Park in Encinitas (see MHCP Database Records Map). This species is primarily restricted to weathered sandstone bluffs in association with or in microhabitats within southern maritime chaparral.

Within the MHCP, a critical location of this species is found at Oak Crest Park in Encinitas. Although this population may be small, it is considered critical because of its overall importance to the survival of this species rather than population size, because it is one of only two known extant populations. It appears to be declining (fewer than 40 individuals were observed in 1993 and fewer than 10 individuals in 1994) and is highly susceptible to stochastic events due to its small size. It occupies a relatively small area (43 square feet) and is subject to trampling by hikers and migrant worker and invasion by exotic grass and weed species (USFWS 1996a; Reiser 2001).

Threats and Limiting Factors. Threats to this species include urbanization, recreational activities, trampling, collecting, habitat fragmentation and edge effects, invasive exotic plants, and small population size.

Special Considerations. Orcutt's spineflower is an annual plant that may experience yearly fluctuations in population size. It is insect-pollinated (e.g., syrphids and bee flies, Wyatt 1983) and seeds are presumably self-dispersed. This species occurs in a fire-adapted habitat (chaparral); however, its fire response mechanism is unknown. It presumably forms a persistent seed bank. Although the level of survey effort for this species in the study area has been relatively high, it appears to germinate under a very specific set of environmental conditions, so would not be present (i.e., above ground) in all years.

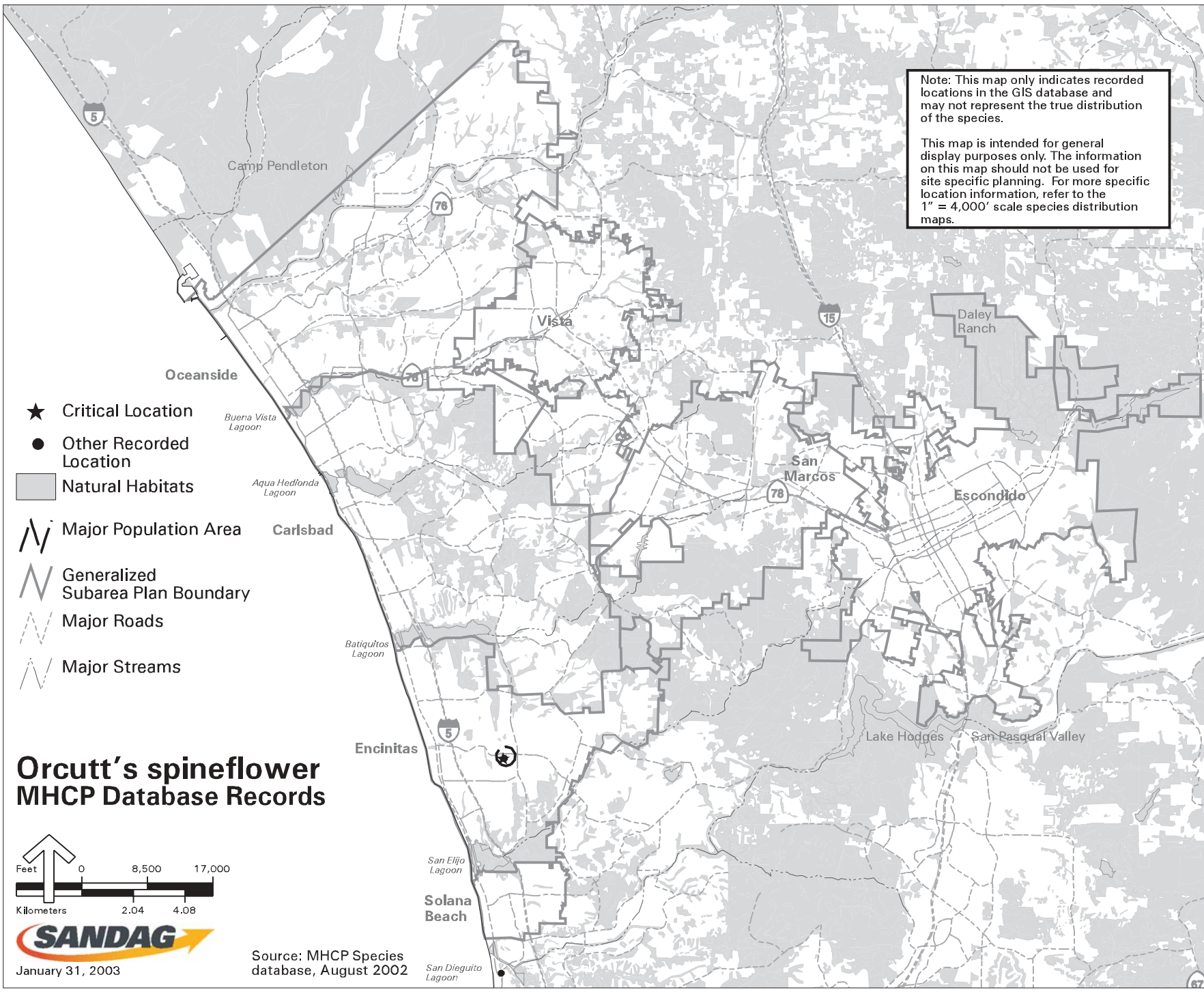
Conservation Analysis

Conservation and Take Levels. No take of currently known Orcutt's spineflower point localities is expected to occur under this plan. The only known point locality falls within the FPA and will be conserved at 100% (Table 4-10). This is the one critical location of this species known from the study area, which occurs at Oak Crest Park in Encinitas.

In addition to conserved point localities, an estimated 453 acres (72%) of potentially suitable habitat will be conserved in the FPA as a result of the existing preserve design and preserve policies (Table 4-10).

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location

■ Natural Habitats

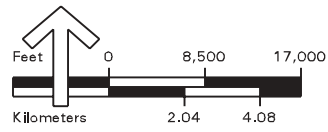
▮ Major Population Area

▮ Generalized Subarea Plan Boundary

▬ Major Roads

▬ Major Streams

Orcutt's spineflower MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Dieguito Lagoon

Table 4-10**SUMMARY OF NET CONSERVATION FOR
ORCUTT'S SPINEFLOWER**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved
Carlsbad	150 (63%)	None known	None known	None known
Encinitas	288 (84%)	1 of 1 (100%)	100%	100%
Escondido	None present	None present	None present	None present
Oceanside	None present	None present	None present	None present
San Marcos	None present	None present	None present	None present
Solana Beach	15 (34%)	None known	None known	None known
Vista	None present	None present	None present	None present
MHCP Total⁴	453 (72%)	1 of 1 (100%)	100%	100%

¹ Habitat for Orcutt's spineflower includes sandstone substrates in southern maritime chaparral.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting suitable vegetation *and* soil types) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ Numbers may not total due to rounding.

Preserve Configuration Issues. The one known population of Orcutt's spineflower in the study area occurs in a relatively small block of habitat in Oak Crest Park in Encinitas. The park is surrounded by development and the spineflower population is subject to edge effects (particularly, trampling). The proposed preserve design will conserve an estimated 72% of potentially suitable habitat for this species. This includes some larger blocks of intact habitat in the vicinity of Oak Crest Park (e.g., Green Valley, Lux Canyon).

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to protect the existing population of Orcutt's spineflower. The MHCP preserve design and avoidance policies conserve the one known location (including the critical population) in the study area and 72% of potentially suitable habitat. If new populations are discovered, then MHCP management practices will address threats that have resulted in the decline of this species throughout the study area. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Special Considerations. Although Orcutt's spineflower may have some adaptations to fire, it may also be adversely affected by unnatural fire regimes (e.g., frequent fires, high-intensity fires resulting from fire suppression policies), particularly where such regimes result in a type conversion of native habitat and/or invasion of habitat by nonnative weedy species. In addition, this species appears to be susceptible to soil surface disturbance and it likely forms a persistent seed bank. Therefore, effective conservation of Orcutt's spineflower must include a fire management plan that protects conserved populations from frequent or high-intensity fires and from equipment associated with fire suppression activities (e.g., vehicles). Conserved populations should also be protected from trampling or other soil surface disturbance, and surveys for this species should be required for all potentially suitable habitat outside the FPA prior to development or other disturbance.

Adaptive Management Program

If a subarea meets all required conditions and receives coverage for this species, it will be managed and monitored in conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for Orcutt's spineflower. Conduct demographic, genetic, and ecological research on Orcutt's spineflower, and identify management requirements for this species. Specific studies might focus on reproductive and pollination biology, seed and pollen viability, germination

requirements, seed dispersal strategies, seed bank ecology, seedling mortality, genetic characterization, specific habitat requirements, and management techniques for maintaining viable populations. In addition, matrix projection modeling may be conducted to identify critical life cycle stages and project population growth rates for reintroduced populations (Menges 1986; Schemske et al. 1994).

Summer Holly

Comarostaphylis diversifolia ssp. *diversifolia*

USFWS: Federal Species of Concern (former Category 2 candidate)

CDFG: None

MHCP: None

Conservation Goals

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat of summer holly.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat and adjacent habitat that supports pollinators and seed dispersal agents). Implement species-specific management actions as necessary to enhance or protect habitat quality. These may include prohibiting adverse activities within preserve areas and developing fire management guidelines.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP will adequately conserve this species by conserving 70% of potential habitat, 60% of point locations (125 of 210 locations are within the FPA), and 65% of major populations. Some of the conserved populations are in relatively intact and connected habitat blocks.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. Fire management plans must be implemented for all conserved populations to promote biological goals (e.g., regeneration) while protecting individual plants and habitat from frequent fires and fire suppression activities. Develop fire management guidelines within conserved areas that incorporate controlled burns (or other fuel reduction methods in urban areas), while limiting fire frequency and emergency access.
2. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. Summer holly occurs in Orange, Riverside, and San Diego counties, and in Baja California, Mexico (Skinner and Pavlik 1994). In

San Diego County, the species is found along the coast from Carlsbad to the U.S.-Mexican border, and in inland locations from the San Marcos Mountains south to Otay Mountain. Within the MHCP, the species occurs in Carlsbad, Encinitas, San Marcos, and Escondido. Summer holly is associated with chaparral.

Within the MHCP, major populations of this species are found in Carlsbad (Agua Hedionda), Encinitas (vicinity of Green Valley, Lux Canyon), San Marcos (Mt. Whitney-Double Peak), and Escondido (Merriam Mountains and Del Dios) (see MHCP Database Records Map). No critical locations have been identified to date.

Threats and Limiting Factors. Threats to this species include development and associated edge effects (including fuel modification, fuel suppression, and invasion of nonnative plants), as well as gravel mining.

Special Considerations. Summer holly is a fire-adapted shrub that stump-sprouts from the base of the stem or root-crown after fire or cutting (Wells 1986; Conrad 1987). Because of its capacity for resprouting, individuals are typically long-lived and populations typically experience relatively slow rates of turnover of individuals (Wells 1986). It is presumably insect-pollinated and seeds are animal-dispersed. The level of survey effort for this species in the study area is considered relatively high.

Conservation Analysis

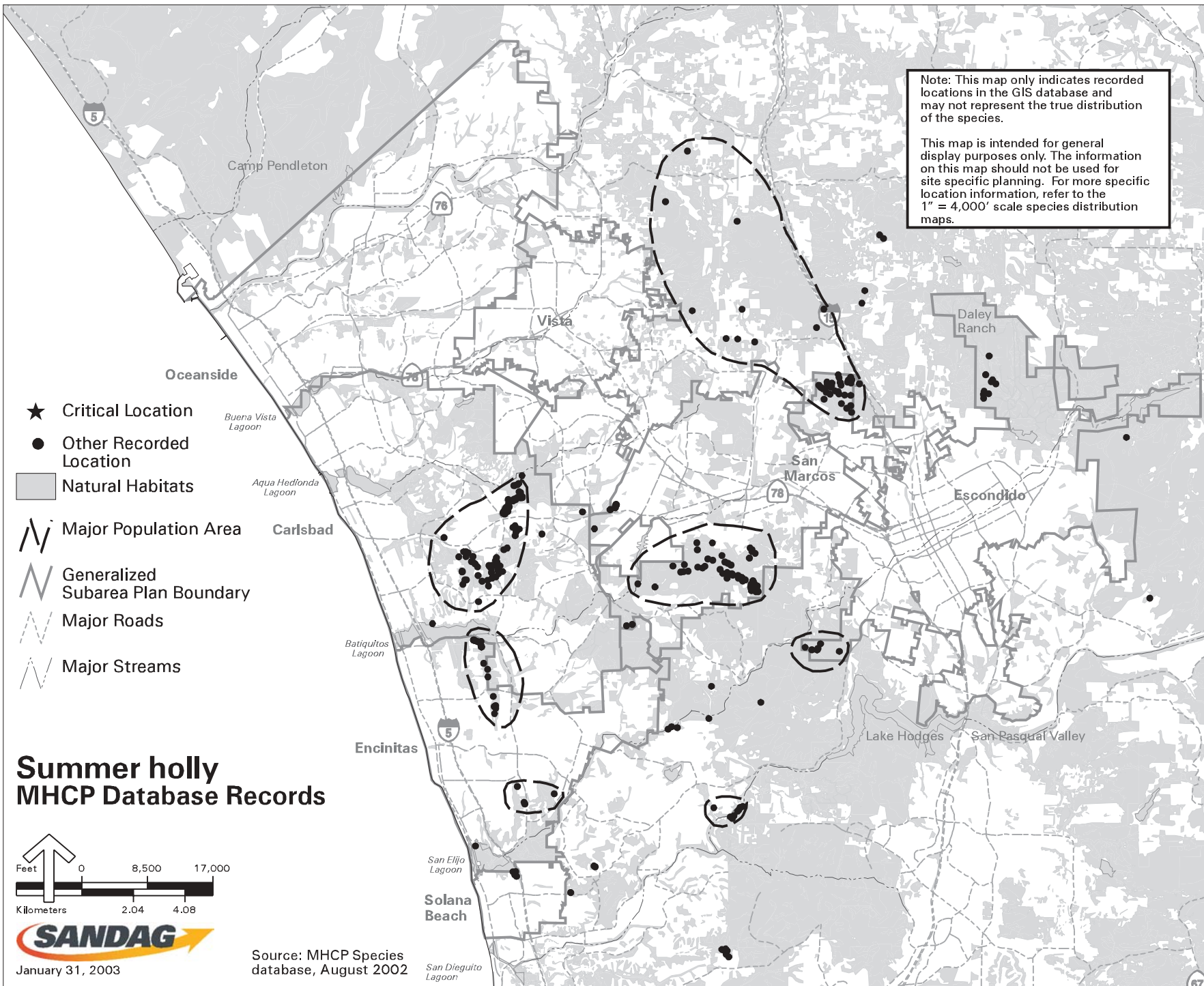
Conservation and Take Levels. The expected level of take of known locations of summer holly is relatively low (Table 4-11). Approximately 60% of points fall within the FPA and will be conserved at 100% in hardline areas and the FPA percentage (or mitigation ratio) in softline areas within the FPA. Because no critical locations have been identified for this species, and it is neither a narrow endemic nor a wetland species, conservation outside the FPA is not required.

Overall, 65% of major populations of this species will be conserved in the study area. Of the six major populations of this species that were identified in the study area, the Green Valley population (Encinitas) and the Del Dios population (Escondido) will be entirely conserved within the FPA. Conservation of the remaining populations includes 88% of the Lux Canyon population (Encinitas), 64% of the Mt. Whitney-Double Peak population (San Marcos), 41% of the Aqua Hedionda population (Carlsbad), and 0% of the Merriam Mountains population (Escondido).

In addition to conserved point localities, an estimated 5,806 acres (70%) of potentially suitable habitat will be conserved as a result of the existing preserve design and preserve policies (Table 4-11).

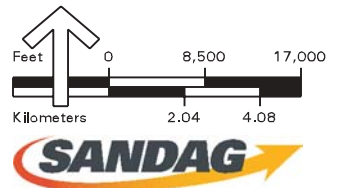
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- Major Population Area
- Generalized Subarea Plan Boundary
- Major Roads
- Major Streams

Summer holly MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Dieguito Lagoon

Table 4-11

**SUMMARY OF NET CONSERVATION FOR
SUMMER HOLLY**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved
Carlsbad	426 (71%)	21 of 51 (42%)	60% ⁴	None identified
Encinitas	158 (75%)	43 of 43 (99%)	82% ⁵	None identified
Escondido	3,819 (80%)	15 of 47 (31%)	67%	None identified
Oceanside	21 (47%)	None known	None known	None known
San Marcos	1,193 (50%)	44 of 64 (66%)	64%	None identified
Solana Beach	8 (34%)	3 of 3 (100%)	None identified	None identified
Vista	181 (62%)	2 of 2 (100%)	None identified	None identified
MHCP Total ⁶	5,806 (70%)	125 of 210 (60%)	65%	None identified

¹ Habitat for summer holly is chaparral.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting suitable vegetation) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ Includes only the portion of the Agua Hedionda population that occurs within the Carlsbad city limits.

⁵ Includes only the portion of the Green Valley population that occurs within the Encinitas city limits.

⁶ Numbers may not total due to rounding.

Preserve Configuration Issues. The preserve design conserves a portion of 5 of 6 major populations of summer holly in the study area. In at least one case (Del Dios), the preserve design ensures connectivity with populations in the MSCP study area to the south. At least two populations (Green Valley, Mt. Whitney-Double Peak) occur in relatively large blocks of intact habitat (~250 to 500 acres) that are expected to support appropriate pollinators and seed dispersal agents. Many of the individual plants occur at or near the edge of conserved areas and may be subject to edge effects.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species and therefore contribute to species recovery. The MHCP preserve design and avoidance policies conserve the majority of known locations (including major populations), while MHCP management practices will address threats that have resulted in the decline of this species throughout the study area. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Special Considerations. Summer holly is a fire-adapted shrub that is nonetheless adversely affected by frequent burning. Effective conservation of this species must include a fire management plan that protects conserved populations from frequent or high-intensity fires. In addition, adequate preserve design for this species must include sufficient habitat to support appropriate pollinators and seed dispersal agents.

Adaptive Management Program

If a subarea meets all required conditions and receives coverage for this species, it will be managed and monitored in conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for summer holly. Conduct demographic and ecological research on summer holly, and identify management requirements for this species. Specific studies might focus on specific habitat requirements and management techniques (e.g., controlled burning, cutting) for maintaining viable populations.

Del Mar Mesa Sand Aster*Corethrogyne filaginifolia* var. *linifolia***USFWS: Federal Species of Concern (proposed rule for listing as threatened was withdrawn)****CDFG: None****MHCP: Narrow Endemic****Conservation Goals**

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat of Del Mar Mesa sand aster (if this plant is determined to be a valid taxon) in a configuration that maintains genetic connectivity with populations outside the plan area.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat and adjacent habitat that supports pollinators and seed dispersal agents). Implement species-specific management actions as necessary to enhance or protect habitat quality and increase population size. These may include prohibiting adverse activities within preserve areas, developing fire management guidelines, and enhancing declining populations and restoring damaged habitat.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP may contribute to the conservation of this species within the area by conserving 49% of potential habitat and 60% of point locations (3 of 5 locations are within the FPA). The major and critical population in Oceanside and the critical population in Carlsbad are in 50% and 75% FPAs, respectively. Although the Narrow Endemic Policy is assumed to protect these populations at the 95% level, this may not be reasonable if some development is allowed on these small parcels.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. Fire management plans must be implemented for all conserved populations to promote biological goals (e.g., regeneration) while protecting individual plants and habitat from frequent fires and fire suppression activities. Fire management plans should include emergency access plans for conserved areas to protect populations from fires and disturbances associated with fire suppression.
2. The MHCP Narrow Endemic Policy must be applied to any populations of this species, including those already known and any found in the future.

3. Declining populations must be enhanced, and damaged habitat restored, if determined necessary through monitoring. Enhancement may include introduction of plant materials to existing populations, while restoration may include site-specific habitat improvement activities. Unless analyses determine that there is no significant genetic variation between populations, introduced plant materials must be from the parental population or a population in proximity.
4. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. Del Mar Mesa sand aster is a San Diego County endemic plant that occurs along bluffs or brushy slopes near the coast from Carlsbad southward to Point Loma. Within the MHCP, this taxon occurs in several locations in Carlsbad and Encinitas, but is more common to the south, in the MSCP study area (see MHCP Database Records Map). Del Mar Mesa sand aster is found in sandstone substrates where it is generally associated with coastal sage scrub or chaparral (including southern maritime chaparral).

Within the MHCP, major populations of Del Mar Mesa sand aster are found in Carlsbad (Batiqitos, vicinity of Green Valley), Encinitas (Batiqitos, vicinity of Green Valley, Lux Canyon and vicinity, San Elijo), and Solana Beach (San Elijo). None of the populations within the MHCP is considered a critical location at this time. The MHCP Standards and Guidelines (Ogden 1998) also identified a population in south Carlsbad as major; however, current data indicate that this population does not meet size or other criteria for that designation.

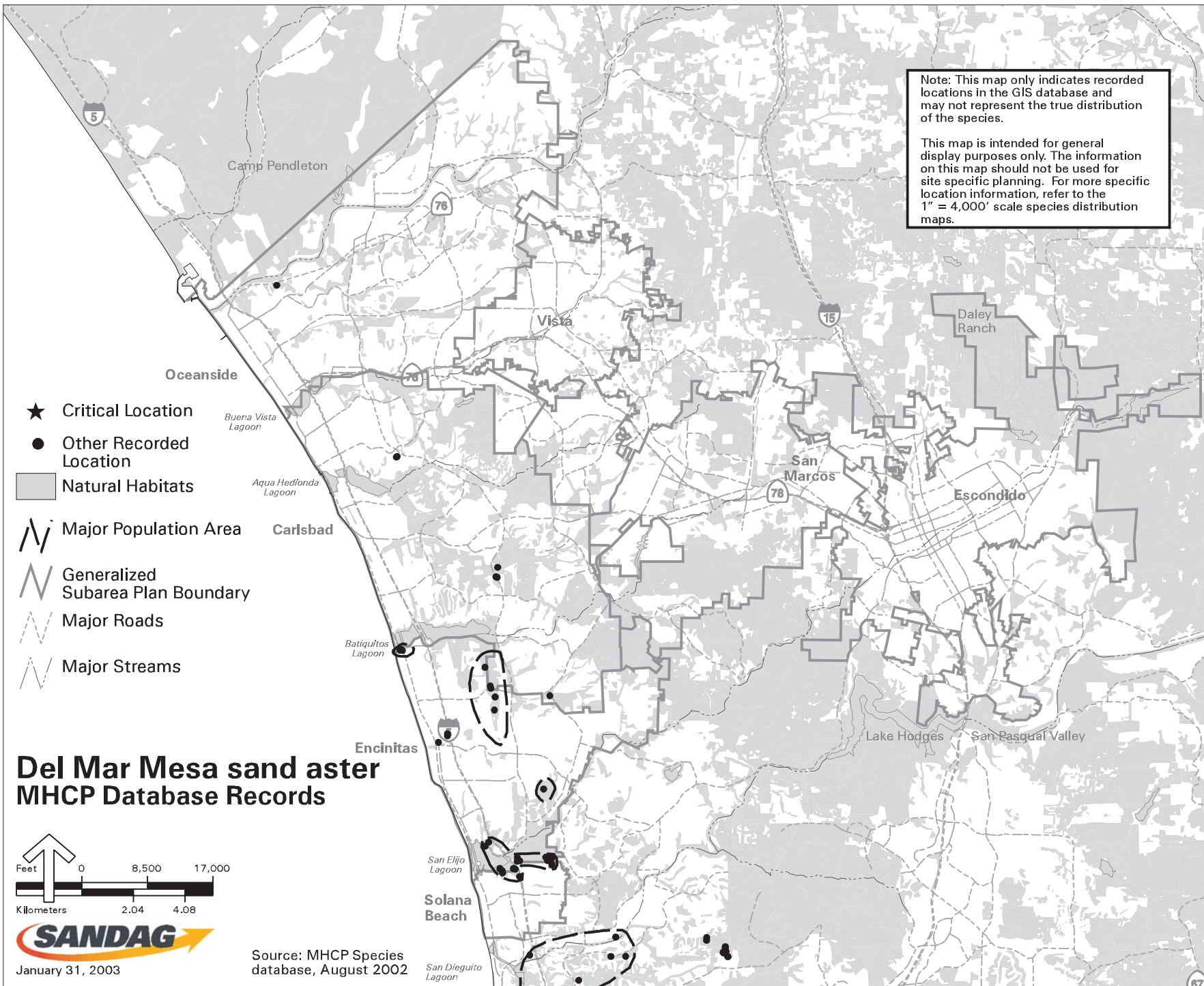
Threats and Limiting Factors. Threats to this species include development and edge effects.

Special Considerations. Del Mar Mesa sand aster is a perennial herb. It is insect-pollinated (e.g., bees, butterflies, Wyatt 1983), and seeds (achenes) are presumably wind- and animal-dispersed. This taxon appears to be tolerant of some surface disturbance. The level of survey effort for this species in the study area is considered relatively high; however, it blooms in late summer and early fall and could be missed during spring surveys.

Current taxonomic information indicates that this taxon is indistinct from the more widespread and nonsensitive *Lessingia filaginifolia* var. *filaginifolia* (Lane 1992, 1993). For that reason, the USFWS withdrew a proposal to list this species as threatened, stating that it no longer qualifies for listing under the federal Endangered Species Act (USFWS 1996b).

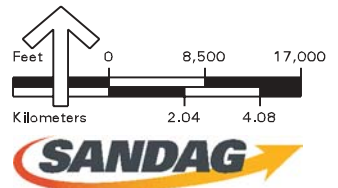
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- ▭ Major Population Area
- ▭ Generalized Subarea Plan Boundary
- Major Roads
- Major Streams

Del Mar Mesa sand aster MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Diego Lagoon

Conservation Analysis

Conservation and Take Levels. The expected level of take of Del Mar Mesa sand aster is relatively low (Table 4-12). The majority of points falls within the FPA and will be conserved at levels of 95 or 100%. Points that fall outside the FPA will be conserved at a minimum 80% level based on the narrow endemic policy. Additional conservation may occur through application of the critical location policy.

Overall, 93% of major populations of Del Mar Mesa sand aster will be conserved in the study area. Of the four major populations of this species that were identified in the study area, the Lux Canyon (Encinitas) and San Elijo (Encinitas) populations will be entirely conserved (100%) within the FPA. An estimated 96% of the Green Valley population (Carlsbad, Encinitas) will be conserved, while the Batiquitos population will be conserved at a level of 80%.

In addition to conserved point localities, an estimated 1,953 acres (73%) of potentially suitable habitat will be conserved as a result of the existing preserve design and preserve policies (Table 4-12).

Preserve Configuration Issues. Populations of Del Mar Mesa sand aster are scattered throughout the coastal portion of the study area. The proposed preserve design and avoidance policies conserve the majority of these populations in a configuration that will not adversely affect the potential exchange of genetic material between populations, relative to existing conditions. Several populations (Lux Canyon, San Elijo, and Green Valley) occur within large blocks of intact habitat (e.g., 100 to 250 acres) that may provide opportunities for population expansion and support appropriate pollinators or dispersal agents. Conversely, the Batiquitos population is conserved in a smaller block of habitat (e.g., <50 acres).

Conserved populations will be subject to varying levels of edge effects. The Lux Canyon population occurs in the interior of a large block of habitat, so edge effects are expected to be minimal. Portions of the San Elijo and Green Valley populations occur within the FPA, but near the edge of conserved habitat, whereas the Batiquitos population occurs entirely outside the FPA. The Batiquitos population is in proximity to conserved habitat along Batiquitos Lagoon to the north, but adjacent to developed land to the south.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species and therefore contribute to species recovery. The MHCP preserve design and avoidance policies conserve the majority of point localities (including major populations), while MHCP management practices will address threats that have resulted in the decline of this species throughout the study area. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Table 4-12**SUMMARY OF NET CONSERVATION FOR
DEL MAR MESA SAND ASTER**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved
Carlsbad	768 (70%)	10 of 11 (91%)	90% ⁴	None identified
Encinitas	683 (80%)	22 of 23 (97%)	93% ⁵	None identified
Escondido	None present	None present	None present	None present
Oceanside	472 (64%)	1 of 1 (100%)	None identified	None identified
San Marcos	0 (0%)	None present	None present	None present
Solana Beach	29 (37%)	2 of 2 (100%)	100%	None identified
Vista	1 (5%)	None known	None known	None known
MHCP Total ⁶	1,953 (70%)	35 of 37 (96%)	93%	None identified

¹ Habitat for Del Mar Mesa sand aster includes sandstone substrates in coastal sage scrub or chaparral (including southern maritime chaparral).

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting suitable vegetation *and* soil types) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ Includes only that portion of the Batiquitos and Green Valley populations that lie within the Carlsbad city limits.

⁵ Includes only that portion of the Batiquitos and Green Valley populations that lie within the Encinitas city limits.

⁶ Numbers may not total due to rounding.

Special Considerations. Although Del Mar Mesa sand aster likely has some adaptation to fire, it may be adversely affected by unnatural fire regimes (e.g., frequent fires, high-intensity fires resulting from fire suppression policies), particularly where they result in a type conversion of native habitat and/or invasion of habitat by nonnative weedy species. Therefore, effective conservation of Del Mar Mesa sand aster must include a fire management plan that protects conserved populations from frequent or high-intensity fires and from equipment associated with fire suppression activities (e.g., vehicles).

Adaptive Management Program

If a subarea meets all required conditions and receives coverage for this species, it will be managed and monitored in conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for Del Mar Mesa sand aster. Conduct demographic and ecological research on Del Mar Mesa sand aster, and identify management requirements for this species. Specific studies might focus on reproductive and pollination biology, seed and pollen viability, germination requirements, seed bank ecology, seedling mortality, specific habitat requirements, and management techniques for maintaining viable populations.

Blochman's Dudleya*Dudleya blochmaniae* ssp. *blochmaniae***USFWS: Federal Species of Concern (former Category 2 candidate)****CDFG: None****MHCP: None****Conservation Goals**

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat of Blochman's dudleya.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat and adjacent habitat that supports pollinators). Implement species-specific management actions as necessary to enhance or protect habitat quality. These may include prohibiting adverse activities within preserve areas, developing fire management guidelines, and enhancing declining populations and restoring damaged habitat.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, unless subarea plans adopt additional measures.

Achievement of Conservation Goals. Subject to all MHCP policies and the specific conditions listed herein, the MHCP will adequately conserve this species by conserving both known locations, including 100% conservation of the critical location in Oceanside. Increased coordination of monitoring and management may improve knowledge of species' requirements and habitat quality in the study area.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. The major population and critical location of Blochman's dudleya in Oceanside must be conserved at a level consistent with the critical location policy and managed as part of the preserve system.
2. Fire management plans must be implemented for all conserved populations to protect them from frequent and high-intensity fires and fire suppression activities.
3. Declining populations must be enhanced, and damaged habitat restored, if determined necessary through monitoring. Enhancement may include introduction of plant materials to existing populations, while restoration may include site-specific habitat improvement activities. Unless analyses determine that there is no significant genetic variation between populations, introduced plant materials must be from the parental population or a population in proximity.

4. As part of the project review process (e.g., CEQA) for individual projects within the MHCP area, a qualified biologist must survey for this species in all potential habitat areas.
5. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. Blochman's dudleya is found in San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange, and San Diego counties, and in Baja California, Mexico. Despite its relatively widespread distribution, this species is known from fewer than 20 occurrences in California and fewer than 5 occurrences in Baja California (Skinner and Pavlik 1994). In San Diego County, the species is found on Camp Pendleton and in Oceanside and Carlsbad. The Oceanside and Carlsbad locations are the only records for this species in the MHCP (see MHCP Database Records Map). Blochman's dudleya is typically found on coastal bluffs in association with coastal scrub habitat. It has also been reported on rocky or clay soils.

The population of Blochman's dudleya in Oceanside is considered both major and a critical location. The population in Carlsbad (north of Palomar Airport) is small (<100 individuals) and is not considered a major population. It is, however, considered a critical location because it comprises the southernmost known location for this species.

Threats and Limiting Factors. The primary threats to this taxon are trampling and development. Edge effects associated with development may also impact extant populations.

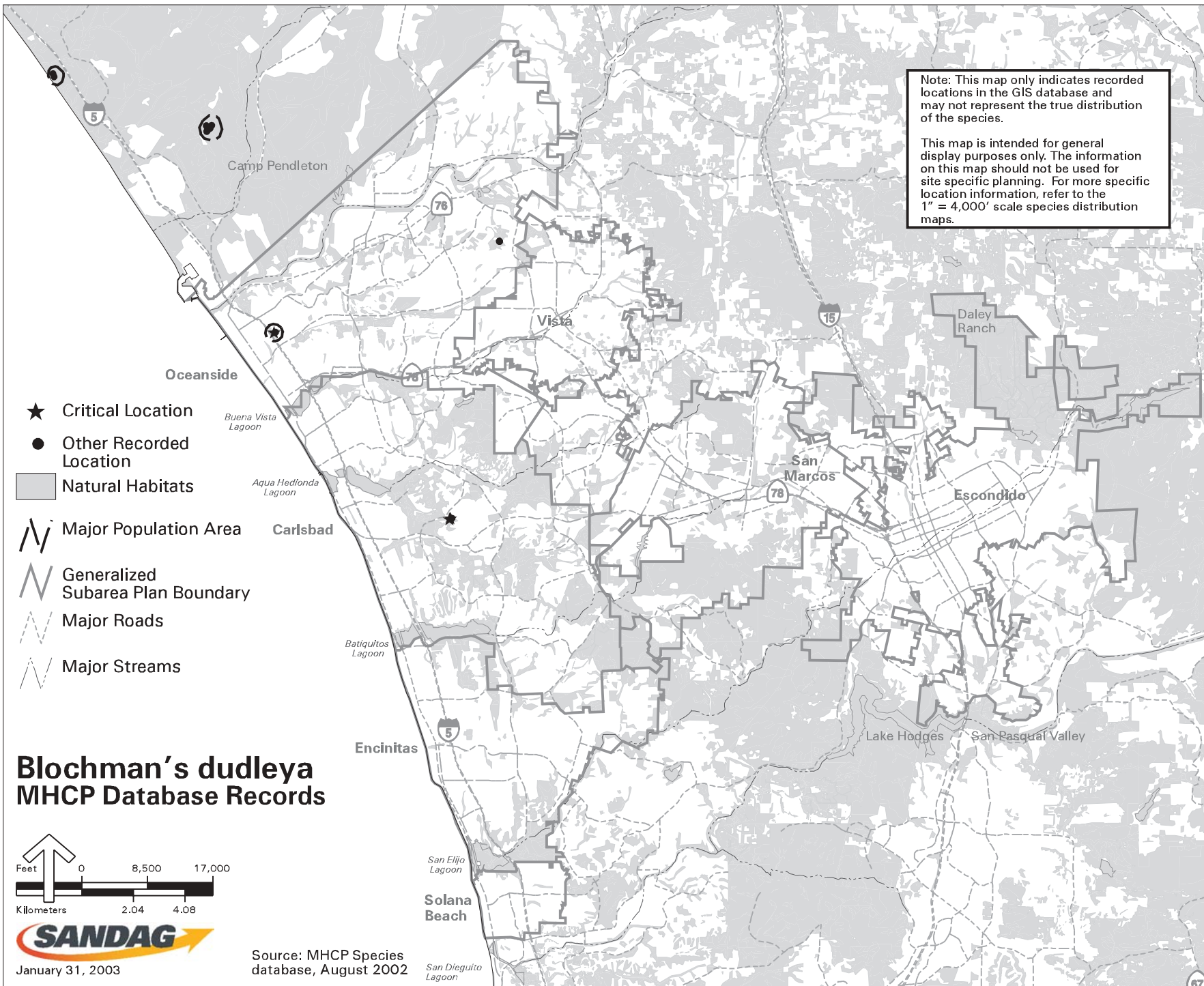
Special Considerations. Blochman's dudleya is an herbaceous perennial plant. It is presumably outcrossing and insect-pollinated (e.g., bees, bee flies, Wyatt 1983). Seeds are presumably self-dispersed. This species may be susceptible to fires. The level of survey effort for this species in the study area is considered relatively low. Blochman's dudleya can be difficult to find when not in flower, and much of the study area is considered beyond its distributional limit, so it may not have been surveyed for in those areas.

Conservation Analysis

Conservation and Take Levels. Of the 5 point localities in the study area, 3 fall within the FPA and will be conserved at 100% in hardline areas but only at the FPA percentage (or mitigation ratio) in softline areas within the FPA. Therefore, some take may occur within the FPA (Table 4-13). Conservation outside the FPA is not required. It is thought that this species has not been adequately surveyed for in the study area.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



Overall, 50% of major populations and 63% of critical locations of this species will be conserved in the study area under the current FPA design. The Oceanside population, which is both a major population and critical location, currently occurs in a softline area, where it is assumed to be conserved at a 50% level (Table 4-13). Application of the critical location policy would increase the percent conservation of this population. The Carlsbad population, which is a critical location, occurs in a softline area, where it is assumed to be conserved at a 75% level.

In addition to conserved point localities, an estimated 309 acres (49%) of potentially suitable habitat will be conserved as a result of the existing preserve design and preserve policies (Table 4-13). It should be noted that the amount of potentially suitable acreage might be underestimated. The number provided includes coastal sage scrub on clay soils; however, Blochman's dudleya may also occur on rocky substrates, and the Oceanside population occurs in association with chamise chaparral.

Preserve Configuration Issues. The proposed preserved design will conserve at least a portion of the Oceanside population, which currently lies in a softline area. The relatively small parcel (<25 acres) on which this population occurs is surrounded by development to the north, a golf course to the east and south, and a freeway to the west. The Carlsbad population also occurs on a relatively small parcel (<20 acres) that is surrounded by development. Both populations will be subject to edge effects.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species and therefore contribute to species recovery. The MHCP preserve design and avoidance policies conserve the majority of major populations and/or critical locations, while MHCP management practices will address threats that have resulted in the decline of this species throughout the study area. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Special Considerations. Blochman's dudleya appears to be susceptible to fires and disturbances associated with fire suppression. Therefore, effective conservation of this species must include a fire management plan that protects conserved populations from frequent or high-intensity fires, and from equipment associated with fire suppression activities (e.g., vehicles). Adequate preserve design for this species must also include sufficient habitat to support pollinators.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved area in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Table 4-13

**SUMMARY OF NET CONSERVATION FOR
BLOCHMAN'S DUDLEYA**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved
Carlsbad	174 (61%)	2 of 2 (75%)	None identified	75%
Encinitas	54 (52%)	None known	None known	None known
Escondido	7 (48%)	None known	None known	None known
Oceanside	62 (33%)	2 of 3 (50%)	50%	50%
San Marcos	5 (16%)	None known	None known	None known
Solana Beach	None present	None known	None known	None known
Vista	2 (45%)	None known	None known	None known
MHCP Total⁴	304 (49%)	3 of 5 (60%)	50%	63%

¹ Habitat for Blochman's dudleya includes coastal bluff scrub and coastal sage scrub, where it often occurs in rocky or clay soils.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting both suitable vegetation *and* soil types) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ Numbers may not total due to rounding.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for Blochman's dudleya. Conduct demographic and ecological research on Blochman's dudleya, and identify management requirements for this species. Specific studies might focus on reproductive and pollination biology, seed and pollen viability, germination requirements, specific habitat requirements, and management techniques for maintaining viable populations.

Short-leaved Dudleya

Dudleya blochmaniae ssp. *brevifolia*

USFWS: Federal Species of Concern (proposal for listing as endangered was withdrawn)

CDFG: Endangered

MHCP: Narrow Endemic

Conservation Goals

Maintain the potential for short-leaved dudleya to occur in the plan area by conserving potentially suitable habitat to allow for population expansion or natural recolonization.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat, adjacent habitat that supports pollinators, and unoccupied habitat that may support a persistent seed bank). Implement species-specific management actions as necessary to enhance or protect habitat quality. These may include surveys of potential habitat areas, prohibiting adverse activities within preserve areas, developing fire management guidelines, and enhancing declining populations (if present) and restoring damaged habitat.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, unless subarea plans adopt additional measures.

Rationale. The MHCP may contribute to the conservation of this species by conserving 72% of potentially suitable habitat within the study area. However, no point locations, critical locations, or major populations are known in the study area, and potentially suitable habitat in the study area is probably overestimated.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. At least five self-sustaining, distinct populations⁶ must be conserved within the species geographic range (including 100% of extant populations and the majority of all newly discovered, naturally occurring populations and artificially initiated populations) before any incidental take is allowed.
2. The MHCP Narrow Endemic Policy must be applied to any populations of this species, including those already known and any found in the future.

⁶ The five self-sustaining populations do not necessarily need to be within the MHCP study area, but do need to be situated within the known distributional range of this species and/or within suitable habitat (i.e., MSCP and MHCP study areas).

3. All conserved populations must be managed for genetic considerations as a metapopulation.
4. A fire management plan must be implemented for all conserved populations to protect them from frequent or high-intensity fires and fire suppression activities.
5. Declining populations must be enhanced, and damaged habitat restored, if determined necessary through monitoring. Enhancement may include introduction of plant materials to existing populations, while restoration may include site-specific habitat improvement activities. Unless analyses determine that there is no significant genetic variation between populations, introduced plant materials must be from the parental population or a population in proximity.
6. As part of the project review process (e.g., CEQA) for individual projects within the MHCP area, a qualified biologist must survey for this species in all potential habitat areas.
7. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

Self-sustaining populations are defined as those that retain genetic resources necessary to undergo adaptive evolutionary change (Guerrant 1996). Determination of a viable or self-sustaining population shall be assessed through long-term monitoring (e.g., 5 to 10 years) and shall include demographic measures (e.g., the number of individuals or viable seeds in a population is stable or increasing over time) and genetic measures (e.g., changes in overall genetic diversity as measured against a baseline genetic profile) (Primack 1996; Falk et al. 1996). Self-sustaining populations should contain a minimum of 500 individuals to reduce the risk of extinction from intrinsic or random events, unless research or monitoring indicates that higher or lower population numbers are appropriate for this species. In addition, self-sustaining populations should occur within blocks of natural habitat that are large enough (i.e., >50 acres) to support appropriate pollinators and buffer the conserved population from edge effects.

Background

Distribution, Abundance, and Trends. The entire distribution of this San Diego County endemic plant is approximately 2.5 miles wide by 7 miles long, in the area between Del Mar and La Jolla (Moran 1950). Historical occurrences include Torrey Pines, the rim of La Jolla Canyon, the mesa on the south side of McGonigle Canyon, the mesa east of Del Mar, Crest Canyon, and Carmel Mountain. The species has been extirpated from the mesa above La Jolla and Del Mar Heights Road, and some other populations may also be extirpated. This species is not known from the MHCP, but has some potential for occurrence based on the presence of suitable habitat (no known localities in database). Short-leaved dudleya is generally found on dry, sandstone bluffs in southern maritime chaparral. Known populations are confined to the red sandstone-capped areas of the Linda Vista Terrace, a distinctive, uncommon habitat marked by thin soils, reddish

ironstone concretions, and sparse vegetation (Moran 1950). This tiny plant resembles the small, hard concretions of its habitat.

No major populations of short-leaved dudleya occur in the MHCP study area, nor have any critical locations been identified to date for this taxon in the study area.

Threats and Limiting Factors. Threats to short-leaved dudleya include urbanization, edge effects, and vehicular traffic.

Special Considerations. Short-leaved dudleya is an herbaceous perennial. It is insect-pollinated (e.g., bees or bee flies, Wyatt 1983), and seeds are presumably self-dispersed. The level of survey effort for this species in the study area is considered relatively low. Short-leaved dudleya can be difficult to find when not in flower. In addition, much of the study area is beyond the known distributional limit of this species, so it may not have been adequately surveyed for in those areas.

Short-leaved dudleya is a “covered species” under the MSCP. As a result of protection afforded this taxon under the MSCP, the USFWS determined that threats to short-leaved dudleya have decreased since it was proposed for listing as endangered in 1993. As a result, the USFWS withdrew the proposal to list this species as threatened (USFWS 1996b).

Conservation Analysis

Conservation and Take Levels. Short-leaved dudleya is not currently known from the MHCP study area, although the species does occur to the south, in the MSCP study area (e.g., Del Mar, Carmel Mountain). An estimated 453 acres (72%) of potentially suitable habitat for this species will be conserved in the FPA (Table 4-14). In addition, 95 or 100% of any newly detected localities for this species would be conserved inside the FPA and a minimum 80% would be conserved outside the FPA through application of the narrow endemic policy. Additional conservation could occur through application of the critical location policy.

Preserve Configuration Issues. The proposed preserve design and avoidance policies will conserve an estimated 453 acres (72%) of potentially suitable habitat for this species in the FPA. This includes some larger blocks of intact habitat (e.g., Green Valley, Lux Canyon).

Effects on Population Viability and Species Recovery. Implementation of the MHCP may protect population viability for this species, if present in the study area, thereby contributing to species recovery. The MHCP will conserve 72% of potentially suitable habitat, while MHCP management practices will address threats that have resulted in the decline of this species throughout the study area. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Table 4-14

**SUMMARY OF CONSERVATION AND TAKE FOR
SHORT-LEAVED DUDLEYA**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved
Carlsbad	150 (63%)	None known	None known	None known
Encinitas	288 (84%)	None known	None known	None known
Escondido	None present	None present	None present	None present
Oceanside	None present	None present	None present	None present
San Marcos	None present	None present	None present	None present
Solana Beach	15 (34%)	None known	None known	None known
Vista	None Present	None present	None present	None present
MHCP Total ⁴	453 (72%)	None known	None known	None known

¹ Habitat for short-leaved dudleya includes sandstone substrates in southern maritime chaparral.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting suitable vegetation *and* soil types) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved. Note that not all conserved habitat will be suitable for this species due to microhabitat requirements.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ Numbers may not total due to rounding.

Special Considerations. Although short-leaved dudleya may have some adaptation to fire, it may be adversely affected by unnatural fire regimes (e.g., frequent fires, high-intensity fires resulting from fire suppression policies), particularly where they result in a type conversion of native habitat and/or invasion of habitat by nonnative weedy species. In addition, this species may be susceptible to soil surface disturbance. Therefore, effective conservation of short-leaved dudleya must include a fire management plan that protects conserved populations from frequent or high-intensity fires and from equipment associated with fire suppression activities (e.g., vehicles). Conserved populations should also be protected from trampling or other soil surface disturbance, and surveys for this species should be required for all potentially suitable habitat outside the FPA prior to development or other disturbance.

Adaptive Management Program

Not applicable.

Variegated Dudleya

Dudleya variegata

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: None

MHCP: Narrow Endemic

Conservation Goals

Maintain the potential for variegated dudleya to occur in the plan area by conserving potentially suitable habitat to allow for population expansion or natural recolonization.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat and adjacent habitat that supports pollinators). Implement species-specific management actions as necessary to enhance or protect habitat quality. These may include prohibiting adverse activities within preserve areas and enhancing declining populations (if present) and restoring damaged habitat.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, due to insufficient conservation.

Rationale. Current levels of conservation expected under the MHCP FPA and guidelines do not meet the conservation goals for this species. No known locations for this species occur in the study area, and only 49% of potentially suitable habitat will be conserved within the FPA. Most of the conserved habitat occurs on small, disjunct parcels, particularly in the southeast portion of the study area where this species has the highest potential for occurrence based on known distribution.

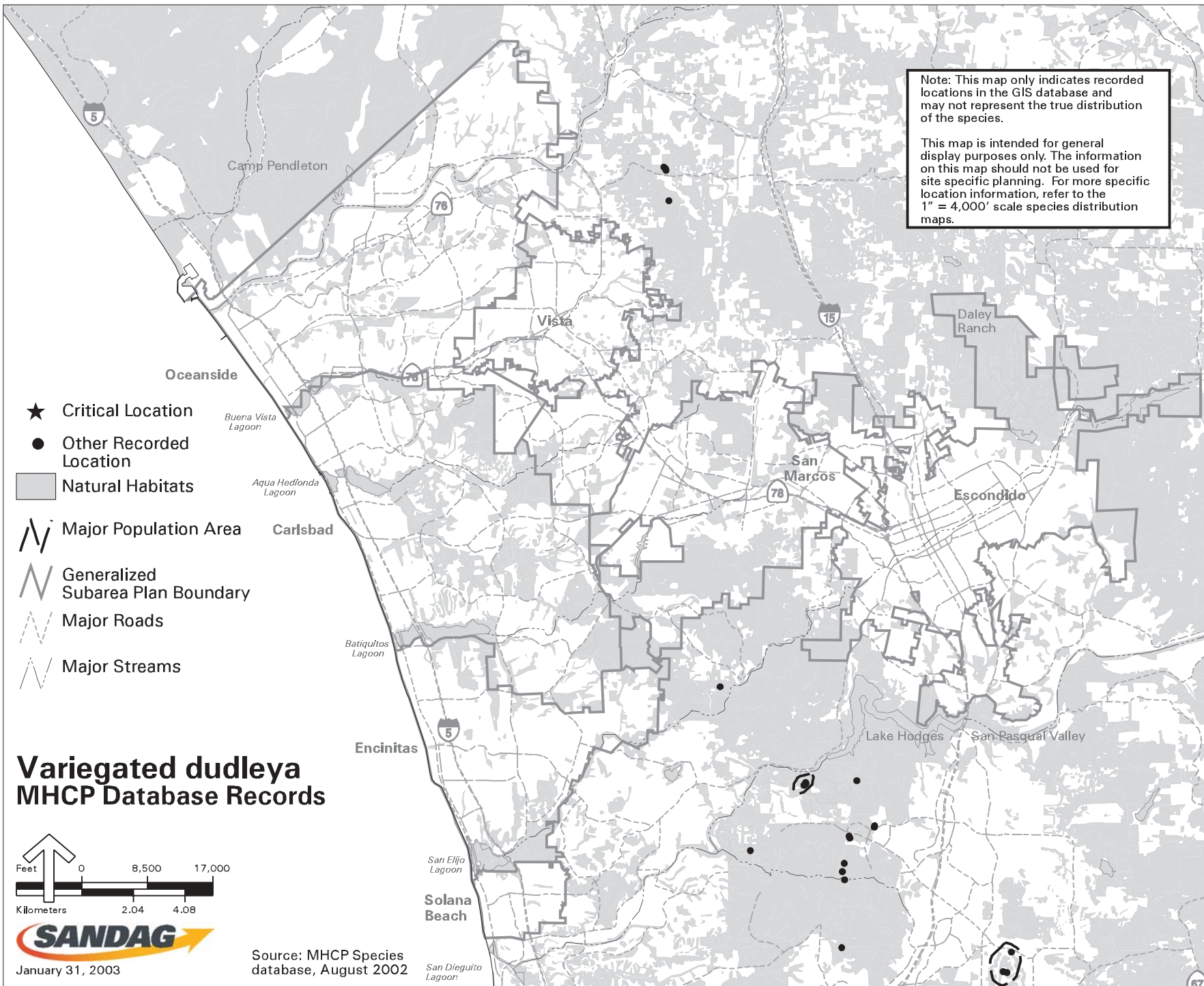
Conditions. Not applicable.

Background

Distribution, Abundance, and Trends. Variegated dudleya is restricted in distribution to southern San Diego County and Baja California, Mexico (Skinner and Pavlik 1994). In San Diego County, the species typically occurs away from the immediate coast, from the San Dieguito River Valley-Lake Hodges area and Poway south to the U.S.-Mexican border. Additional, important locations include Miramar Naval Air Station, San Miguel Mountain, Otay Mountain, Otay Mesa, and Dehesa. This species has not been reported from the MHCP, but has some potential for occurrence based on the presence of suitable habitat and known locations in proximity to the MHCP (see MHCP Database Records Map). Variegated dudleya is associated with clay soils in coastal sage scrub.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location

■ Natural Habitats

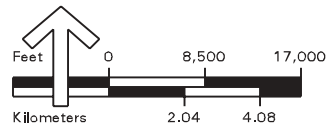
▭ Major Population Area

▭ Generalized Subarea Plan Boundary

— Major Roads

— Major Streams

Variegated dudleya MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Dieguito Lagoon

Within the MHCP, no major populations or critical locations have been identified for this species.

Threats and Limiting Factors. Threats to this species include development and livestock grazing.

Special Considerations. Variegated dudleya is an herbaceous perennial plant. It is insect-pollinated (e.g., bees, bee flies, Wyatt 1983), and seeds are presumably self-dispersed. The level of survey effort for this species in the study area is considered relatively low. Much of the study area is beyond the known distributional limit of variegated dudleya, so it may not have been adequately surveyed for in those areas.

Conservation Analysis

Conservation and Take Levels. Variegated dudleya is not currently known from the MHCP study area, although the species does occur to the east and southeast, in the MSCP study area (e.g., San Dieguito River Valley-Lake Hodges area, Poway). About 49% of potentially suitable habitat for this species will be conserved in the FPA (Table 4-15). Within the study area, 95 to 100% of any newly detected localities would be conserved inside the FPA and a minimum 80% would be conserved outside the FPA, based on the narrow endemic policy. Additional conservation may occur through application of the critical location policy.

Preserve Configuration Issues. The proposed preserve design will conserve an estimated 49% of potentially suitable habitat for this species inside the FPA. Most of this acreage occurs as small, fragmented blocks of habitat scattered throughout the study area.

Effects on Population Viability and Species Recovery. Implementation of the MHCP would protect populations of this species, if present in the study area. It is not certain, however, if protection and conservation alone would necessarily enhance population viability. The MHCP preserve design conserves about 304 acres of potentially suitable habitat, which is scattered throughout the study area in small, relatively isolated patches inside the FPA. Preserved populations would be subject to edge effects and, possibly, inbreeding depression. In addition, preserved habitat may or may not be sufficiently large to support appropriate pollinators.

Special Considerations. Variegated dudleya apparently requires insects for pollination. In addition, it may be susceptible to surface disturbances (e.g., vehicular traffic, trampling). Therefore, effective conservation of variegated dudleya must include adequately sized preserves to allow for appropriate pollinators and protection from trampling or other soil surface disturbance.

Adaptive Management Program

Not applicable.

Table 4-15**SUMMARY OF NET CONSERVATION FOR
VARIEGATED DUDLEYA**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved
Carlsbad	174 (61%)	None known	None known	None known
Encinitas	54 (52%)	None known	None known	None known
Escondido	7 (48%)	None known	None known	None known
Oceanside	62 (33%)	None known	None known	None known
San Marcos	5 (16%)	None known	None known	None known
Solana Beach	None present	None present	None present	None present
Vista	2 (45%)	None known	None known	None known
MHCP Total⁴	304 (49%)	None known	None known	None known

¹ Habitat for variegated dudleya includes clay soils in coastal sage scrub.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting suitable vegetation *and* soil types) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ Numbers may not total due to rounding.

Sticky Dudleya*Dudleya viscida***USFWS: Federal Species of Concern (former Category 2 candidate)****CDFG: None****MHCP: None****Conservation Goals**

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat of sticky dudleya.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat and adjacent habitat that supports pollinators). Implement species-specific management actions as necessary to enhance or protect habitat quality. These may include prohibiting adverse activities within preserve areas and developing fire management guidelines.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, unless subarea plans adopt additional measures.

Rationale. The MHCP will contribute to the conservation of this species within the area by conserving 66% of potential habitat, 74% of point locations (19 of 25 locations are within the FPA), and 74% of critical location and major population in Oceanside.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. The major population and critical location at the San Luis Rey River in Oceanside must be conserved at a level consistent with the critical location policy and managed as part of the preserve system.
2. Fire management plans must be implemented for all conserved populations to protect them from frequent and high-intensity fires and fire suppression activities. If determined necessary to maintain the population, develop fire management guidelines within conserved areas that limit fire frequency and emergency access.
3. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. Sticky dudleya occurs in Orange, Riverside, and San Diego counties (Skinner and Pavlik 1994). In San Diego County, the species occurs on Camp Pendleton (San Mateo Creek, Stuart Mesa, bluffs at the mouth of the Santa Margarita River), Oceanside, Carlsbad, Escondido Creek, San Dieguito River Valley, and Santa Fe Valley. The Oceanside and Carlsbad locations fall within the MHCP (see MHCP Database Records Map). Sticky dudleya is found on dry, rocky slopes or cliffs and is typically associated with coastal sage scrub or chaparral.

Within the MHCP study area, major populations of this species occur in Oceanside (mouth of the San Luis Rey River) and Carlsbad (San Marcos Creek). Both populations are considered critical locations. The San Marcos Creek population occurs on an already permitted property (Fieldstone HCP property), and is not included in this analysis; however, this population is being entirely conserved.

Threats and Limiting Factors. The primary threats to this species are road construction (e.g., road widening), development, and associated edge effects.

Special Considerations. Sticky dudleya is an herbaceous perennial plant. It is insect-pollinated (e.g., bees, bee flies, Wyatt 1983), and seeds are presumably self-dispersed. This species may be susceptible to fires. The level of survey effort for this species in the study area is considered relatively high.

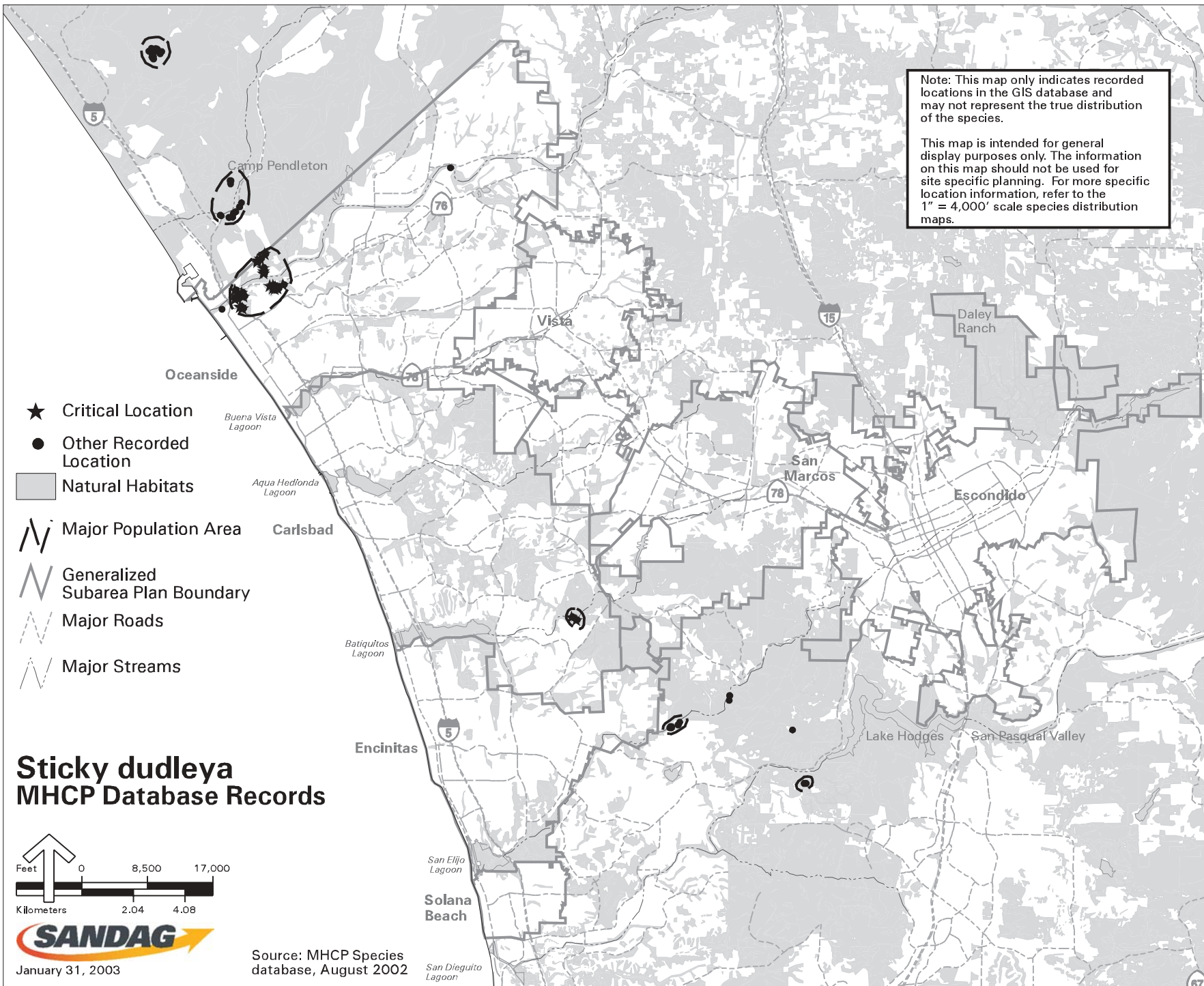
Conservation Analysis

Conservation and Take Levels. The expected level of take of known locations of sticky dudleya is relatively low (Table 4-16). It is thought that this species has been well surveyed for in the study area. The majority of points (74%) falls within the current FPA, where they will be conserved at 100% in hardline areas or according to mitigation ratios in softline areas. An estimated 74% of the San Luis Rey River major population (Oceanside) will be conserved according to the current FPA design; additional conservation must occur outside the FPA through application of the critical location policy. The San Marcos Creek population (Carlsbad) was not considered in this analysis because it occurs within an already permitted property (i.e., the Fieldstone HCP property), although it is entirely conserved.

In addition to conserved point localities, an estimated 11,140 acres (66%) of potentially suitable habitat will be conserved as a result of the existing preserve design and preserve policies (Table 4-16). Sticky dudleya appears to have microhabitat requirements (e.g., cliffs, rocky slopes) beyond simply habitat affinity, so only a portion of the estimated acreage would actually be expected to support this species.

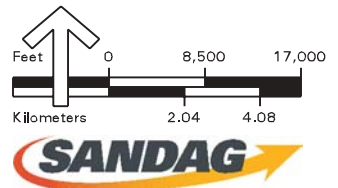
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- ▭ Major Population Area
- ▭ Generalized Subarea Plan Boundary
- ▭ Major Roads
- ▭ Major Streams

Sticky dudleya MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Diego County

Table 4-16

**SUMMARY OF NET CONSERVATION FOR
STICKY DUDLEYA**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved	Other Considerations
Carlsbad	1,792 (69%)	None known	None known	None known	San Marcos Creek population occurs in an already permitted property
Encinitas	789 (68%)	None known	None known	None known	–
Escondido	5,352 (76%)	None known	None known	None known	–
Oceanside	713 (52%)	19 of 25 (74%)	74%	74%	–
San Marcos	2,164 (51%)	None known	None known	None known	–
Solana Beach	14 (39%)	None known	None known	None known	–
Vista	317 (58%)	None known	None known	None known	–
MHCP Total ⁴	11,140 (66%)	19 of 25 (74%)	74%	74%	–

¹ Habitat for sticky dudleya is coastal sage scrub or chaparral.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting suitable vegetation) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ Numbers may not total due to rounding.

Preserve Configuration Issues. The proposed preserve design conserves the majority of the major population and critical location of sticky dudleya in the analysis area. A large portion of the population occurs in a relatively large block of habitat (>250 acres) adjacent to and north of the San Luis Rey River and is in proximity to populations of sticky dudleya on Camp Pendleton. Based on size and the presence of several habitat types, conserved habitat is expected to support appropriate pollinators. The conserved population will be subject to edge effects, particularly south of the San Luis Rey River where conserved habitat is adjacent to development.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species and therefore contribute to species recovery. The MHCP preserve design conserves the majority of the major population and critical location in the analysis area, and additional conservation of this population may occur through application of the critical location policy. MHCP management practices will address threats that have resulted in the decline of this species throughout the study area. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Special Considerations. Sticky dudleya appears to be susceptible to fires and disturbances associated with fire suppression. Therefore, effective conservation of this species must include a fire management plan that protects conserved populations from frequent or high-intensity fires, and from equipment associated with fire suppression activities (e.g., vehicles). Adequate preserve design for this species must also include sufficient habitat to support pollinators.

Adaptive Management Program

If a subarea meets all required conditions and receives coverage for this species, it will be managed and monitored in conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for sticky dudleya. Conduct demographic and ecological research on sticky dudleya, and identify management requirements for this species. Specific studies might focus on reproductive and pollination biology, seed and pollen viability, and management techniques for maintaining viable populations.

San Diego Button-celery*Eryngium aristulatum* var. *parishii***USFWS: Endangered****CDFG: Endangered****MHCP: Narrow Endemic, Wetland Obligate****Conservation Goals**

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat (including vernal pool watersheds) of San Diego button-celery.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat, adjacent habitat that supports pollinators and seed dispersal agents, and vernal pool watersheds). Implement species-specific management actions as necessary to enhance or protect habitat quality and increase population size. These may include prohibiting adverse activities within preserve areas and within the watersheds of vernal pools, regulating toxic substances near vernal pools, controlling nonnative competitive species, and restoring damaged habitat.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, unless subarea plans adopt additional measures. Any city that demonstrates it is achieving the conditions listed below could request take authorization for this species, but such authorization could be revoked in the future, depending on conservation levels achieved in the San Marcos critical location, including those portions inside as well as outside of the Major Amendment Area.

Rationale. The MHCP will contribute to the conservation of this species within the area by conserving 96% of point locations (14 of 17 locations are within the FPA) and 93% of the critical locations and major populations in the study area. The Carlsbad major population and critical location at Poinsettia Lane will be conserved at 100%. The portion of the San Marcos major population and critical location within the study area will be conserved at 85%, but over 75% of this population occurs in the San Marcos Major Amendment Area and is not addressed in this plan.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. The major population and critical location of San Diego button-celery in San Marcos must be conserved at a level consistent with the critical location policy and managed as part of the preserve system. Depending on resolution of

- conservation for this species in the San Marcos Major Amendment Area, permits for this species take could be revoked in the future.
2. The MHCP Narrow Endemic Policy must be applied to any populations of this species, including those already known and any found in the future.
 3. All conserved populations must be adequately managed to control edge effects and avoid adverse changes to vernal pools and their watersheds. Stabilize preserved populations by removing impacts or potential impacts, and excluding adverse activities within preserve areas and within the watersheds of vernal pools (e.g., trampling, vehicular or recreational traffic, illegal dumping, invasive exotic plants, water pollution, alteration of hydrology, and collecting). Regulate the use of toxic substances (e.g., herbicides, pesticides) and control nonnative competitive species in the vicinity of vernal pools.
 4. Declining populations must be enhanced, and damaged habitat restored, if determined necessary through monitoring. Enhancement may include introduction of plant materials to existing populations, while restoration may include site-specific habitat improvement activities. Unless analyses determine that there is no significant genetic variation between populations, introduced plant materials must be from the parental population or a population in proximity.
 5. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. San Diego button-celery is found in Riverside and San Diego counties, and in Baja California, Mexico (Skinner and Pavlik 1994). In San Diego County, the species is found on Camp Pendleton, Carlsbad, San Marcos, Miramar Naval Air Station, Clairemont Mesa, and Otay Mesa (Beauchamp 1986; USFWS 1993a; Ogden 1998). This species occurs in clay soils in vernal pools or grasslands.

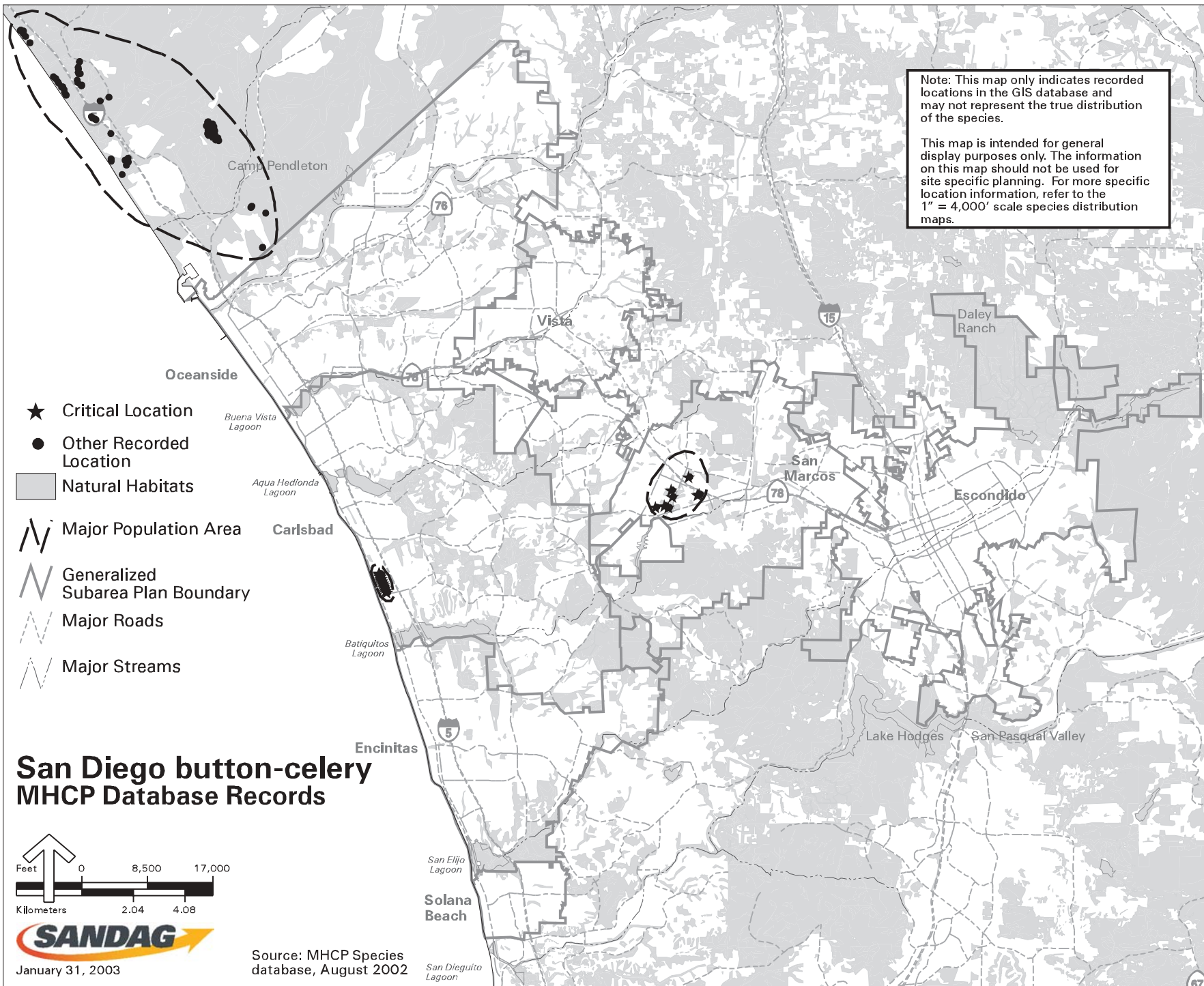
Within the MHCP, major populations of San Diego button-celery are found in Carlsbad (Poinsettia Lane) and San Marcos (see MHCP Database Records Map). Both populations are considered critical locations.

Threats and Limiting Factors. Threats to San Diego button-celery include agriculture, urbanization, road maintenance, vehicular traffic, foot traffic, and edge effects.

Special Considerations. San Diego button-celery is a prostrate biennial or perennial herbaceous plant. It reproduces by outcrossing and is presumably insect-pollinated. Seeds are self- and, possibly, animal-dispersed (Zedler 1987). The level of survey effort for this species in the study area is considered relatively high.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



Conservation Analysis

Conservation and Take Levels. The expected level of take of known locations of San Diego button-celery is relatively low (Table 4-17). The majority of points falls within the FPA and will be conserved at a level of 100%. Points that fall outside the FPA will be conserved at a minimum 80% level based on the narrow endemic policy. Additional conservation may occur through application of the critical location policy.

Overall, 93% of major populations and critical locations in the analysis area will be conserved under the current FPA design. The Poinsettia Lane population (Carlsbad) will be conserved at a 100% level, while that portion of the San Marcos population that falls within the analysis area is currently proposed to be conserved at a minimum level of 85%. This population must be 100% conserved under the permit conditions. The remaining point localities in the San Marcos population, which comprise 75% of the total point localities in the population, lie within a Major Amendment Area and were not considered in the analysis of conservation and take levels.

Although the level of habitat conservation for this species is relatively low, as depicted in Table 4-17, this acreage includes all grassland habitats, whereas San Diego button-celery is restricted to the most mesic areas within grasslands. In addition, all mapped vernal pools are conserved under this plan. This species has been well surveyed for in the study area.

Preserve Configuration Issues. Populations of San Diego button-celery occur in the MHCP study area only in Carlsbad and San Marcos. Although the Carlsbad population is conserved in its entirety, it occurs in a narrow, linear strip of habitat that is bordered by the Poinsettia Train Station on one side and a road on the other side. In this case, habitat fragmentation has resulted in the vernal pool complex being separated from surrounding native vegetation or (more appropriately) areas restorable to native vegetation. As a consequence, the Carlsbad pools may not support appropriate pollinators or seed dispersal agents. The existing hydrology appears adequate to support a viable vernal pool resource, as indicated by robust populations of several sensitive vernal pool species. It will be important to maintain the current hydrological regime to ensure that habitat becomes neither too dry (i.e., allowing invasion of the pool by grasses) nor too wet (i.e., allowing invasion of the pool by freshwater marsh species). This will entail preserving the watershed necessary to support these pools, as measured by topography and soils. Finally, because of its shape (i.e., high edge-to-area ratio) and adjacent land uses, this population is highly susceptible to edge effects (e.g., invasion of nonnative plants).

A watershed analysis was recently conducted on the parcel adjacent to the Poinsettia Lane vernal pools. This analysis was initiated because of the potential for proposed development to impact the vernal pool watershed. Results of this analysis found that the Poinsettia Lane vernal pools and immediately surrounding habitat are restricted to Huerhuero loam soils, and that these soils extend only slightly into the adjacent property (e.g., typically about 25 feet) (H. Wier pers. comm.). Huerhuero soils are moderately

Table 4-17

**SUMMARY OF NET CONSERVATION FOR
SAN DIEGO BUTTON-CELERY**

City	Habitat Acreage Conserved ^{1,2}	Location Points Conserved ³	Major Populations Conserved	Critical Locations Conserved	Other Considerations
Carlsbad	171 (40%)	13 of 13 (100%)	100%	100%	–
Encinitas	10 (19%)	None known	None known	None known	–
Escondido	None present	None present	None present	None present	–
Oceanside	110 (27%)	None known	None known	None known	–
San Marcos	19 (11%)	3 of 4 (85%)	85% ⁴	85% ⁴	75% of San Marcos population occurs in a Major Amendment Area
Solana Beach	None present	None present	None present	None present	–
Vista	3 (3%)	None present	None present	None present	–
MHCP Total ⁵	313 (27%)	16 of 17 (96%)	93%	93%	–

¹ Habitat for San Diego button-celery includes clay soils in grasslands and vernal pools.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting suitable vegetation *and* soil types) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved. Note that not all conserved habitat will be suitable for this species due to topography, hydrology, or other site factors.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ Includes only the portion of the San Marcos population (2 point localities) that occurs within the San Marcos city limits *and* within the analysis area.

⁵ Numbers may not total due to rounding.

well drained loams with a clay subsoil that developed in sandy marine sediments. In undisturbed situations, they can support mima mounds (USDA-SCS 1973). The Huerhuero soils are replaced on the adjacent property by Marina loamy coarse sand (H. Wier pers. comm.). Marina soils are excessively drained, deep loamy coarse sands that are characterized by rapid permeability (USDA-SCS 1973). These soils do not have a clay subsoil and are not expected to be important in maintaining pool hydrology because of their rapid permeability. The development proposal on this adjacent property includes a setback of 100 feet, which will be entirely on the Marina loamy coarse sands (H. Wier pers. comm.).

The portion of the San Marcos population included in this analysis occurs on a relatively small parcel that is surrounded largely by development. This population is part of the San Marcos vernal pool complex and is in proximity to other vernal pools and stands of San Diego button-celery within the complex. Despite the fragmented nature of the San Marcos vernal pool complex, it currently contains at least some of its original watershed and adjacent upland habitat, which may support some of the animal fauna necessary for the persistence of San Diego button-celery (e.g., pollinators, dispersers). The preserved population will be subject to edge effects.

Genetic consequences are a concern in preserve design for vernal pool species. Although gene flow between vernal pool complexes appears to be low (Fugate 1993, in USFWS 1998a; Davies 1996, in USFWS 1998a), flooding between pools within a complex is an important means of augmenting gene flow in populations already naturally low in variability (Davies 1996, in USFWS 1998a). Disruptions of the watershed that compromise gene exchange within a complex may result in a loss of genetic variability and an increased risk of extinction (Soulé 1986). From a genetic perspective, conservation of San Diego button-celery within the Poinsettia Lane complex will require maintenance of the hydrological flow between pools. It should be recognized, however, that the existing variability might be too low to prevent adverse genetic consequences (e.g., inbreeding depression). The San Marcos complex occupies a larger area, which includes at least a portion of the watershed surrounding extant pools. Although only a small area of that complex is included in this analysis, effective conservation for this species will require connectivity to the larger watershed. In addition, conservation of additional vernal pools and watershed in this area will (1) increase the probability that propagules will be available for recolonization in the event of localized species extirpations and (2) provide potentially restorable vernal pool habitat.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species, and therefore contribute to species recovery. The MHCP preserve design and avoidance policies conserve the majority of known point localities (including major populations and critical locations) in the analysis area, while MHCP management practices will address threats that have resulted in the decline of this species throughout the study area. Management of both edge effects and the hydrological regimes of conserved pools will

be a critical component of maintaining or enhancing population viability. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Special Considerations. San Diego button-celery relies on animal vectors for pollination and, possibly, seed dispersal. In addition, plants have specific hydrological requirements. Therefore, effective conservation of this species must include sufficient habitat to maintain an appropriate fauna and must manage the vernal pool watershed in a manner that maintains both the hydrological regime and water quality.

Adaptive Management Program

If a subarea meets all required conditions and receives coverage for this species, it will be managed and monitored in conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

As part of the recovery plan for vernal pools, the USFWS (1998) has proposed a number of management actions that may benefit this species. These include reestablishing vernal pool habitat, rehabilitating and enhancing vernal pools and their constituent species, managing and monitoring protected habitat, and research to investigate biological factors affecting recovery (USFWS 1998d). The recovery plan also recognizes that the conservation potential for the Carlsbad pools at Poinsettia Lane is limited to management activities, whereas the conservation potential in San Marcos may include restoration and enhancement activities (USFWS 1998d). Management actions for San Diego button-celery within the MHCP should coordinate with existing programs (e.g., MSCP, USFWS recovery efforts) to ensure compatibility of monitoring results and prevent duplication of efforts.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for San Diego button-celery. Conduct demographic and ecological research on San Diego button-celery, and identify management requirements for this species. Specific studies might focus on reproductive and pollination biology, seed dispersal strategies, and management techniques for maintaining viable populations.

Cliff Spurge*Euphorbia misera***USFWS: None****CDFG: None****MHCP: None****Conservation Goals**

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat of cliff spurge.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat and adjacent habitat that supports pollinators). Implement species-specific management actions as necessary to enhance or protect habitat quality. These may include prohibiting adverse activities within preserve areas and developing fire management guidelines.

Coverage Determination and Permit Conditions

Coverage Determination. Covered.

Rationale. The MHCP will adequately conserve this species by conserving 69% of potential habitat and 100% of the one known point location in the study area.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. Fire management plans must be implemented for all conserved populations to protect them from frequent and high-intensity fires and fire suppression activities. If determined necessary to maintain the population, develop fire management guidelines within conserved areas that limit fire frequency and emergency access.
2. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. Cliff spurge is found in Orange, Riverside, and San Diego counties; on San Clemente and Santa Catalina islands in Los Angeles County; and on the mainland and Isla Guadalupe in Baja California, Mexico (Skinner and Pavlik 1994). In San Diego County, this species is known from Carlsbad, Point Loma, San Diego, Sweetwater Valley, and Otay Mesa. It also occurs across the border in the Tijuana Hills (Beauchamp 1986). The only reported location for this species in the

MHCP study area is in Carlsbad (see MHCP Database Records Map). The species is apparently more common north and south of the MHCP. Cliff spurge is found on rocky slopes and coastal bluffs in coastal scrub (e.g., coastal bluff scrub, maritime succulent scrub, coastal sage scrub). No major populations or critical locations have been identified for this species within the MHCP study area.

Threats and Limiting Factors. The primary threat to this species is development. Associated edge effects may also impact extant populations.

Special Considerations. Cliff spurge is a shrub (stem succulent) that presumably is not particularly well adapted to fire because of its succulence. It is insect-pollinated (Crepet 1983) and seeds are presumably self-dispersed. The level of survey effort for this species in the study area is considered relatively high.

Conservation Analysis

Conservation and Take Levels. The only known point location in the study area falls within the FPA and will be conserved at a 100% level (Table 4-18). No major populations or critical locations were identified for this species in the study area. There may be take of up to 31% of potential habitat.

In addition to conserved point localities, an estimated 1,183 acres (69%) of potentially suitable habitat will be conserved as a result of the existing preserve design and preserve policies (Table 4-18). This includes 29 acres (90%) of maritime succulent scrub.

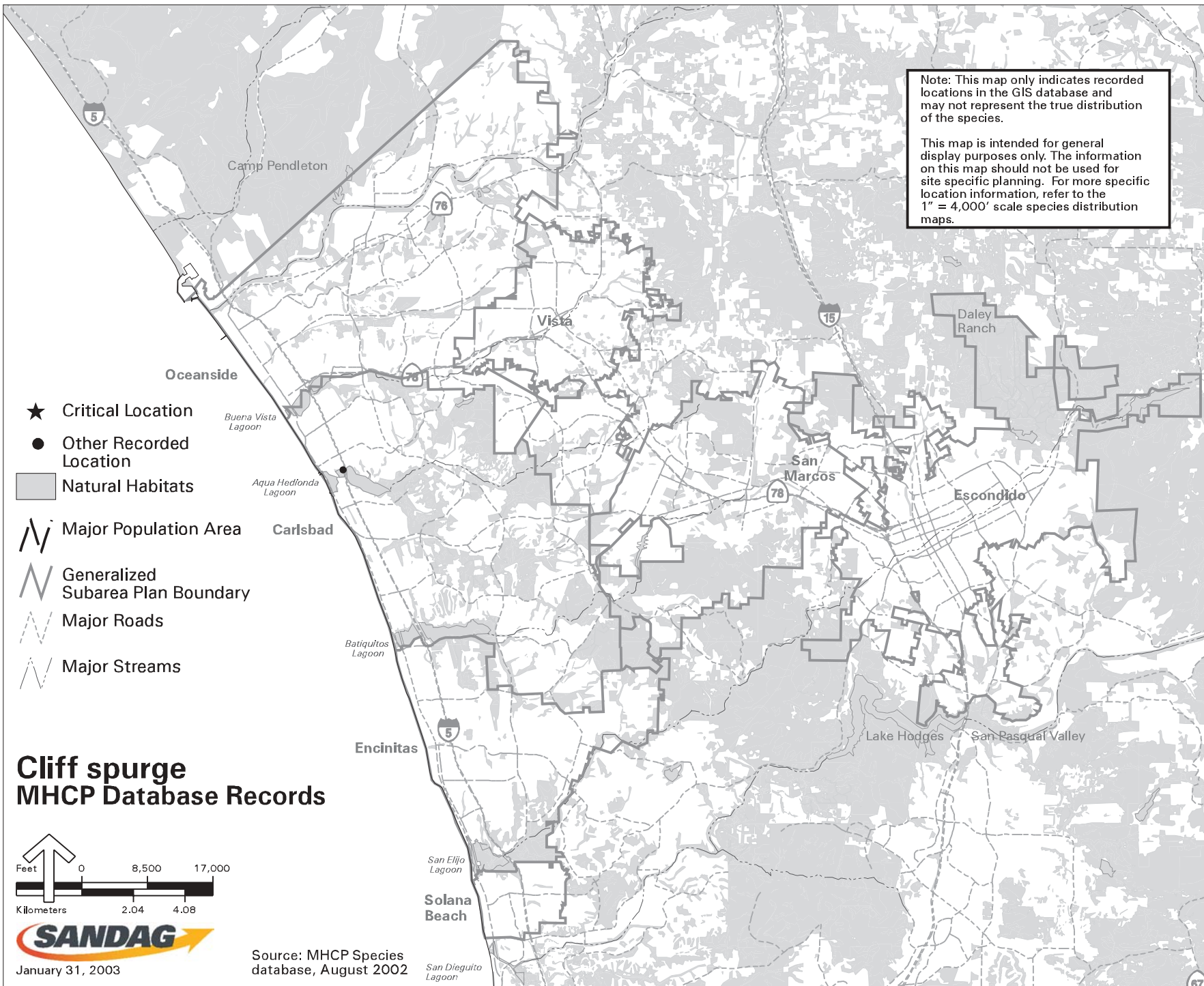
Preserve Configuration Issues. Cliff spurge is known from one location within the MHCP study area, and the proposed preserve design conserves this population in its entirety. This population occurs in a relatively small stand of habitat (<5 acres) adjacent to Aqua Hedionda Lagoon. It is not known whether conserved habitat is sufficiently large to support pollinators for this species. This habitat is likely subject to edge effects.

The MHCP study area does not appear to support any major populations of this species, nor do historical records indicate that this species was common in the study area in the past. The MHCP study area does, however, provide a continuum for this species between important populations to the south (e.g., Point Loma) and to the north (Dana Point, Corona del Mar), and the existing preserve design appears to maintain that connection relative to existing conditions.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species and therefore contribute to species recovery. The MHCP preserve design and avoidance policies conserve the only known location of cliff spurge in the study area, as well as additional, potentially suitable habitat. MHCP management practices will address threats that have resulted in the decline of this species throughout the study area. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



★ Critical Location

● Other Recorded Location

■ Natural Habitats

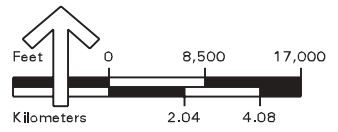
▮ Major Population Area

▮ Generalized Subarea Plan Boundary

▬ Major Roads

▬ Major Streams

Cliff spurge MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Dieguito Lagoon

Solana Beach

San Elijo Lagoon

Encinitas

Batiquitos Lagoon

Carlsbad

Aqua Hedfonda Lagoon

Buena Vista Lagoon

Oceanside

Camp Pendleton

Vista

San Marcos

Escondido

Daley Ranch

Lake Hodges

San Pasqual Valley

Table 4-18
SUMMARY OF NET CONSERVATION FOR
CLIFF SPURGE

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved
Carlsbad	434 (71%)	1 of 1 (100%)	None identified	None identified
Encinitas	279 (77%)	None known	None known	None known
Escondido	None present	None present	None present	None present
Oceanside	463 (64%)	None known	None known	None known
San Marcos	0 (0%)	None known	None known	None known
Solana Beach	6 (49%)	None known	None known	None known
Vista	1 (8%)	None known	None known	None known
MHCP Total⁴	1,183 (69%)	1 of 1 (100%)	None known	None known

¹ Habitat for cliff spurge includes coastal scrubs (coastal bluff scrub, maritime succulent scrub, and coastal sage scrub). For coastal sage scrub, only that habitat occurring on sandstone substrates was included in these calculations; 18 acres (95%) of maritime succulent scrub will be conserved.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting both suitable vegetation *and* soil types) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ Numbers may not total due to rounding.

Special Considerations. Cliff spurge is a stem succulent species that may be susceptible to fires. Therefore, effective conservation of this species must include a fire management plan that protects conserved populations from frequent or high-intensity fires. Adequate preserve design for this species must also include sufficient habitat to support pollinators.

Adaptive Management Program

If a subarea meets all required conditions and receives coverage for this species, it will be managed and monitored in conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for cliff spurge. Conduct demographic and ecological research on cliff spurge, and identify management requirements for this species. Specific studies might focus on reproductive and pollination biology, specific habitat requirements, and management techniques for maintaining viable populations.

San Diego Barrel Cactus

Ferocactus viridescens

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: None

MHCP: None

Conservation Goals

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat of San Diego barrel cactus.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat and adjacent habitat that supports pollinators and seed dispersal agents). Implement species-specific management actions as necessary to enhance or protect habitat quality. These may include prohibiting adverse activities within preserve areas and developing fire management guidelines.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP will adequately conserve this species by conserving 62% of potential habitat, 88% of point locations (28 of 32 locations are within the FPA), and 86% of the critical location and major population in Encinitas.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. The major population and critical location at Lux Canyon in Encinitas must be conserved at a level consistent with the critical location policy and managed as part of the preserve system.
2. Fire management plans must be implemented for all conserved populations to protect them from frequent or high-intensity fires and fire suppression activities. If determined necessary to maintain the population, develop fire management guidelines within conserved areas that limit fire frequency and emergency access.
3. As part of the project review process (e.g., CEQA) for individual projects within the MHCP area, a qualified biologist must survey for this species in all potential habitat areas. Newly found populations or individuals shall be avoided by the project to the maximum extent feasible, and any individuals that cannot be avoided shall be salvaged and transplanted to a suitable preserve area.

4. All species-specific monitoring and monitoring identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. San Diego barrel cactus is restricted to San Diego County and Baja California, Mexico (Skinner and Pavlik 1994). In San Diego County, this species occurs along the coastal slope from Oceanside south to the U.S.-Mexican border. Although the species was formerly widespread within its San Diego range, it now persists in numerous, fragmented populations. Approximately eight major populations of this species were identified in the MSCP study area; only two major populations have been documented in the MHCP study area. Within the MHCP, the species occurs in Encinitas and Oceanside (although the MHCP database has no point locations in Oceanside, the approximate distribution of the population is displayed on the distribution map). San Diego barrel cactus is primarily associated with coastal sage scrub, although it has also been documented in chaparral and grassland habitats.

Within the MHCP, major populations of this species occur in Oceanside (north bank of the San Luis Rey River) and Encinitas (Lux Canyon) (see MHCP Database Records Map). Both populations are considered critical locations.

Threats and Limiting Factors. The primary threats to this species are urbanization, off-road vehicular traffic, horticultural collecting, and edge effects.

Special Considerations. San Diego barrel cactus is a perennial plant (stem succulent) that presumably is not particularly well adapted to fire because of its succulence. It is insect-pollinated. It has a fleshy fruit, and seeds are presumably self-dispersed. The level of survey effort for this species in the study area is considered relatively high.

Conservation Analysis

Conservation and Take Levels. The expected level of take of known locations of San Diego barrel cactus is relatively low (Table 4-19). The majority of points in the database (88%; does not include Oceanside population) falls within the FPA, where they will be conserved at a level of 100% in hardline areas and at the FPA percentage (or mitigation ratio) in softline areas. Additional conservation may occur through application of the critical location policy.

Of the two major populations (both are critical locations) of this species that were identified in the study area, an estimated 86% of the population at Lux Canyon (Encinitas) is proposed to be conserved under the current FPA design. All of this location must be conserved under the permit conditions. The other population occurs along the north bank of the San Luis Rey River (Oceanside). It is estimated that over 150 acres of potential habitat will be conserved in the FPA along the north bank of the San Luis Rey River. Most of this habitat occurs in a relatively contiguous stand and comprises the majority of suitable habitat in this area.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.

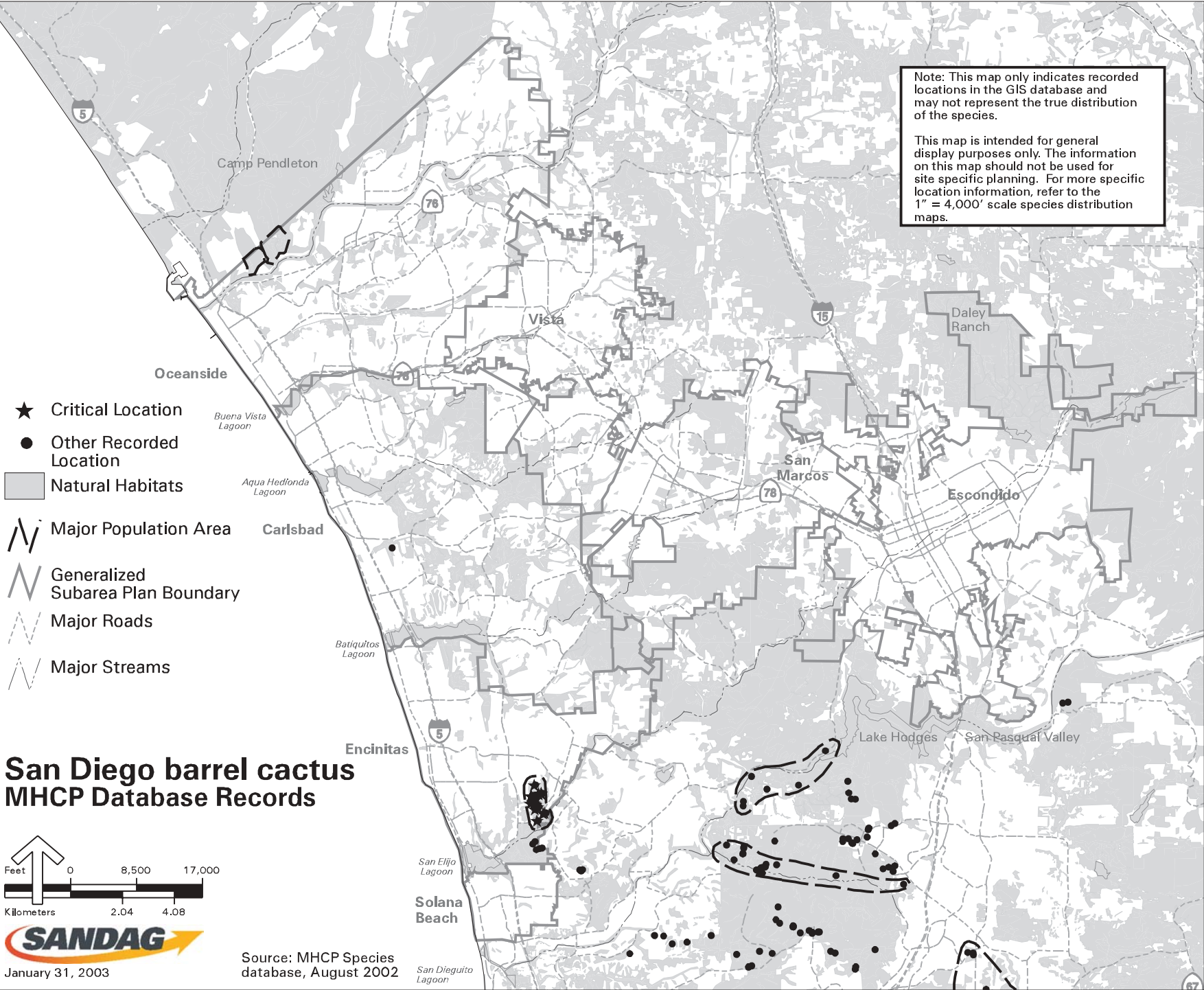


Table 4-19

**SUMMARY OF NET CONSERVATION FOR
SAN DIEGO BARREL CACTUS**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved
Carlsbad	1,366 (69%)	1 of 1 (100%)	None identified	None identified
Encinitas	631 (67%)	27 of 31 (87%)	86%	86%
Escondido	1,533 (68%)	None known	None identified	None identified
Oceanside	692 (52%)	None in database	San Luis Rey River population is substantially conserved	Unknown
San Marcos	971 (52%)	None known	None known	None known
Solana Beach	6 (53%)	None known	None known	None known
Vista	136 (54%)	None known	None known	None known
MHCP Total⁴	5,334 (62%)	28 of 32 (88%)	86%⁵	86%⁵

¹ Habitat for San Diego barrel cactus is primarily coastal sage scrub. Although it can be occasionally found in chaparral and grassland, those habitats were not considered in the estimation of potentially suitable habitat conserved for this species.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting suitable vegetation) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ Numbers may not total due to rounding.

⁵ Percentages do not include the Oceanside population.

In addition to point localities, an estimated 5,334 acres (62%) of potentially suitable habitat will be conserved throughout the MHCP as a result of the existing preserve design and preserve policies (Table 4-19). No conservation is assumed outside the FPA.

Preserve Configuration Issues. The proposed preserve design and avoidance policies conserve the majority of point localities, major populations, and critical locations in a configuration that will not adversely affect the potential exchange of genetic material between populations, relative to existing conditions. Both major populations (Oceanside, Encinitas) occur within relatively large blocks of habitat (>50 acres) that may support appropriate pollinators. Both populations are subject to edge effects.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species and therefore contribute to species recovery. The MHCP preserve design and avoidance policies conserve the majority of known locations, while MHCP management practices will address threats that have resulted in the decline of this species throughout the study area. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Special Considerations. San Diego barrel cactus appears to be susceptible to fires. Therefore, effective conservation of this species must include a fire management plan that protects conserved populations from frequent or high-intensity fires. Adequate preserve design for this species must also include sufficient habitat to support pollinators.

Adaptive Management Program

If a subarea meets all required conditions and receives coverage for this species, it will be managed and monitored in conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for San Diego barrel cactus. Conduct demographic and ecological research on San Diego barrel cactus, and identify management requirements for this species. Specific studies might focus on reproductive and pollination biology, seed dispersal strategies, specific habitat requirements, and management techniques for maintaining viable populations.

Orcutt's Hazardia*Hazardia orcuttii***USFWS: Federal Species of Concern (former Category 2 Candidate)****CDFG: None****MHCP: Narrow Endemic****Conservation Goals**

Promote species persistence within the plan area by conserving major populations, critical locations, and required habitat of Orcutt's hazardia.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat and adjacent habitat that supports pollinators and seed dispersal agents). Implement species-specific management actions as necessary to enhance or protect habitat quality and increase population size. These may include prohibiting adverse activities within preserve areas, developing fire management guidelines, and enhancing declining populations and restoring damaged habitat.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP will adequately conserve this species by conserving 66% of potential habitat, 97% of point locations (5 of 6 locations are within the FPA), and 97% of the critical location and major population in Encinitas. The MHCP Narrow Endemic Policy is expected to protect any additional populations found in the future.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. The MHCP Narrow Endemic Policy must be applied to any populations of this species, including those already known and any found in the future.
2. Fire management plans must be implemented for all conserved populations to promote biological goals (e.g., regeneration) while protecting individual plants and habitat from frequent or high-intensity fires and fire suppression activities. Develop fire management guidelines within conserved areas that incorporate controlled burns (or other fuel reduction methods in urban areas), while limiting fire frequency and emergency access.
3. Declining populations must be enhanced, and damaged habitat restored, if determined necessary through monitoring. Enhancement may include introduction of plant materials to existing populations, while restoration may

- include site-specific habitat improvement activities. Unless analyses determine that there is no significant genetic variation between populations, introduced plant materials must be from the parental population or a population in proximity.
4. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. Orcutt's hazardia is known only from San Diego County and Baja California, Mexico (Skinner and Pavlik 1994). It is locally common in open habitats along the coastal plains and hills from Colonet to Tijuana in Baja California (Clark 1979). In the United States, however, this species is known only from Lux Canyon in Encinitas (Oberbauer 1981), where it occurs in association with chaparral and coastal sage scrub (see MHCP Database Records Map). The Encinitas population of Orcutt's hazardia is considered both a major population and critical location for this species.

Threats and Limiting Factors. Threats to this species include urbanization and associated edge effects. Habitat fragmentation may also threaten this species in the United States.

Special Considerations. Orcutt's hazardia is a shrub that is presumably fire-adapted, although the fire response mechanism is unknown. Flowers are insect-pollinated and seeds are presumably animal-dispersed. The level of survey effort for this species in the study area is considered relatively high, particularly in coastal locations.

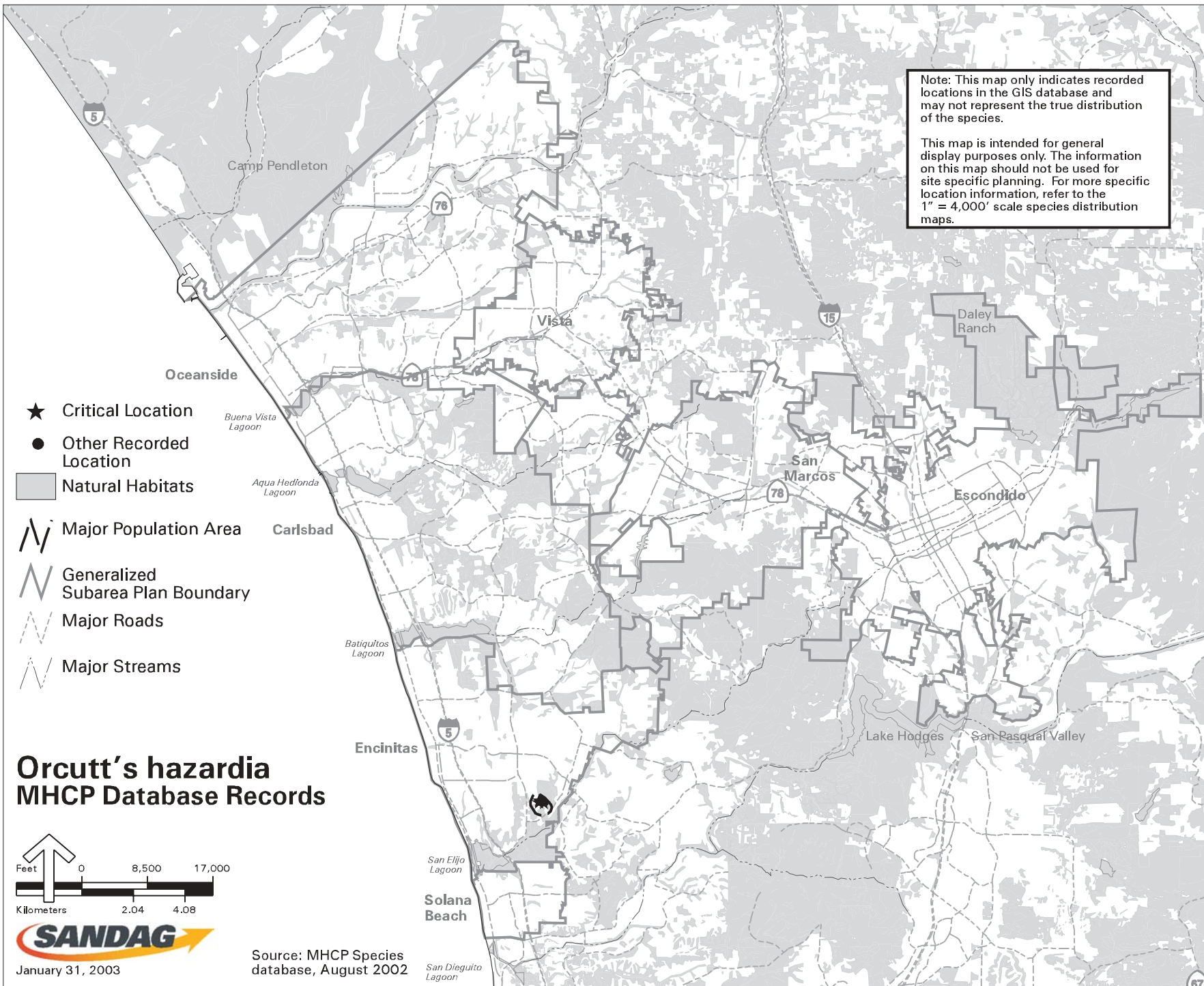
Conservation Analysis

Conservation and Take Levels. The expected level of take of known populations of Orcutt's hazardia is relatively low (Table 4-20). The majority of points falls within the FPA and will be conserved at levels of 100%. Points that fall outside the FPA will be conserved at a minimum 80% level based on the narrow endemic policy. The Lux Canyon population of Orcutt's hazardia, which is the only major population and critical location of this species identified in the study area, will be conserved at a level of 97%.

In addition to conserved point localities, an estimated 11,889 acres (66%) of potentially suitable habitat will be conserved in the FPA as a result of the existing preserve design and preserve policies (Table 4-20). It should be noted that this acreage is almost certainly an overestimation, because it includes all conserved chaparral and coastal sage scrub in the FPA. Although specific habitat affinities have not been determined for this species, its present and historical range suggests a relatively coastal distribution. When only habitat within coastal communities (Oceanside, Carlsbad, Encinitas, and Solana Beach) is considered, an estimated 4,056 acres (66%) of potentially suitable habitat will be conserved. Including habitat only from Encinitas (site of the one known population) and its two adjacent cities, Carlsbad and Solana Beach, results in conservation of 3,343 acres (70%) of potentially suitable habitat.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location

■ Natural Habitats

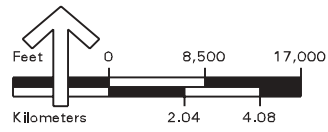
▮ Major Population Area

▮ Generalized Subarea Plan Boundary

▬ Major Roads

▬ Major Streams

Orcutt's hazardia MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Dieguito Lagoon

Table 4-20**SUMMARY OF NET CONSERVATION FOR
ORCUTT'S HAZARDIA**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved
Carlsbad	2,046 (69%)	None known	None known	None known
Encinitas	1,267 (74%)	6 of 6 (97%)	97%	97%
Escondido	5,352 (76%)	None known	None known	None known
Oceanside	713 (52%)	None known	None known	None known
San Marcos	2,164 (51%)	None known	None known	None known
Solana Beach	30 (36%)	None known	None known	None known
Vista	317 (58%)	None known	None known	None known
MHCP Total⁴	11,889 (66%)	6 of 6 (97%)	97%	97%

¹ Habitat for Orcutt's hazardia includes chaparral (including southern maritime chaparral) and coastal sage scrub.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting suitable vegetation) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved. Note that Orcutt's hazardia is extremely limited in range, and not all conserved habitats are expected to be suitable for this species. Site-specific factors governing the distribution of this species have not yet been determined, however, the text describes alternative habitat conservation numbers based on the known range of this species.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ Numbers may not total due to rounding.

Preserve Configuration Issues. The one known population of Orcutt's hazardia occurs in a relatively large block of habitat (>100 acres) near Lux Canyon in Encinitas. The population occurs at the edge of this habitat, however, and is potentially subject to edge effects. Within Encinitas, the proposed preserve design will conserve an estimated 1,267 acres of potentially suitable habitat in the FPA, which includes habitat east of Crest Drive and in the vicinity of Green Valley. Habitat east of Crest Drive is nearly contiguous with habitat currently occupied by this species.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species and therefore contribute to species recovery. The MHCP preserve design and avoidance policies conserve the majority of the one known population of this species in the study area, which is considered both major and critical, in addition to potentially suitable habitat. In addition, MHCP management practices will address threats that have resulted in the loss of suitable habitat for this species throughout the study area. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Special Considerations. Although Orcutt's hazardia likely has some adaptation to fire, it may be adversely affected by unnatural fire regimes (e.g., frequent fires, high-intensity fires resulting from fire suppression policies), particularly where they result in a type conversion of native habitat and/or invasion of habitat by nonnative weedy species. Therefore, effective conservation of this species must include a fire management plan that protects conserved populations from frequent or high-intensity fires and from equipment associated with fire suppression activities (e.g., vehicles). Conserved populations should also be protected from edge effects, and future development in proximity to the one known population should minimize habitat fragmentation.

Adaptive Management Program

If a subarea meets all required conditions and receives coverage for this species, it will be managed and monitored in conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for Orcutt's hazardia. Conduct demographic and ecological research on Orcutt's hazardia, and identify management requirements for this species. Specific studies might focus on reproductive and seed dispersal strategies, seed and pollen viability, germination requirements, seed bank ecology, fire response, specific habitat requirements, and management techniques for maintaining viable populations.

San Diego Marsh-elder

Iva hayesiana

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: None

MHCP: None

Conservation Goals

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat of San Diego marsh-elder.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat and adjacent habitat that supports pollinators). Implement species-specific management actions as necessary to enhance or protect habitat quality. These may include prohibiting adverse activities within preserve areas and enhancing declining populations and restoring damaged habitat.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP will adequately conserve this species by conserving 100% of potential habitat and 75% of point locations (3 of 4 locations are within the FPA). The major population and critical location on San Marcos Creek in San Marcos will be conserved at 100%, but the portion of this major and critical population on Encinitas Creek in San Marcos is not conserved. Although only 50% of the major and critical population is currently considered conserved within the FPA, application of the MHCP critical location and wetland policies will increase the level of protection for this population.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. The major population and critical location along Encinitas Creek in San Marcos must be conserved in accordance with wetland and critical location policies and managed as part of the preserve system.
2. Declining populations must be enhanced, and damaged habitat restored, if determined necessary through monitoring. Enhancement may include introduction of plant materials to existing populations, while restoration may include site-specific habitat improvement activities. Unless analyses determine that there is no significant genetic variation between populations, introduced plant materials must be from the parental population or a population in proximity.

3. All species-specific monitoring and monitoring identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. San Diego marsh-elder is restricted to southwestern San Diego County and northern Baja California, Mexico (Skinner and Pavlik 1994). In San Diego County, this species occurs from San Marcos south to the U.S.-Mexican border. Reported localities include San Marcos Creek, Encinitas Creek, Escondido Creek, San Elijo Lagoon, San Dieguito River Valley, Rancho Santa Fe, Los Peñasquitos Canyon, Proctor Valley, Otay River Valley, Tijuana River Valley, and Otay Mesa, among others (Beauchamp 1986; Ogden 1998). Within the MHCP, this species occurs in Carlsbad, Encinitas, and San Marcos (see MHCP Database Records Map). San Diego marsh-elder is found in moist or alkaline places in the coastal region, particularly along intermittent streams.

Within the MHCP study area, major populations of this species are found in Carlsbad (San Marcos Creek, Encinitas Creek) and San Marcos (San Marcos Creek, Encinitas Creek). These populations are also considered critical locations for the species. Those portions of the San Marcos and Encinitas Creek populations that occur in Carlsbad lie within an already permitted property (Fieldstone HCP property) and are not included in this analysis.

Threats and Limiting Factors. The primary threats to this species are waterway channelization, development, and edge effects.

Special Considerations. San Diego marsh-elder is a perennial subshrub. It is wind-pollinated (Stebbins 1974), and seeds are self-dispersed. This species is commercially propagated and has been successfully planted in restoration projects. The level of survey effort for this species in the study area is considered relatively high.

Conservation Analysis

Conservation and Take Levels. All points in the analysis area will be conserved at 100% in hardline areas and at the FPA percentage (or mitigation ratio) in softline areas within the FPA, with the exception of the Encinitas Creek population in San Marcos (Table 4-21).

Overall, 50% of major populations of this species are proposed to be conserved in the study area. That portion of the San Marcos Creek population that occurs in the analysis area will be conserved in its entirety (100%). That portion of the Encinitas Creek population that occurs in the analysis area is outside the FPA (0% conservation), but would receive additional protection through application of critical location policies.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.

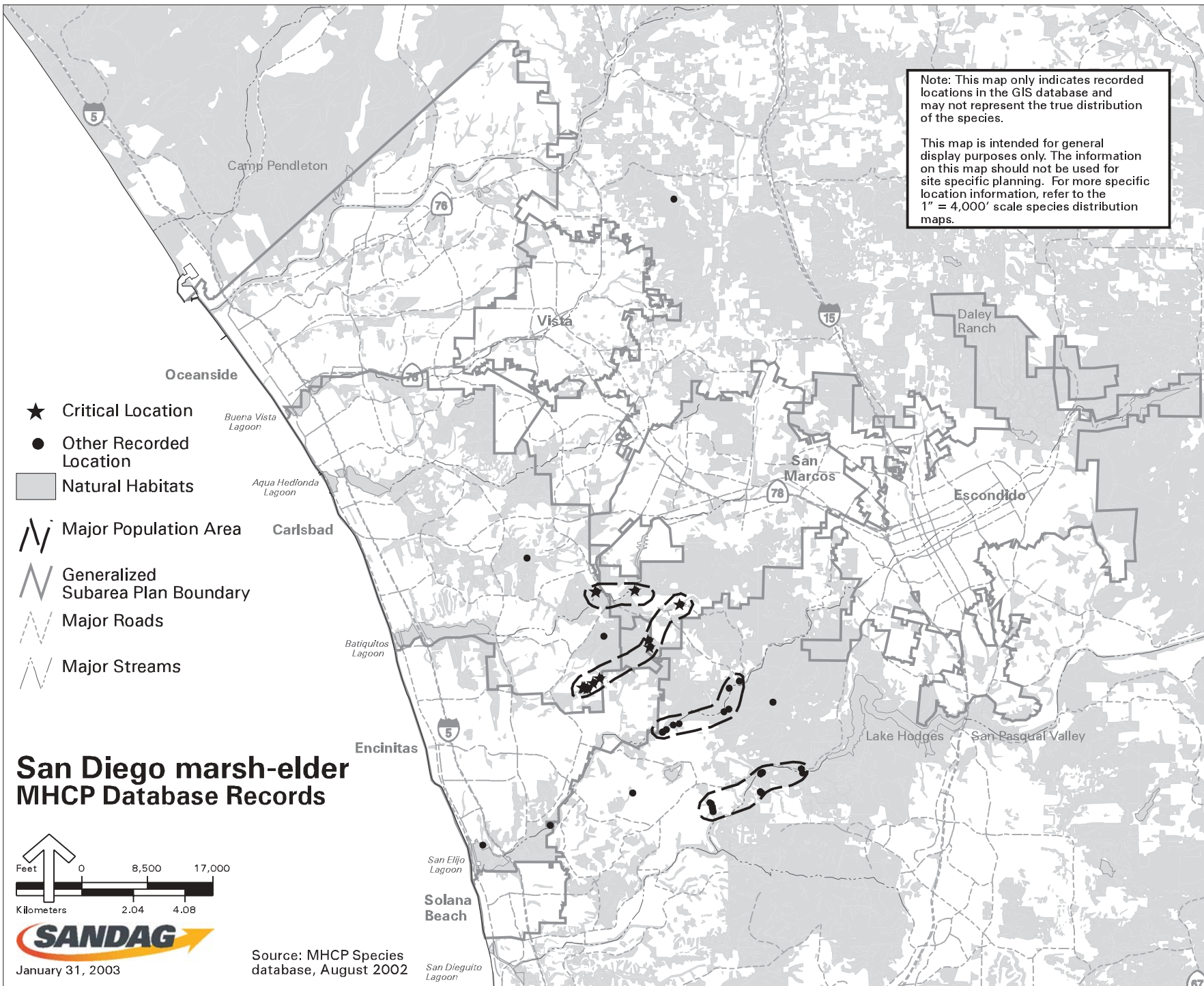


Table 4-21

**SUMMARY OF NET CONSERVATION FOR
SAN DIEGO MARSH-ELDER**

City	Habitat Acreage Conserved ^{1,2}	Location Points Conserved ³	Major Populations Conserved	Critical Locations Conserved	Other Considerations
Carlsbad	13 (100%)	None known	None known	None known	San Marcos and Encinitas Creek populations occur on already permitted property
Encinitas	141 (100%)	2 of 2 (100%)	None identified	None identified	–
Escondido	None present	None present	None present	None present	–
Oceanside	12 (100%)	None known	None known	None known	–
San Marcos	None present	1 of 2 (50%)	50% ⁴	50%	–
Solana Beach	None present	None present	None present	None present	–
Vista	None present	None present	None present	None present	–
MHCP Total ⁵	165 (100%)	3 of 4 (75%)	50%	50%	–

¹ Habitat for San Diego marsh-elder is alkali marsh.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting both suitable vegetation *and* soil types) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate). This species may receive additional protection through the no-net-loss of wetland habitat policy, where it occurs in wetlands.

⁴ Includes that portion of the San Marcos Creek population that occurs within the San Marcos city limits.

⁵ Numbers may not total due to rounding.

In addition to conserved point localities, all of the alkali marsh habitat in the study area (165 acres) will be conserved as a result of the existing preserve design and preserve policies (Table 4-21). It should be noted that this species has been observed in other wetland habitats, as well, including freshwater marsh and disturbed wetlands. Both freshwater marsh and disturbed wetlands will be conserved in their entirety (100%) within the study area.

Preserve Configuration Issues. The proposed preserve design and avoidance policies will conserve the majority of point localities in the analysis area. This includes that portion of the San Marcos Creek major population that occurs in San Marcos, as well as individual point localities along Escondido Creek and San Elijo Lagoon in Encinitas. That portion of the Encinitas Creek major population that occurs in San Marcos may receive protection through preserve design and avoidance policies. Most locations occur in blocks of habitat that appear to include relatively wide buffers around wetland habitat.

The exception is along Encinitas Creek in San Marcos where a portion of a critical location occurs outside the FPA. In this location, appropriate buffers will be required around wetland habitat to protect the conserved population from edge effects.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species and therefore contribute to species recovery. The MHCP preserve design and avoidance policies conserve the majority of known locations, while MHCP management practices will address threats that have resulted in the decline of this species throughout the study area. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Special Considerations. Propagation and transplanted/reintroduction appears to be an effective method of enhancing populations of this species in suitable habitat.

Adaptive Management Program

If a subarea meets all required conditions and receives coverage for this species, it will be managed and monitored in conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for San Diego marsh-elder. Conduct demographic and ecological research on San Diego marsh-elder, and identify management requirements for this species. Specific studies might focus on reproductive

strategies, seed and pollen viability, specific habitat requirements, and management techniques for maintaining viable populations.

Nuttall's Lotus*Lotus nuttallianus***USFWS: Federal Species of Concern (former Category 2 Candidate)****CDFG: None****MHCP: Narrow Endemic****Conservation Goals**

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat of Nuttall's lotus.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat, unoccupied habitat that may allow for population fluctuations, and adjacent habitat that supports pollinators). Implement species-specific management actions as necessary to enhance or protect habitat quality and increase population size. These may include prohibiting adverse activities within preserve areas, enhancing declining populations and restoring damaged habitat, and establishing a seed bank for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP will adequately conserve this species by conserving 95% of point locations (6 of 8 locations are within the FPA) and 92% of critical locations and major populations. The MHCP Narrow Endemic Policy is expected to protect any additional populations found in the future.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. The major population and critical location along the San Luis Rey River in Oceanside and at the San Elijo Lagoon in Encinitas must be conserved at a level consistent with the critical location policy and managed as part of the preserve system.
2. The MHCP Narrow Endemic Policy must be applied to any populations of this species, including those already known and any found in the future.
3. If not already established in the region by another entity, the MHCP management program must establish a seed bank as a guarantee against extinction and to provide source material for conservation and research activities. A seed bank must be established within 15 years of permit issuance. Collections should be based on established guidelines and subject to seed availability. Collected seed

- should be stored at an established seed bank facility (e.g., Rancho Santa Ana Botanic Garden or San Diego Wild Animal Park).
4. Declining populations must be enhanced, and damaged habitat restored, if determined necessary through monitoring. Enhancement may include introduction of plant materials to existing populations, while restoration may include site-specific habitat improvement activities. Unless analyses determine that there is no significant genetic variation between populations, introduced plant materials must be from the parental population or a population in proximity.
 5. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. Nuttall's lotus is restricted to San Diego County and northern Baja California, Mexico (Skinner and Pavlik 1994). In San Diego County, this species historically occurred from Camp Pendleton (north end of the Santa Margarita estuary) southward along the coast to the U.S.-Mexican border. The species is now known from fewer than 10 locations in the county, including Camp Pendleton, Oceanside (mouth of the San Luis Rey River), Carlsbad (Batiqitos Lagoon), Encinitas (San Elijo Lagoon), the San Diego River Flood Control Channel, the D Street Fill and Marisma de Nacion, Silver Strand, and Border Field State Park. Nuttall's lotus occurs along the immediate coast and is associated with flat areas of coastal dunes and coastal scrub habitat.

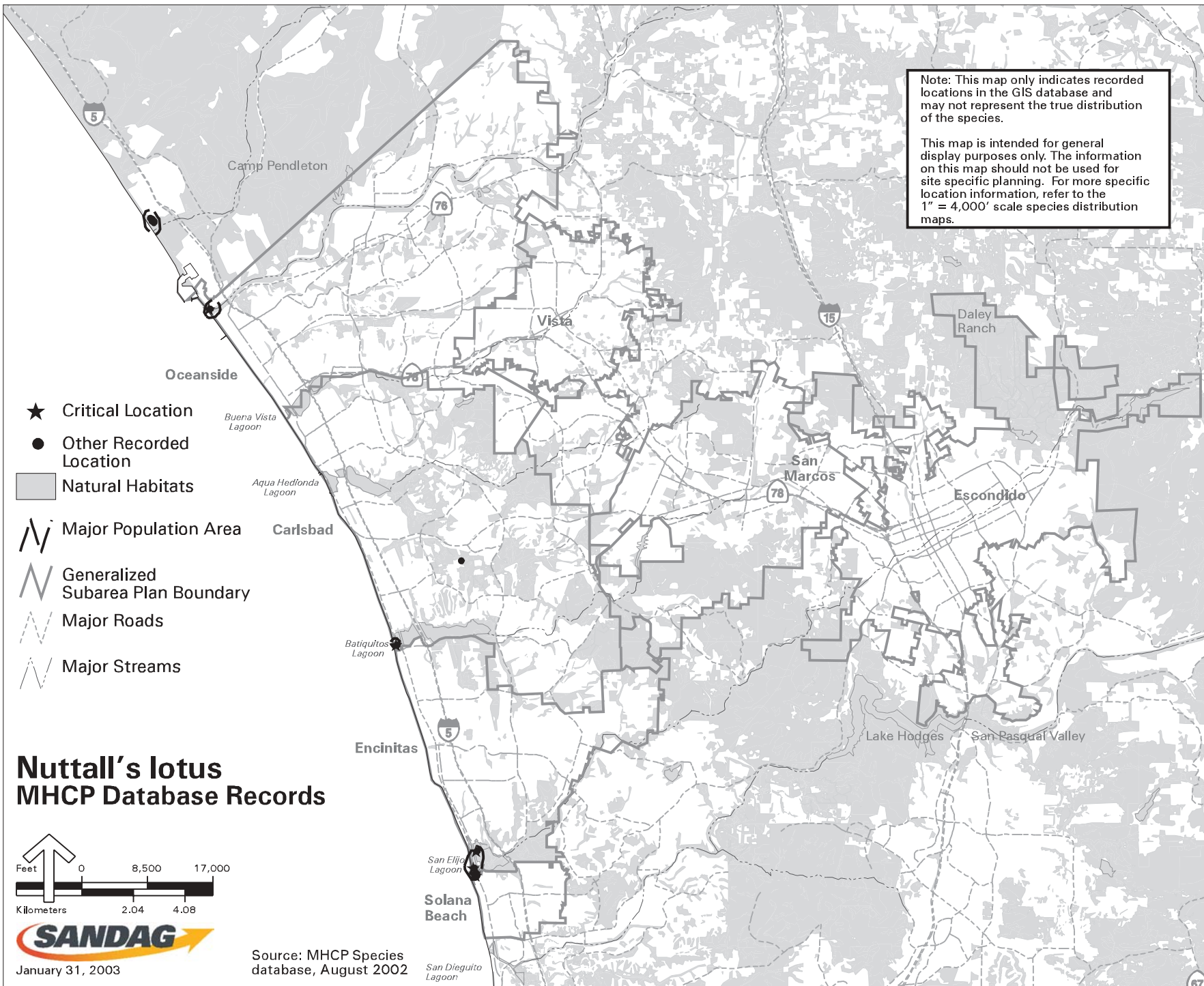
Within the MHCP, major populations of Nuttall's lotus occur in Oceanside (mouth of the San Luis Rey River), Carlsbad (Batiqitos Lagoon), and Encinitas (San Elijo Lagoon) (see MHCP Database Records Map). All of these populations are considered critical locations.

Threats and Limiting Factors. Threats to this species include development, trampling, invasive nonnative plants, land management activities, and edge effects.

Special Considerations. Nuttall's lotus is an annual plant that may experience yearly fluctuations in population size. Flowers are insect-pollinated. Although the seed dispersal strategy of this species is unknown, it is possibly self-dispersed. The level of survey effort for this species in the study area is considered relatively high; however, annual plants germinate in response to specific climatic conditions, so this species could be missed during a poor survey year.

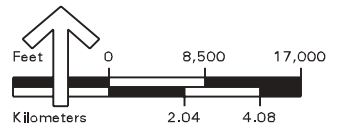
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- ▭ Major Population Area
- ▭ Generalized Subarea Plan Boundary
- ▭ Major Roads
- ▭ Major Streams

Nuttall's lotus MHCP Database Records



Source: MHCP Species database, August 2002

San Diego Lagoon

Conservation Analysis

Conservation and Take Levels. The expected level of take of known locations of Nuttall's lotus is relatively low (Table 4-22). The majority of points falls within the FPA and will be conserved at levels of 100%. Points that fall outside the FPA will be conserved at a minimum 80% level based on the narrow endemic policy. Additional conservation may occur through application of the critical location policy.

Overall, 92% of all major populations and critical locations will be conserved for this species within the study area. Of the three major, critical populations that were identified in the study area, one will be entirely conserved within the FPA (Batiquitos Lagoon in Carlsbad). The remaining two populations will be conserved at levels of 80% (San Luis Rey River in Oceanside) and 96% (San Elijo Lagoon in Encinitas), respectively, under the current FPA design. These two critical locations must be 100% conserved under the permit conditions.

Typical habitat for this species is coastal dunes (beach) and coastal scrub (coastal bluff scrub); the percent conservation of these two habitats in the FPA is relatively low (8 acres, 15%) (Table 4-22). However, 75% of the Nuttall's lotus point localities in the study area occur within coastal salt marsh habitat. These locations likely represent inclusions of beach or scrub habitat within the salt marsh that could not be differentiated due to the scale of vegetation mapping. Nonetheless, it should be noted that conservation of salt marsh habitat is 272 acres (100%) within the FPA.

Preserve Configuration Issues. Populations of Nuttall's lotus are concentrated in coastal locations in or near major lagoons or rivers, and the preserve design conserves the majority of these populations in a configuration that will not adversely affect the potential exchange of genetic material between populations, relative to existing conditions. The critical location near the San Luis Rey River in Oceanside occurs along a strip of beach habitat outside the FPA, and is potentially subject to trampling, invasive nonnative plants, land management activities, and edge effects associated with recreation and development. The population in Batiquitos Lagoon in Carlsbad occurs in a relatively small block of salt marsh habitat that is physically separated from the main lagoon by the Pacific Coast Highway. Maintenance of appropriate conditions to ensure the persistence of salt marsh habitat is a major concern in this area, as is protection from edge effects. The population in San Elijo Lagoon in Encinitas occurs in a relatively large block of habitat, although some plants are found near the edge of this habitat where they are potentially susceptible to edge effects, including trampling.

Table 4-22**SUMMARY OF NET CONSERVATION FOR
NUTTALL'S LOTUS**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved
Carlsbad	None in database	2 of 2 (100%)	100%	100%
Encinitas	4 (90%)	5 of 5 (96%)	96%	96%
Escondido	None present	None present	None present	None present
Oceanside	4 (8%)	1 of 1 (80%)	80%	80%
San Marcos	None present	None present	None present	None present
Solana Beach	0 (0%)	None known	None known	None known
Vista	None present	None present	None present	None present
MHCP Total⁴	8 (15%)	8 of 8 (95%)	92%	92%

¹ Habitat for Nuttall's lotus includes coastal dunes (beach) and coastal scrub (coastal bluff scrub).

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting suitable vegetation types) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved. Numbers shown may underestimate the amount of conserved habitat. Acreage calculations include only dunes and coastal bluff scrub; however, this species could potentially occur in coastal sage scrub near the coast, as well. In addition, it is currently shown on MSCP maps as occurring in coastal salt marsh. These latter locations likely represent inclusions of sandy habitat within larger areas dominated by salt marsh.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ Numbers may not total due to rounding.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species and therefore contribute to species recovery. The MHCP preserve design and avoidance policies conserve the majority of the major populations and critical locations in the study area, while MHCP management practices will address threats that have resulted in the loss of suitable habitat for this species throughout the study area. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Special Considerations. Effective conservation of this species must include sufficient habitat to support insect pollinators. Watersheds should also be managed in a manner that maintains the hydrological regime necessary to support this species. In addition, conserved populations should be protected from trampling and other habitat disturbance.

Adaptive Management Program

If a subarea meets all required conditions and receives coverage for this species, it will be managed and monitored in conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for Nuttall's lotus. Conduct demographic and ecological research on Nuttall's lotus, and identify management requirements for this species. Specific studies might focus on reproductive and pollination biology, seed dispersal strategies, seed and pollen viability, germination requirements, seed bank ecology, specific habitat requirements, and management techniques for maintaining viable populations.

San Diego Goldenstar

Muilla clevelandii

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: None

MHCP: Narrow Endemic

Conservation Goals

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat of San Diego goldenstar.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat and adjacent habitat that supports pollinators). Implement species-specific management actions as necessary to enhance or protect habitat quality and increase population size. These may include prohibiting adverse activities within preserve areas and restoring damaged habitat.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, due to insufficient conservation.

Rationale. Current levels of conservation expected under the current MHCP FPA and guidelines do not meet the conservation goals for this species due to insufficient conservation of habitat and likely population locations. No known locations for this species occur in the analysis area. Two major populations (both are critical locations) occur on already permitted property in the study area (Villages of La Costa), but will be impacted by development. Only 34% of potentially suitable habitat will be conserved for this species in the FPA, and most of this occurs on small, disjunct parcels.

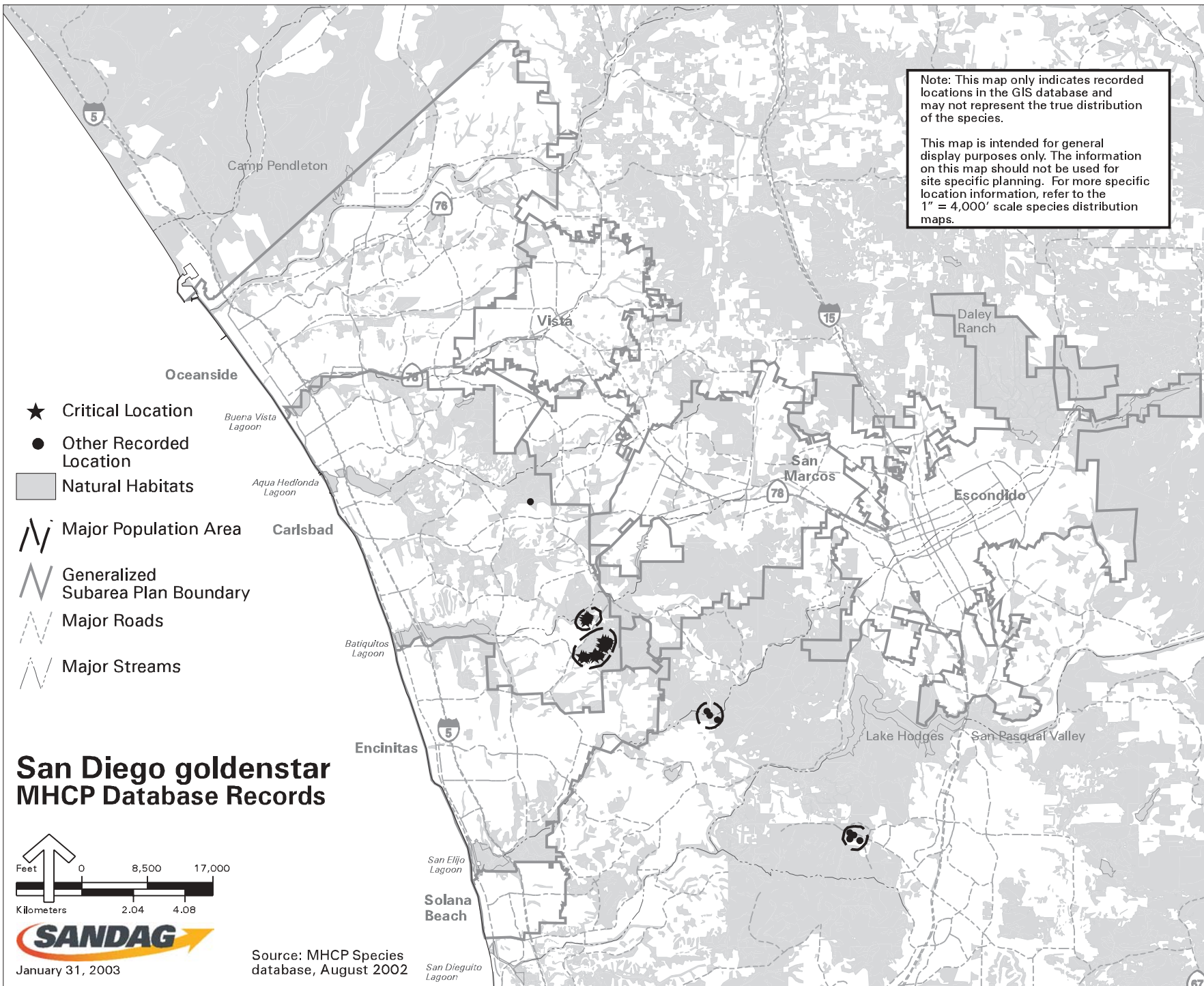
Conditions. Not applicable.

Background

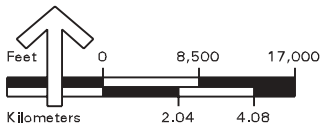
Distribution, Abundance, and Trends. San Diego goldenstar is found only in southwestern San Diego County and northwestern Baja California, Mexico (Skinner and Pavlik 1994; Wiggins 1980). In San Diego County, the species occurs in Carlsbad, Escondido Creek, Rancho Santa Fe, the vicinity of Lake Hodges, Del Mar Mesa, Carmel Mountain, Poway, Fernbrook, Miramar Naval Air Station, Mira Mesa, Tierrasanta, Santee, Dehesa Mountain, Proctor Valley, Otay Mesa, and Marron Valley (Ogden 1995). San Diego goldenstar occurs in clay soils in grasslands and coastal sage scrub.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



San Diego goldenstar MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Dieguito Lagoon

Within the MHCP, San Diego goldenstar occurs only in Carlsbad, where it is found along San Marcos Creek and Encinitas Creek (see MHCP Database Records Map). These are both considered major populations and critical locations for this species; however, both locations occur on already permitted property within the study area.

Threats and Limiting Factors. Threats to this species include urbanization, road construction, vehicular traffic, and illegal dumping.

Special Considerations. San Diego goldenstar is an herbaceous perennial that is presumably insect-pollinated (e.g., bees, Wyatt 1983). In addition, it likely reproduces asexually by producing corm offsets, and transplantation/reintroduction of corms and corm offsets may be an effective method of enhancing populations. Seeds are presumably self-dispersed. The level of survey effort for this species in the study area is considered relatively high; however, flowering of bulb species depends on climatic conditions, so this species could be missed during a poor survey year.

Conservation Analysis

Conservation and Take Levels. San Diego goldenstar is not currently known from the MHCP except in an already permitted area (i.e., the Fieldstone HCP property). An estimated 608 acres (34%) of potentially suitable habitat for this species will be conserved in the study area (Table 4-23). In addition, a minimum of 95 to 100% of any newly detected localities for this species would be conserved inside the FPA, and a minimum 80% would be conserved outside the FPA based on the narrow endemic policy. Additional conservation could occur through application of the critical location policy.

Preserve Configuration Issues. Although San Diego goldenstar is not currently known from the FPA, it is present in the MHCP study area and has the potential to occur in the FPA based on the presence of potentially suitable habitat. However, the amount of potentially suitable habitat that will be conserved for this species in the study area is low (34%) and occurs primarily in small, disjunct blocks. Populations of San Diego goldenstar that may occur in this habitat would likely be subject to edge effects.

Effects on Population Viability and Species Recovery. It is uncertain whether implementation of the MHCP will enhance population viability for this species, if present in the FPA. The MHCP preserve design and avoidance policies conserve only 34% of potentially suitable habitat, and this habitat occurs largely in small, disjunct stands that are not in proximity to known (or extant) populations. If determined to be present, MHCP management practices would address threats that have resulted in the decline of this species throughout the study area. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence, if present.

Table 4-23**SUMMARY OF NET CONSERVATION FOR
SAN DIEGO GOLDENSTAR**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved
Carlsbad	340 (48%)	1 of 1 (100%)	None known ⁴	None known ⁴
Encinitas	64 (41%)	None known	None known	None known
Escondido	7 (47%)	None known	None known	None known
Oceanside	172 (29%)	None known	None known	None known
San Marcos	21 (11%)	None known	None known	None known
Solana Beach	None present	None present	None present	None present
Vista	5 (5%)	–	–	–
MHCP Total⁵	608 (34%)	1 of 1 (100%)	None known	None known

¹ Habitat for San Diego goldenstar includes clay soils in grasslands and coastal scrub.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting suitable vegetation types) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ San Marcos Creek and Encinitas Creek populations occur on already permitted property, and are not included in this analysis.

⁵ Numbers may not total due to rounding.

Special Considerations. Effective conservation of San Diego goldenstar will require conservation of adequate habitat to support insect pollinators, to allow for population expansion through production of corm offsets, and to buffer against adverse edge effects.

Adaptive Management Program

Not applicable.

Little Mouseltail*Myosurus minimus ssp. apus***USFWS: Federal Species of Concern (former Category 2 Candidate)****CDFG: None****MHCP: Narrow Endemic, Wetland Obligate****Conservation Goals**

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat (including vernal pool watersheds) of little mouseltail.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat, unoccupied habitat that may allow for population fluctuations, adjacent habitat that supports pollinators, seed dispersal agents, and vernal pool watersheds). Implement species-specific management actions as necessary to enhance or protect habitat quality and increase population size. These may include prohibiting adverse activities within preserve areas and within the watersheds of vernal pools, regulating toxic substances near vernal pools, controlling nonnative competitive species, enhancing populations and restoring damaged habitat, and establishing a seed bank.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP will adequately conserve this species by conserving 93% of the potentially suitable habitat and 100% of the one known critical location and major population in Carlsbad. The MHCP Narrow Endemic Policy is expected to protect any additional populations found in the future.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. All conserved populations must be adequately managed to control edge effects and avoid adverse changes to vernal pools and their watersheds. Stabilize preserved populations by removing impacts or potential impacts, and excluding adverse activities within preserve areas and within the watersheds of vernal pools (e.g., trampling, vehicular or recreational traffic, illegal dumping, invasive exotic plants, water pollution, alteration of hydrology, and collecting). Regulate the use of toxic substances (e.g., herbicides, pesticides) and control nonnative competitive species in the vicinity of vernal pools.
2. The MHCP Narrow Endemic Policy must be applied to any populations of this species, including those already known and any found in the future.

3. Declining populations must be enhanced, and damaged habitat restored, if determined necessary through monitoring. Enhancement may include introduction of plant materials to existing populations, while restoration may include site-specific habitat improvement activities. Unless analyses determine that there is no significant genetic variation between populations, introduced plant materials must be from the parental population or a population in proximity.
4. If not already established in the region by another entity, the MHCP management program must establish a seed bank as a guarantee against extinction and to provide source material for conservation and research activities. A seed bank must be established within 15 years of permit issuance. Collections should be based on established guidelines and subject to seed availability. Collected seed should be stored at an established seed bank facility (e.g., Rancho Santa Ana Botanic Garden or San Diego Wild Animal Park).
5. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. Little mousetail has a relatively widespread distribution, occurring in Butte, Colusa, Solano, Contra Costa, Alameda, Stanislaus, Kern, Riverside, San Bernardino, and San Diego counties, as well as in Oregon and Baja California, Mexico (Skinner and Pavlik 1994). In San Diego County, the species is restricted to Camp Pendleton (Stuart Mesa, Wire Mountain), Carlsbad, Ramona, the mesas north of San Diego, and Otay Mesa. Only the Carlsbad location falls within the MHCP. Little mousetail is found in vernal pools and alkaline marshes.

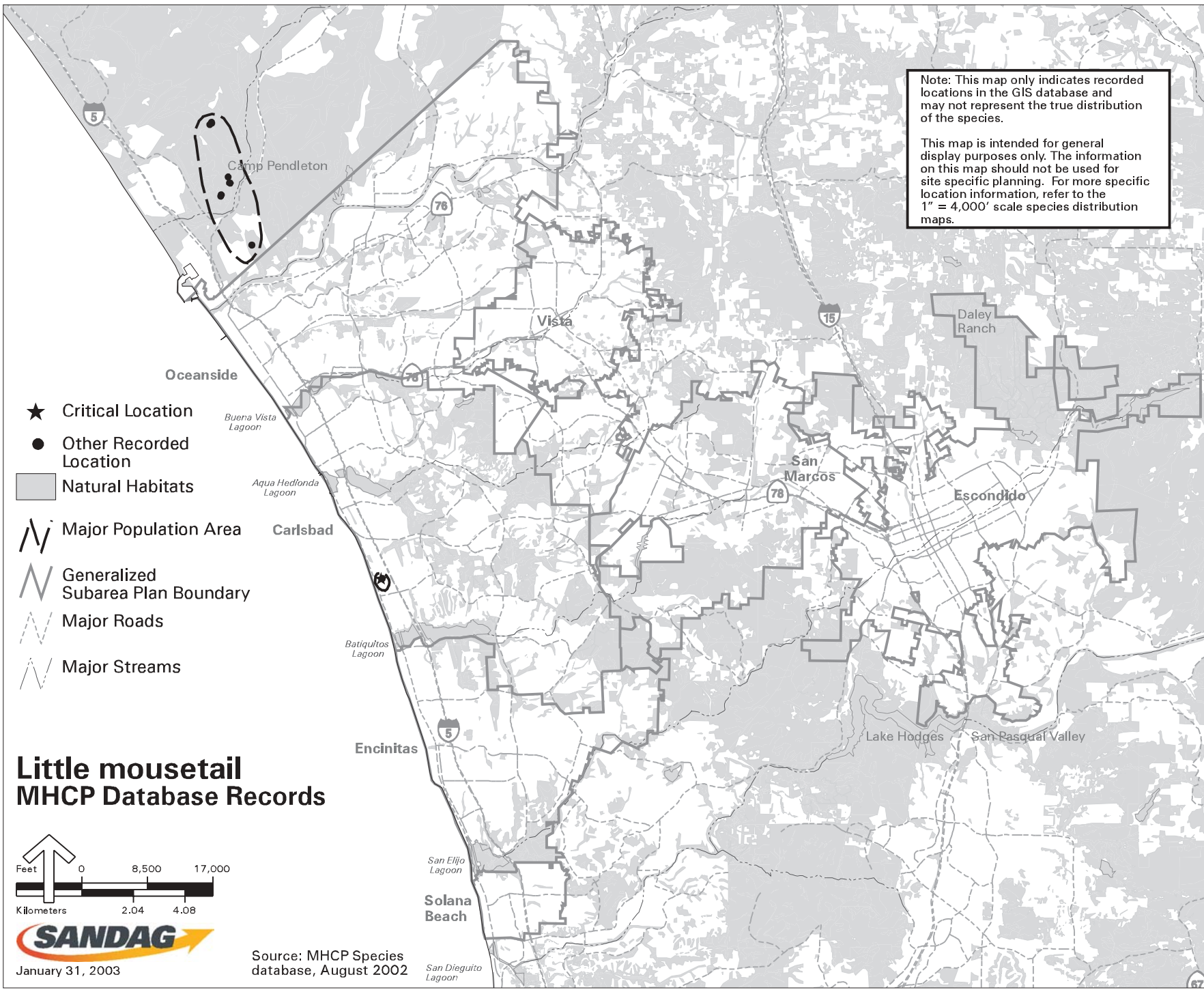
Within the MHCP, little mousetail occurs in the Poinsettia Lane vernal pools in Carlsbad (see MHCP Database Records Map). This occurrence is considered both a major population and critical location for this taxon.

Threats and Limiting Factors. Threats to this species include vehicular traffic, livestock grazing, agriculture, and edge effects.

Special Considerations. Little mousetail is a small, tufted annual that may experience yearly fluctuations in population size. It is presumably insect-pollinated (Grant and Grant 1965), and seeds are self- and, possibly, animal-dispersed. The level of survey effort for this species in the study area is considered relatively high.

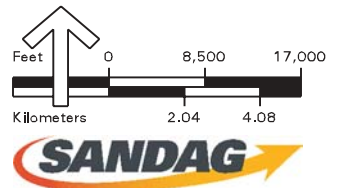
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- ▭ Major Population Area
- ▭ Generalized Subarea Plan Boundary
- ▭ Major Roads
- ▭ Major Streams

Little mousetail MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Dieguito Lagoon

Conservation Analysis

Conservation and Take Levels. The expected level of take of little mousetail is relatively low (Table 4-24). All known points (100%) fall within the FPA and will be conserved at a 100% level. This includes the Poinsettia Lane population in Carlsbad. In addition, 174 acres (93%) of potentially suitable habitat within the study area will be conserved (Table 4-24).

Preserve Configuration Issues. Little mousetail occurs in the MHCP study area only in the Poinsettia Lane vernal pools in Carlsbad. Although this population is conserved in its entirety, it occurs in a narrow, linear strip of habitat that is bordered by the Poinsettia Train Station on one side and a road on the other side. In this case, habitat fragmentation has resulted in the vernal pool complex being separated from surrounding native vegetation or (more appropriately) areas restorable to native vegetation. As a consequence, the Carlsbad pools may not support appropriate pollinators or seed dispersal agents. The existing hydrology appears adequate to support a viable vernal pool resource, as indicated by robust populations of several sensitive vernal pool species. It will be important to maintain the current hydrological regime to ensure that habitat becomes neither too dry (i.e., allowing invasion of the pool by grasses) nor too wet (i.e., allowing invasion of the pool by freshwater marsh species). This will entail preserving the watershed necessary to support these pools, as measured by topography and soils.

Finally, because of its shape (i.e., high edge-to-area ratio) and adjacent land uses, this population is also highly susceptible to edge effects (e.g., invasion of nonnative plants).

A watershed analysis was recently conducted on the parcel adjacent to the Poinsettia Lane vernal pools. This analysis was initiated because of the potential for proposed development to impact the vernal pool watershed. Results of this analysis found that the Poinsettia Lane vernal pools and immediately surrounding habitat are restricted to Huerhuero loam soils, and that these soils extend only slightly into the adjacent property (e.g., typically about 25 feet) (H. Wier pers. comm.). Huerhuero soils are moderately well drained loams with a clay subsoil that developed in sandy marine sediments. In undisturbed situations, they can support mima mounds (USDA-SCS 1973). The Huerhuero soils are replaced on the adjacent property by Marina loamy coarse sand (H. Wier pers. comm.). Marina soils are excessively drained, deep loamy coarse sands that are characterized by rapid permeability (USDA-SCS 1973). These soils do not have a clay subsoil and are not expected to be important in maintaining pool hydrology because of their rapid permeability. The development proposal on this adjacent property includes a setback of 100 feet, which will be entirely on the Marina loamy coarse sands (H. Wier pers. comm.).

Genetic consequences are a concern in preserve design for vernal pool species. Although gene flow between vernal pool complexes appears to be low (Fugate 1993, in USFWS 1998a; Davies 1996, in USFWS 1998a), flooding between pools within a complex is an important means of augmenting gene flow in populations already naturally low in

Table 4-24

**SUMMARY OF NET CONSERVATION FOR
LITTLE MOUSETAIL**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved
Carlsbad	18 (100%)	1 of 1 (100%)	100%	100%
Encinitas	141 (100%)	None known	None known	None known
Escondido	None present	None present	None present	None present
Oceanside	12 (100%)	None known	None known	None known
San Marcos	4 (24%)	None present	None present	None present
Solana Beach	None present	None present	None present	None present
Vista	None present	None present	None present	None present
MHCP Total⁴	174 (93%)	1 of 1 (100%)	100%	100%

¹ Habitat for little mousetail includes vernal pools and alkaline marshes.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting suitable vegetation types) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ Numbers may not total due to rounding.

variability (Davies 1996, in USFWS 1998a). Disruptions of the watershed that compromise gene exchange within a complex may result in a loss of genetic variability and an increased risk of extinction (Soulé 1986). From a genetic perspective, conservation of little mousetail within the Poinsettia Lane complex will require maintenance of the hydrological flow between pools. It should be recognized, however, that the existing variability might be too low to prevent adverse genetic consequences (e.g., inbreeding depression).

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species and therefore contribute to species recovery. The MHCP preserve design and avoidance policies conserve the only known location (which is considered a major population and critical location) of this species in the study area. Management of both edge effects and the hydrological regime of the Poinsettia Lane pools will be a critical component of maintaining or enhancing population viability. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Special Considerations. Little mousetail relies on animal vectors for pollination and, possibly, seed dispersal. In addition, plants have specific hydrological requirements. Therefore, effective conservation of this species must include sufficient habitat to maintain an appropriate fauna and must manage the vernal pool watershed in a manner that maintains both the hydrological regime and water quality.

Adaptive Management Program

If a subarea meets all required conditions and receives coverage for this species, it will be managed and monitored in conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

This species is not specifically addressed in the draft recovery plan for vernal pools; however, there are a number of proposed management actions in the recovery plan that may directly or indirectly benefit little mousetail. These include reestablishing vernal pool habitat, rehabilitating and enhancing vernal pools and their constituent species, managing and monitoring protected habitat, and research to investigate biological factors affecting recovery (USFWS 1998d). The recovery plan also recognizes that the conservation potential for the Carlsbad pools at Poinsettia Lane is limited to management activities (USFWS 1998d). Management actions for little mousetail within the MHCP should coordinate with existing programs (e.g., MSCP) to ensure compatibility of monitoring results and prevent duplication of efforts.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for little mousetail. Conduct demographic and ecological research on little mousetail, and identify management requirements for this species. Specific studies might focus on reproductive and pollination biology, seed dispersal strategies, seed and pollen viability, germination requirements, seed bank ecology, and management techniques for maintaining viable populations.

Spreading Navarretia

Navarretia fossalis

USFWS: Proposed Threatened

CDFG: None

MHCP: Narrow Endemic, Wetland Obligate

Conservation Goals

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat (including vernal pool watersheds) of spreading navarretia.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat, unoccupied habitat that may allow for population fluctuations, adjacent habitat that supports pollinators, and vernal pool watersheds). Implement species-specific management actions as necessary to enhance or protect habitat quality and increase population size. These may include prohibiting adverse activities within preserve areas and within the watersheds of vernal pools, regulating toxic substances near vernal pools, controlling nonnative competitive species, enhancing populations and restoring damaged habitat, and establishing a seed bank.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions. However, coverage could be revoked in the future depending on resolution of species conservation in the San Marcos Major Amendment Area.

Rationale. The MHCP will contribute to the conservation of this species within the area by conserving 88% of point location (2 of 5 locations are within the FPA) and 93% of critical locations and major populations in the study area. Only 41% of the mapped vernal pool habitat (9 of 22 acres) are within the FPA. The critical location and major population at Poinsettia Lane in Carlsbad will be 100% conserved. Although 85% of the San Marcos critical location and major population within the study area will be conserved, 29 acres of vernal pool habitat occurs in the San Marcos Major Amendment Area and are not addressed by this plan.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. The major population and critical location of spreading navarretia in San Marcos must be conserved at a level consistent with the critical location policy and managed as part of the preserve system.

2. All conserved populations must be adequately managed to control edge effects and avoid adverse changes to vernal pools and their watersheds. Stabilize preserved populations by removing impacts or potential impacts, and excluding adverse activities within preserve areas and within the watersheds of vernal pools (e.g., trampling, vehicular or recreational traffic, illegal dumping, invasive exotic plants, water pollution, alteration of hydrology, and collecting). Regulate the use of toxic substances (e.g., herbicides, pesticides) and control nonnative competitive species in the vicinity of vernal pools.
3. The MHCP Narrow Endemic Policy must be applied to any populations of this species, including those already known and any found in the future.
4. Declining populations must be enhanced, and damaged habitat restored, if determined necessary through monitoring. Enhancement may include introduction of plant materials to existing populations, while restoration may include site-specific habitat improvement activities. Unless analyses determine that there is no significant genetic variation between populations, introduced plant materials must be from the parental population or a population in proximity.
5. A seed bank must be established as a guarantee against extinction and to provide source material for conservation and research activities. Collections should be based on established guidelines and subject to seed availability. Collected seed should be stored at an established seed bank facility (e.g., Rancho Santa Ana Botanic Garden).
6. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. Spreading navarretia occurs in western Riverside and southwestern San Diego counties and in northwestern Baja California, Mexico (Skinner and Pavlik 1994; USFWS 1998a). Historically, this species appears to have been present in relatively few San Diego County vernal pools. In San Diego County, this species is found below 450-meter (1,476 feet) elevation in Carlsbad, San Marcos, Ramona, and Otay Mesa. The Carlsbad and San Marcos occurrences lie within the MHCP. This species generally occurs in vernal pools or roadside depressions.

Fewer than 30 populations of spreading navarretia occur in the U.S., and nearly 60% of these populations occur on Otay Mesa in San Diego County or near Hemet and along the San Jacinto River in Riverside County (USFWS 1998a). The largest populations occur in Riverside County and have been estimated to support 300,000 and 75,000 individuals, respectively. Most populations, however, support fewer than 1,000 individuals and occupy relatively small areas (e.g., <1 acre) (USFWS 1998a). The USFWS (1998a) estimates that this species occupies less than 300 acres of habitat in the United States.

Within the MHCP, spreading navarretia occurs in the Poinsettia Lane vernal pools in Carlsbad and in San Marcos (see MHCP Database Records Map). Both occurrences are considered major populations and critical locations for this species.

Threats and Limiting Factors. Threats to spreading navarretia include urbanization and associated edge effects (including alterations in the watershed that may reduce the source of water and encourage invasion of habitat by upland plant species), agriculture, and road construction.

Special Considerations. Spreading navarretia is a low, spreading or ascending annual herb that may experience yearly fluctuations in population size. It is presumably self-breeding (autogamous) (Grant and Grant 1965; Spencer and Rieseberg 1998), and seeds are presumably self-dispersed. The level of survey effort for this species in the study area is considered relatively high.

Conservation Analysis

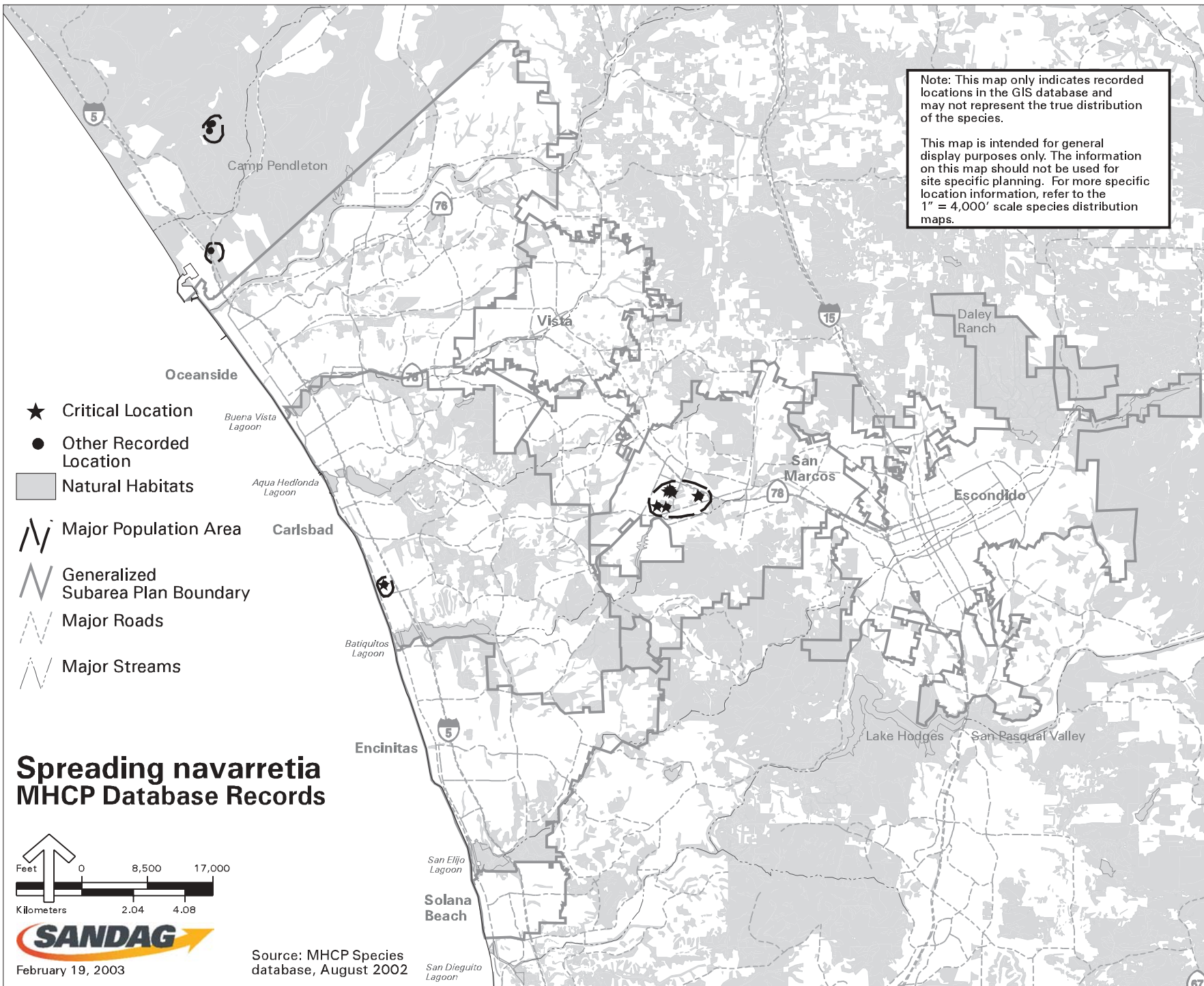
Conservation and Take Levels. The expected level of take of spreading navarretia is relatively low (Table 4.25). The majority of points falls within the FPA and will be conserved at levels of 100%. Points that fall outside the FPA will be conserved at a minimum 80% level based on the narrow endemic policy. Additional conservation could occur through application of wetland and critical location policies.

Overall, 93% of major populations of this species will be conserved in the study area. The Poinsettia Lane population (Carlsbad) will be entirely conserved (100%), while that portion of the San Marcos population that falls within the analysis area will be conserved at a minimum 85% level. This population must be 100% conserved under the permit conditions. The remaining point localities in the San Marcos population, which comprise 75% of the total point localities in this population, lie within a Major Amendment Area and were not considered in the analysis of conservation and take levels.

Preserve Configuration Issues. Populations of spreading navarretia occur in the MHCP study area only in Carlsbad and San Marcos. Although the Carlsbad population is conserved in its entirety, it occurs in a narrow, linear strip of habitat that is bordered by the Poinsettia Train Station on one side and a road on the other side. In this case, habitat fragmentation has resulted in the vernal pool complex being separated from surrounding native vegetation or (more appropriately) areas restorable to native vegetation. The existing hydrology appears adequate to support a viable vernal pool resource, as indicated by robust populations of several sensitive vernal pool species. It will be important to maintain the current hydrological regime to ensure that habitat becomes neither too dry (i.e., allowing invasion of the pool by grasses) nor too wet (i.e., allowing invasion of the pool by freshwater marsh species). This will entail preserving the watershed necessary to support these pools, as measured by topography and soils. Finally, because of its shape (i.e., high edge-to-area ratio) and adjacent land uses, this population is also highly susceptible to edge effects (e.g., invasion of nonnative plants).

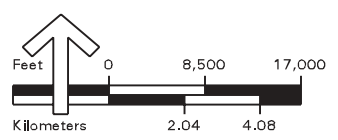
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- ▭ Major Population Area
- ▭ Generalized Subarea Plan Boundary
- ▭ Major Roads
- ▭ Major Streams

Spreading navarretia MHCP Database Records



February 19, 2003

Source: MHCP Species database, August 2002

San Diego County

Table 4-25

**SUMMARY OF NET CONSERVATION FOR
SPREADING NAVARRETIA**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved	Other Considerations
Carlsbad	5 (100%)	1 of 1 (100%)	100%	100%	–
Encinitas	None present	None present	None present	None present	–
Escondido	None present	None present	None present	None present	–
Oceanside	None present	None present	None present	None present	–
San Marcos	4 (24%)	2 of 2 (80%)	85% ⁴	85% ⁴	75% of San Marcos population occurs in a Major Amendment Area
Solana Beach	None present	None present	None present	None present	–
Vista	None present	None present	None present	None present	–
MHCP Total	9 (41%)	3 of 3 (87%)	93%	93%	–

¹ Habitat for spreading navarretia includes vernal pools.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting suitable vegetation types) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ Includes only that portion of the San Marcos population that occurs in the MHCP analysis area (i.e., does not include plants in the Major Amendment Area).

A watershed analysis was recently conducted on the parcel adjacent to the Poinsettia Lane vernal pools. This analysis was initiated because of the potential for proposed development to impact the vernal pool watershed. Results of this analysis found that the Poinsettia Lane vernal pools and immediately surrounding habitat are restricted to Huerhuero loam soils, and that these soils extend only slightly into the adjacent property (e.g., typically about 25 feet) (H. Wier pers. comm.). Huerhuero soils are moderately well drained loams with a clay subsoil that developed in sandy marine sediments. In undisturbed situations, they can support mimamounds (USDA-SCS 1973). The Huerhuero soils are replaced on the adjacent property by Marina loamy coarse sand (H. Wier pers. comm.). Marina soils are excessively drained, deep loamy coarse sands that are characterized by rapid permeability (USDA-SCS 1973). These soils do not have a clay subsoil and are not expected to be important in maintaining pool hydrology because of their rapid permeability. The development proposal on this adjacent property includes a setback of 100 feet, which will be entirely on the Marina loamy coarse sands (H. Wier pers. comm.).

The portion of the San Marcos population included in this analysis occurs on a relatively small parcel that is surrounded largely by development. This population is part of the San Marcos vernal pool complex and is in proximity to other vernal pools and stands of spreading navarretia within the complex. Despite the fragmented nature of the San Marcos vernal pool complex, it currently contains at least some of its original watershed and adjacent upland habitat. The preserved population will be subject to edge effects.

Although genetic consequences are generally a concern in preserve design for vernal pool species, they may be less of an issue for spreading navarretia, since this species is presumably self-breeding (Grant and Grant 1965; Spencer and Rieseberg 1998). However, conservation of additional vernal pools and watershed (e.g., in the San Marcos vernal pool complex) will (1) increase the probability that propagules will be available for recolonization in the event of localized species extirpations and (2) provide potentially restorable vernal pool habitat.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species and therefore contribute to species recovery. The MHCP preserve design and avoidance policies conserve the majority of known locations in the analysis area (including major populations and critical locations), while MHCP management practices will address threats that have resulted in the decline of this species throughout the study area. Management of both edge effects and the hydrological regimes of conserved pools will be a critical component of maintaining or enhancing population viability. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Special Considerations. Spreading navarretia has specific hydrological requirements. Therefore, effective conservation of this species must manage the vernal pool watershed in a manner that maintains the hydrological regime.

Adaptive Management Program

If a subarea meets all required conditions and receives coverage for this species, it will be managed and monitored in conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

As part of the recovery plan for vernal pools, the USFWS has proposed a number of management actions that may benefit this species. These include reestablishing vernal pool habitat, rehabilitating and enhancing vernal pools and their constituent species, managing and monitoring protected habitat, and research to investigate biological factors affecting recovery (USFWS 1998b). The recovery plan also recognizes that the conservation potential for the Carlsbad pools at Poinsettia Lane is limited to management activities, whereas the conservation potential in San Marcos may include restoration and enhancement activities (USFWS 1998b). Management actions for spreading navarretia within the MHCP should coordinate with existing programs (e.g., MSCP, USFWS recovery efforts) to ensure compatibility of monitoring results and prevent duplication of efforts.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for spreading navarretia. Conduct demographic and ecological research on spreading navarretia, and identify management requirements for this species. Specific studies might focus on reproductive biology, seed dispersal strategies, seed and pollen viability, germination requirements, seed bank ecology, and management techniques for maintaining viable populations.

California Orcutt Grass*Orcuttia californica***USFWS: Endangered****CDFG: Endangered****MHCP: Narrow Endemic, Wetland Obligate****Conservation Goals**

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat (including vernal pool watersheds) of California Orcutt grass.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat, unoccupied habitat that may allow for population fluctuations, and vernal pool watersheds). Implement species-specific management actions as necessary to enhance or protect habitat quality and increase population size. These may include prohibiting adverse activities within preserve areas and within the watersheds of vernal pools, regulating toxic substances near vernal pools, controlling nonnative competitive species, enhancing populations and restoring damaged habitat, and establishing a seed bank.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP will adequately conserve this species by conserving 100% of the one known critical location and major population in Carlsbad. The MHCP Narrow Endemic Policy is expected to protect any additional populations found in the future.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. All conserved populations must be adequately managed to control edge effects and avoid adverse changes to vernal pools and their watersheds. Stabilize preserved populations by removing impacts or potential impacts, and excluding adverse activities within preserve areas and within the watersheds of vernal pools (e.g., trampling, vehicular or recreational traffic, illegal dumping, invasive exotic plants, water pollution, alteration of hydrology, and collecting). Regulate the use of toxic substances (e.g., herbicides, pesticides) and control nonnative competitive species in the vicinity of vernal pools.
2. The MHCP Narrow Endemic Policy must be applied to any populations of this species, including those already known and any found in the future.

3. Declining populations must be enhanced, and damaged habitat restored, if determined necessary through monitoring. Enhancement may include introduction of plant materials to existing populations, while restoration may include site-specific habitat improvement activities. Unless analyses determine that there is no significant genetic variation between populations, introduced plant materials must be from the parental population or a population in proximity.
4. A seed bank must be established as a guarantee against extinction and to provide source material for conservation and research activities. Collections should be based on established guidelines and subject to seed availability. Collected seed should be stored at an established seed bank facility (e.g., Rancho Santa Ana Botanic Garden).
5. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

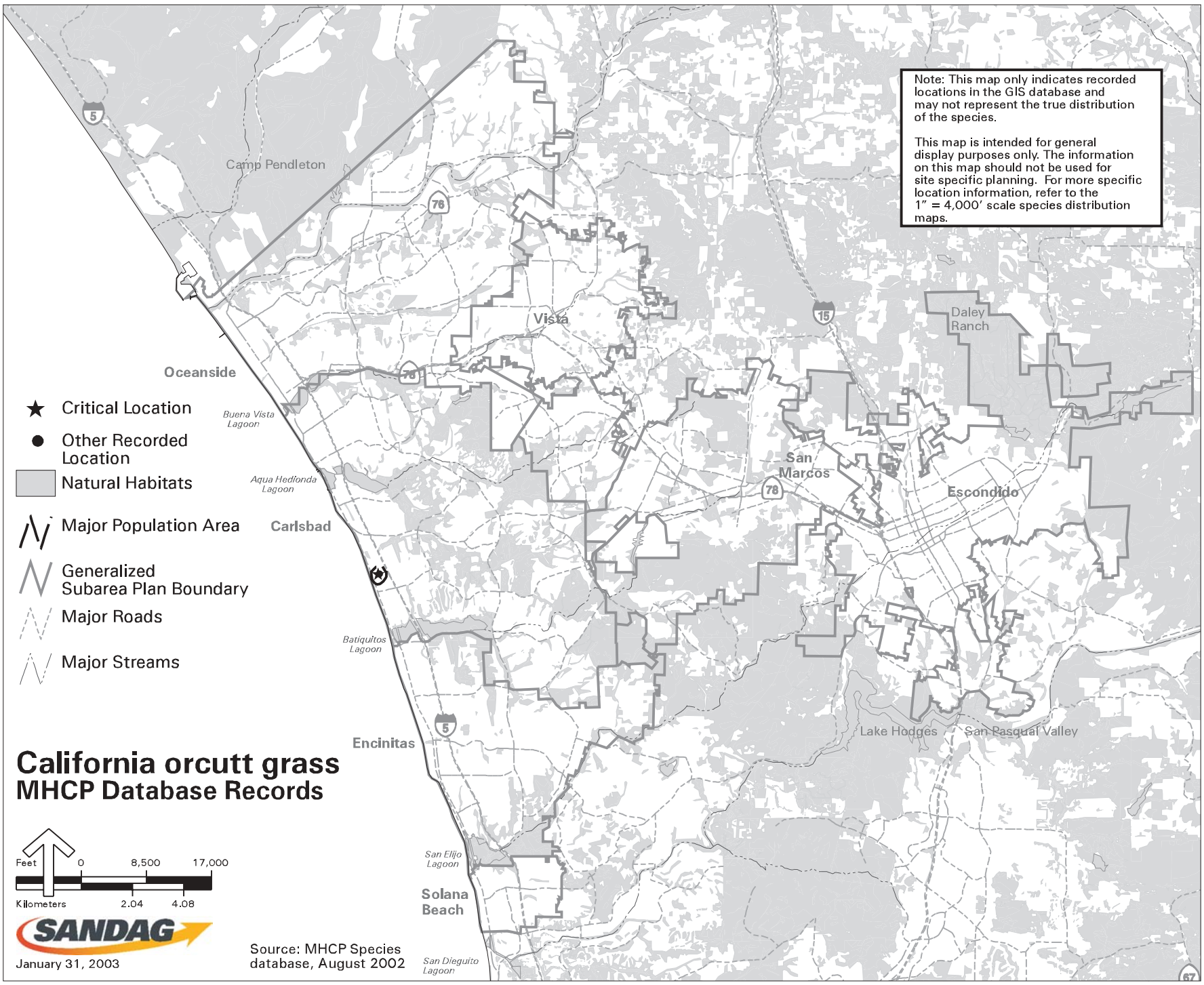
Distribution, Abundance, and Trends. California Orcutt grass is currently found in Ventura, Riverside, and San Diego counties, and Baja California, Mexico. It is apparently extirpated from Los Angeles County and is currently reported from fewer than 20 locations throughout its range (Skinner and Pavlik 1994). In San Diego County, California Orcutt grass is known from below 200-meter (656 feet) elevation on the coastal mesas, with reported localities including Carlsbad, Miramar Naval Air Station, and Otay Mesa (J. Brown pers. comm.; Beauchamp 1986). California Orcutt grass is found in or near vernal pools.

Vernal pool habitat in San Diego County had declined by an estimated 97% as of 1990 (Oberbauer in USFWS 1993a), and most remaining pools face one or more threats (USFWS 1993a). California Orcutt grass has experienced a concomitant decline in number of populations, particularly in the Otay Mesa area of southwestern San Diego County. The historic occurrence of this species in the MHCP area is not well known. The one documented population, which occurs in the Poinsettia Lane vernal pools in Carlsbad, appears to face many of same threats as other populations (see MHCP Database Records Map). This occurrence is considered both a major population and critical location for the species.

Threats and Limiting Factors. Threats to California Orcutt grass include urbanization and associated edge effects (including alterations in the watershed that may reduce the source of water and encourage invasion of habitat by upland plant species), agriculture, invasive nonnative plants, and road construction. In addition, the low numbers of vernal pools remaining and their scattered distributions make this species vulnerable to extinction due to stochastic events (USFWS 1993a).

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

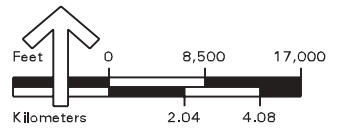
This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats

- ▭ Major Population Area
- ▭ Generalized Subarea Plan Boundary
- ▭ Major Roads
- ▭ Major Streams

California orcutt grass MHCP Database Records



Source: MHCP Species database, August 2002

Table 4-26**SUMMARY OF NET CONSERVATION FOR
CALIFORNIA ORCUTT GRASS**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved
Carlsbad	5 (100%)	1 of 1 (100%)	100%	100%
Encinitas	None present	None present	None present	None present
Escondido	None present	None present	None present	None present
Oceanside	None present	None present	None present	None present
San Marcos	4 (24%)	None known	None known	None known
Solana Beach	None present	None present	None present	None present
Vista	None present	None present	None present	None present
MHCP Total	9 (41%)	1 of 1 (100%)	100%	100%

¹ Habitat for California Orcutt grass includes vernal pools .

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting suitable vegetation types) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

Special Considerations. California Orcutt grass is an annual plant that may experience yearly fluctuations in population size. This species is wind-pollinated and possibly has a mixed breeding system (i.e., possessing both outcrossing and selfing capabilities) (Zedler 1987). California Orcutt grass typically occurs in the deepest portion of vernal pools and occurs in some pools with marshy elements (USFWS 1993a). The level of survey effort for this species in the study area is considered relatively high.

Conservation Analysis

Conservation and Take Levels. The expected level of take of California Orcutt grass is relatively low (Table 4-26). The one known location point in the study area (Poinsettia Lane population in Carlsbad) falls within the FPA and will be conserved at a 100% level. Only about 41% (9 of 22 acres) of mapped vernal pool habitat in the study area is within the FPA, with about 13 acres scattered outside the FPA in central and northern San Marcos. Within the San Marcos Major Amendment Area, which is not assessed in this plan, 29 mapped vernal pool habitat exists.

Preserve Configuration Issues. California Orcutt grass occurs in the MHCP study area only in the Poinsettia Lane vernal pools in Carlsbad. Although this population is conserved in its entirety, it occurs in a narrow, linear strip of habitat that is bordered by the Poinsettia Train Station on one side and a road on the other side. In this case, habitat fragmentation has resulted in the vernal pool complex being separated from surrounding native vegetation or (more appropriately) areas restorable to native vegetation. The existing hydrology appears adequate to support a viable vernal pool resource, as indicated by robust populations of several sensitive vernal pool species. It will be important to maintain the current hydrological regime to ensure that habitat becomes neither too dry (i.e., allowing invasion of the pool by grasses) nor too wet (i.e., allowing invasion of the pool by freshwater marsh species). This will entail preserving the watershed necessary to support these pools, as measured by topography and soils. Finally, because of its shape (i.e., high edge-to-area ratio) and adjacent land uses, this population is also highly susceptible to edge effects (e.g., invasion of nonnative plants).

A watershed analysis was recently conducted on the parcel adjacent to the Poinsettia Lane vernal pools. This analysis was initiated because of the potential for proposed development to impact the vernal pool watershed. Results of this analysis found that the Poinsettia Lane vernal pools and immediately surrounding habitat are restricted to Huerhuero loam soils, and that these soils extend only slightly into the adjacent property (e.g., typically about 25 feet) (H. Wier pers. comm.). Huerhuero soils are moderately well drained loams with a clay subsoil that developed in sandy marine sediments. In undisturbed situations, they can support mima mounds (USDA-SCS 1973). The Huerhuero soils are replaced on the adjacent property by Marina loamy coarse sand (H. Wier pers. comm.). Marina soils are excessively drained, deep loamy coarse sands that are characterized by rapid permeability (USDA-SCS 1973). These soils do not have a clay subsoil, and are not expected to be important in maintaining pool hydrology because of their rapid permeability. The development proposal on this adjacent property

includes a setback of 100 feet, which will be entirely on the Marina loamy coarse sands (H. Wier pers. comm.).

Genetic consequences are a concern in preserve design for vernal pool species. Although gene flow between vernal pool complexes appears to be low (Fugate 1993, in USFWS 1998; Davies 1996, in USFWS 1998), flooding between pools within a complex is an important means of augmenting gene flow in populations already naturally low in variability (Davies 1996, in USFWS 1998). Disruptions of the watershed that compromise gene exchange within a complex may result in a loss of genetic variability and an increased risk of extinction (Soulé 1986). The Carlsbad pools likely occur in only a portion of their former watershed. From a genetic perspective, conservation of California Orcutt grass within this complex will require maintenance of the hydrological flow between pools. It should be recognized, however, that the existing variability might be too low to prevent adverse genetic consequences (e.g., inbreeding depression).

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species, and therefore contribute to species recovery. The MHCP preserve design and avoidance policies conserve the only known location (which is considered a major population and critical location) of this species in the study area. Management of both edge effects and the hydrological regime of the Poinsettia Lane vernal pools will be a critical component of maintaining or enhancing population viability. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Special Considerations. California Orcutt grass has specific hydrological requirements. Therefore, effective conservation of this species must manage the vernal pool watershed in a manner that maintains both the hydrological regime and water quality.

Adaptive Management Program

If a subarea meets all required conditions and receives coverage for this species, it will be managed and monitored in conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

As part of the recovery plan for vernal pools, the USFWS has proposed a number of management actions that may benefit this species. These include reestablishing vernal pool habitat, rehabilitating and enhancing vernal pools and their constituent species, managing and monitoring protected habitat, and research to investigate biological factors affecting recovery (USFWS 1998). The recovery plan also recognizes that the conservation potential for the Carlsbad pools at Poinsettia Lane is limited to management activities (USFWS 1998). Management actions for California Orcutt grass within the MHCP should coordinate with existing programs (e.g., MSCP, USFWS recovery efforts) to ensure compatibility of monitoring results and prevent duplication of efforts.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for California Orcutt grass. Conduct demographic and ecological research on California Orcutt grass, and identify management requirements for this species. Specific studies might focus on reproductive and seed dispersal strategies, seed and pollen viability, germination requirements, seed bank ecology, and management techniques for maintaining viable populations.

Torrey Pine

Pinus torreyana ssp. *torreyana*

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: None

MHCP: None

Conservation Goals

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat of Torrey pine.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery. Implement species-specific management actions as necessary to enhance or protect habitat quality. These may include prohibiting adverse activities within preserve areas and developing fire management guidelines.

Coverage Determination and Permit Conditions

Coverage Determination. Covered.

Rationale. The MHCP will adequately conserve this species by conserving 77% of potential habitat and 65% of point locations (18 of 27 locations are within the FPA). The plan protects the great majority of naturally occurring (not planted) trees within relatively large blocks of natural habitat.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. Fire management plans must be implemented for all conserved populations to protect them from frequent or high-intensity fires and fire suppression activities. If determined necessary to maintain the population, develop fire management guidelines within conserved areas that limit fire frequency and emergency access.
2. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. Torrey pine may be the most restricted pine species in California, occurring only along the coast of San Diego County near Del Mar. The major population of this species occurs in Torrey Pines State Reserve (including the extension) in the MSCP study area, where it is protected and managed. Smaller stands and/or individuals occur in Carlsbad, Encinitas, Del Mar, Carmel Mountain, and the

San Dieguito River Valley. Within the MHCP, this species is restricted to Carlsbad (one occurrence south of Palomar Airport Road) and several locations in Encinitas (see MHCP Database Records Map). Some of the trees mapped in Encinitas and included in the MHCP database have been planted. Torrey pine typically occurs in Torrey pine forest or as inclusions in southern maritime chaparral. Within the MHCP study area, no major populations or critical locations have been identified to date for this taxon.

Threats and Limiting Factors. The primary threats to this species are development and insect infestations (the attacks by the five-spined ips bark beetle at Torrey Pines State Reserve have apparently been contained by biological controls and the end of a long drought period (Skinner and Pavlik 1994; Ledig 1996).

Special Considerations. Torrey pine is a wind-pollinated coniferous tree. This taxon may be self-fertile (Ledig 1987) and apparently possesses extremely low genetic variability (Ledig 1987). Based on its low genetic variability, it has been suggested that this species could be managed in greatly reduced populations without seriously damaging its reproductive capacity from a genetic perspective (Ledig 1987). Small populations would, however, be more susceptible to extirpation from a variety of factors. Therefore, maintenance of large populations provides the best chance for long-term viability for this species. Seeds of this taxon are heavy and nearly wingless, so dispersal is limited (Ledig 1996). Torrey pine is a fire-adapted species for which the frequency and intensity of fire may be critical for regeneration (Barry 1988). The level of survey effort for this species in the study area is considered high.

Conservation Analysis

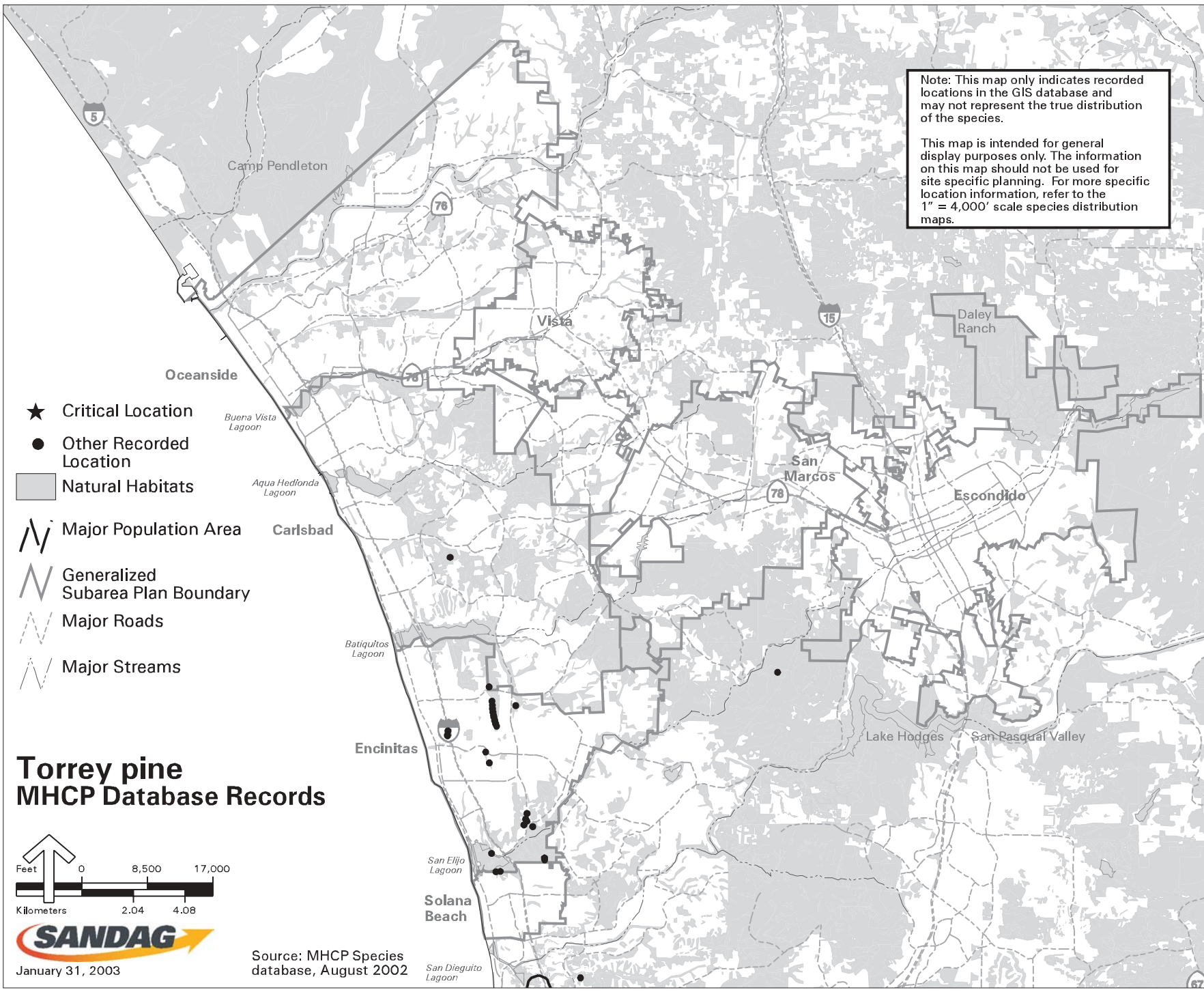
Conservation and Take Levels. The expected level of take of Torrey pine is relatively low (Table 4-27). The majority of points (65%) falls within the FPA and will be conserved at 100% in hardline areas and at the FPA percentage (or mitigation ratio) in softline areas within the FPA. No conservation will be required for this species outside the FPA. No major populations or critical locations of Torrey pine have been identified in the study area. Many of the point localities that do occur are reportedly planted rather than naturally occurring (e.g., the Ecke property in Encinitas).

In addition to conserved point localities, an estimated 748 acres (77%) of potentially suitable habitat will be conserved as a result of the existing preserve design and preserve policies (Table 4-27).

Preserve Configuration Issues. Many locations of Torrey pine in the study area consist of scattered individuals or stands of planted trees. The preserve design has focused on conserving naturally occurring trees within larger blocks of native habitat (e.g., San Elijo Lagoon, Lux Canyon). This configuration maintains connectivity between trees in the MHCP study area and trees to the south, in the MSCP study area (e.g., Torrey Pines State Reserve). Most conserved populations are potentially subject to edge effects.

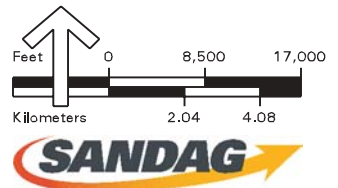
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- ▭ Major Population Area
- ▭ Generalized Subarea Plan Boundary
- Major Roads
- Major Streams

Torrey pine MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

Table 4-27

**SUMMARY OF NET CONSERVATION FOR
TORREY PINE**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved	Other Considerations
Carlsbad	254 (71%)	1 of 2 (50%)	None identified	None identified	–
Encinitas	479 (85%)	17 of 25 (66%)	None identified	None identified	Many point localities are cultivated trees
Escondido	None present	None present	None present	None present	–
Oceanside	None present	None present	None present	None present	–
San Marcos	None present	None present	None present	None present	–
Solana Beach	16 (33%)	None known	None known	None known	–
Vista	None Present	None present	None present	None present	–
MHCP Total ⁴	748 (77%)	18 of 27 (65%)	None known	None known	–

¹ Habitat for Torrey pine is Torrey pine forest (none present in MHCP study area) and southern maritime chaparral.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting suitable vegetation) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ Numbers may not total due to rounding.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species and therefore contribute to species recovery. The MHCP preserve design conserves the majority of naturally occurring trees within larger blocks of habitat, as well as additional, potentially suitable habitat. MHCP management practices will address threats that have resulted in the decline of this species throughout the study area. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Special Considerations. Torrey pine is a fire-adapted species; like other species that rely on fire for recruitment or regeneration, however, it may be adversely affected by unnatural fire regimes (e.g., frequent fires, high-intensity fires resulting from fire suppression policies). Effective conservation of this species must include a fire management plan that protects conserved populations from frequent or high-intensity fires.

Adaptive Management Program

If a subarea meets all required conditions and receives coverage for this species, it will be managed and monitored in conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for Torrey pine. Conduct studies that refine management requirements for Torrey pine. Specific studies might focus on management techniques (including controlled burns) for maintaining viable populations.

Nuttall's Scrub Oak

Quercus dumosa

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: None

MHCP: None

Conservation Goals

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat of Nuttall's scrub oak.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat and adjacent habitat that supports seed dispersal agents). Implement species-specific management actions as necessary to enhance or protect habitat quality. These may include prohibiting adverse activities within preserve areas and developing fire management guidelines.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP will adequately conserve this species by conserving 66% of potential habitat, 68% of point locations (42 of 61 locations are within the FPA), and 86% of the critical locations and major populations.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. The major population and critical location at Agua Hedionda in Carlsbad must be conserved at a level consistent with the critical location policy and managed as part of the preserve system.
2. Fire management plans must be implemented for all conserved populations to promote biological goals (e.g., regeneration), while protecting individual plants and habitat from frequent or high-intensity fires and fire suppression activities. Develop fire management guidelines within conserved areas that incorporate controlled burns (or other fuel reduction methods in urban areas), while limiting fire frequency and emergency access.
3. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. Nuttall's scrub oak has a disjunct distribution that includes Santa Barbara, Orange, and San Diego counties (Skinner and Pavlik 1994). The species also occurs southward to the Punta Banda region of Baja California, Mexico (F. Roberts pers. comm.). In San Diego County, Nuttall's scrub oak has been documented below 500-meter (1,640 feet) elevation in Carlsbad, Encinitas, Queshaven, Solana Beach, and San Dieguito County Park. The Carlsbad, Encinitas, and Solana Beach locations occur in the MHCP study area. It should be noted that this species was only recently described, and its full range has yet to be defined. Nuttall's scrub oak generally occurs in sandy soils near the coast, in association with chaparral and coastal sage scrub.

Within the MHCP, major populations of this species occur in Carlsbad (Agua Hedionda, vicinity of Green Valley) and Encinitas (vicinity of Green Valley, Lux Canyon) (see MHCP Database Records Map). These populations are considered critical locations. That portion of the Green Valley population that occurs in Carlsbad is on an already permitted property (i.e., Fieldstone HCP property) and is not included in this analysis.

Threats and Limiting Factors. The primary threats to this species are development and associated edge effects.

Special Considerations. Nuttall's scrub oak is a fire-adapted evergreen shrub that resprouts from buried root crowns (Conrad 1987; Pavlik et al. 1991). It is also wind-pollinated, and seeds (acorns) are both self- and animal-dispersed. Nuttall's scrub oak hybridizes with *Q. berberidifolia*. The level of survey effort for this species in the study area is considered moderate. Although the species' range is fairly well defined along the immediate coast, its inland extent has not yet been clearly established.

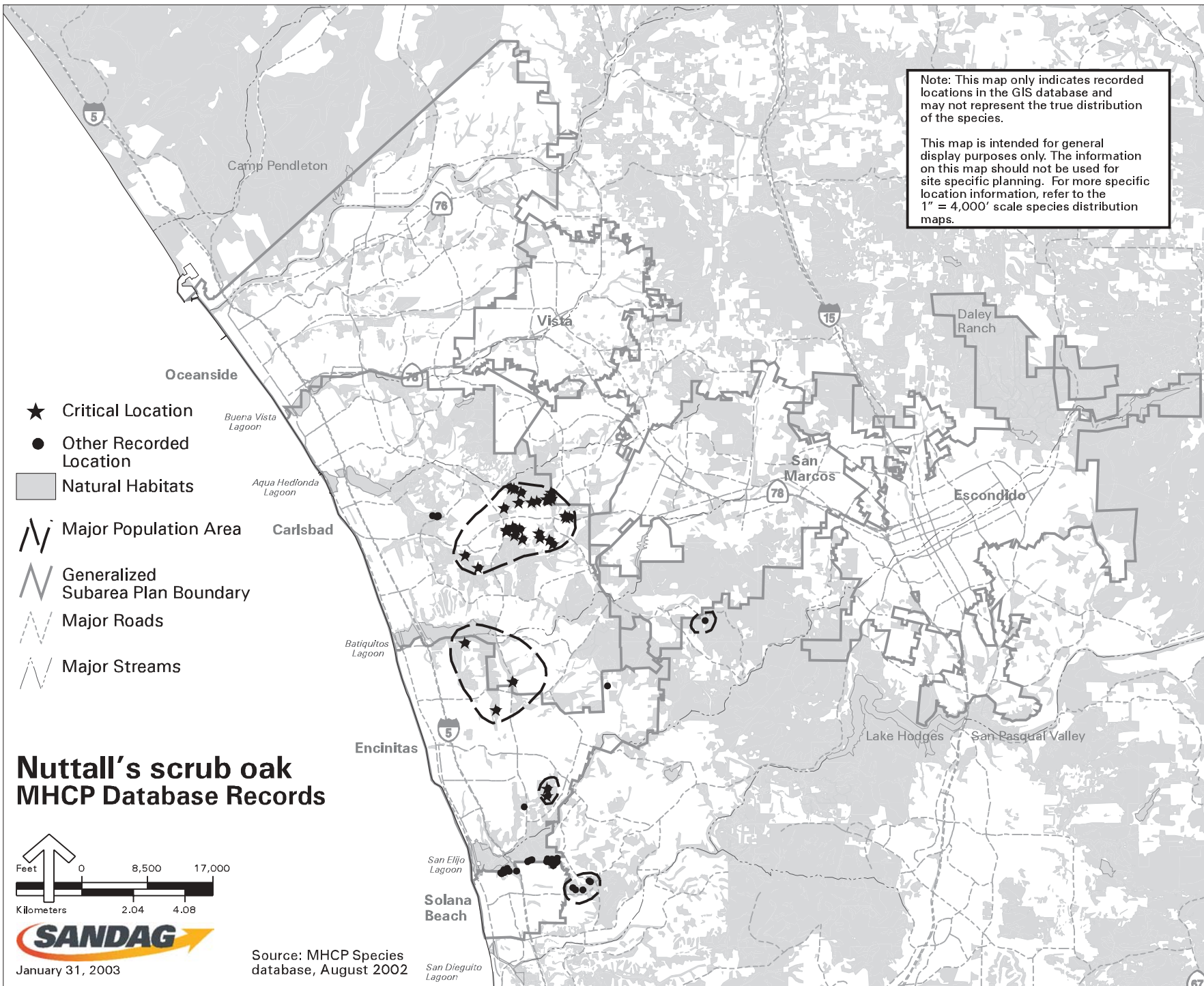
Conservation Analysis

Conservation and Take Levels. The expected level of take of known locations of Nuttall's scrub oak is relatively low (Table 4-28). This species has not been well surveyed for throughout the study area. The majority of points (68%) falls within the FPA and will be conserved at 100% within hardline areas and at the FPA percentage (or mitigation ratio) within softline areas. No conservation is required for this species outside the FPA.

Overall, 86% of major populations of this species are conserved in the study area. Of the three major populations (all critical locations) of this species identified in the study area, two will be conserved in their entirety (that portion of the Green Valley population that occurs in the analysis area and the Lux Canyon population) and another (Agua Hedionda) is currently conserved at a 58% level. This population in Carlsbad must be 100% conserved under permit conditions. An estimated 33% of the point localities in the Green Valley population occur within an already permitted property (i.e., the Fieldstone HCP property) and were not considered in this analysis.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



★ Critical Location

● Other Recorded Location

■ Natural Habitats

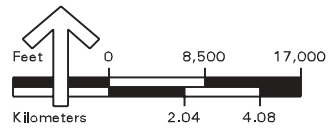
▭ Major Population Area

▭ Generalized Subarea Plan Boundary

▭ Major Roads

▭ Major Streams

Nuttall's scrub oak MHCP Database Records



Source: MHCP Species database, August 2002

San Diego Lagoon

Table 4-28

**SUMMARY OF NET CONSERVATION FOR
NUTTALL'S SCRUB OAK**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved	Other Considerations
Carlsbad	1,792 (69%)	20 of 35 (56%)	58% ⁴	58% ⁴	Green Valley population occurs on an already permitted property
Encinitas	789 (68%)	18 of 20 (90%)	100%	100%	–
Escondido	5,352 (76%)	None known	None known	None known	–
Oceanside	713 (52%)	None known	None known	None known	–
San Marcos	2,164 (51%)	None known	None known	None known	–
Solana Beach	16 (3%)	4 of 6 (67%)	None identified	None identified	–
Vista	317 (58%)	None known	None known	None known	–
MHCP Total⁵	11,140 (66%)	42 of 61 (68%)	86%	86%	–

¹ Habitat for Nuttall's scrub oak includes chaparral and coastal sage scrub.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting suitable vegetation) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ That portion of the Green Valley population that lies within Carlsbad is on an already permitted property (i.e., Fieldstone HCP) and is not included in this analysis. Percent conserved applies only to the Agua Hedionda population.

⁵ Numbers may not total due to rounding.

In addition to conserved point localities, an estimated 11,140 acres (66%) of potentially suitable habitat will be conserved as a result of the existing preserve design and preserve policies (Table 4-28). This acreage includes all conserved chaparral and coastal sage scrub in the FPA and is likely an overestimation of suitable habitat based on current knowledge of the primarily coastal distribution of this species. If suitable habitat is considered to occur only in coastal cities (Oceanside, Carlsbad, Encinitas, and Solana Beach), then an estimated 3,308 acres (64%) would be conserved as a result of the existing preserve design and preserve policies.

Preserve Configuration Issues. Within the MHCP, Nuttall's scrub oak occurs in Carlsbad, Encinitas, and Solana Beach, and the proposed preserve design conserves the majority of populations in a configuration that will not adversely affect the potential exchange of genetic material between populations relative to existing conditions. At least two of the major populations (Green Valley and Lux Canyon) occur within relatively large blocks of intact habitat (~350 acres and >125 acres, respectively) that may support appropriate dispersal agents. The Agua Hedionda major population occurs in smaller stands of habitat and is susceptible to edge effects. Although not identified as a major population or critical location, oaks adjacent to San Elijo Lagoon occur in a smaller stand of habitat (~50 acres). This area is bordered by development to the south and subject to edge effects.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species and therefore contribute to species recovery. The MHCP preserve design and avoidance policies conserve the majority of known locations, while MHCP management practices will address threats that have resulted in the decline of this species throughout the study area. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Special Considerations. Nuttall's scrub oak is a fire-adapted species; like other species that rely on fire for recruitment or regeneration, however, it may be adversely affected by unnatural fire regimes (e.g., frequent fires, high-intensity fires resulting from fire suppression policies). Effective conservation of this species must include a fire management plan that protects conserved populations from frequent or high-intensity fires. Adequate preserve design for this species must also include sufficient habitat to support seed dispersal agents.

Adaptive Management Program

If a subarea meets all required conditions and receives coverage for this species, it will be managed and monitored in conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for Nuttall's scrub oak. Conduct demographic and ecological research on Nuttall's scrub oak, and identify management requirements for this species. Specific studies might focus on germination requirements, seedling recruitment, specific habitat requirements, and management techniques (e.g., controlled burning, cutting) for maintaining viable populations.

Engelmann Oak*Quercus engelmannii***USFWS: None****CDFG: None****MHCP: None****Conservation Goals**

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat of Engelmann oak.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat and adjacent habitat that supports seed dispersal agents). Implement species-specific management actions as necessary to enhance or protect habitat quality. These may include prohibiting adverse activities within preserve areas, developing fire management guidelines, and enhancing declining populations and restoring damaged habitat.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP will adequately conserve this species by conserving 82% of potential habitat, 83% of point locations (66 of 79 locations are within the FPA), and 84% of the critical locations and major populations.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. All critical locations in Escondido must be substantially conserved in accordance with the critical location policy and managed as part of the preserve system.
2. Fire management plans must be implemented for all conserved populations to protect individual plants and habitat from frequent or high-intensity fires.
3. Declining populations must be enhanced, and damaged habitat restored, if determined necessary through monitoring. Enhancement may include introduction of plant materials to existing populations, while restoration may include site-specific habitat improvement activities. Unless analyses determine that there is no significant genetic variation between populations, introduced plant materials must be from the parental population or a population in proximity.

4. Impacts to individual trees shall be avoided and minimized to the greatest extent practicable during project design.
5. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. Engelmann oak occurs in Los Angeles, Orange, Riverside, and San Diego counties; on Santa Catalina Island (one tree); and in Baja California, Mexico (Skinner and Pavlik 1994). In San Diego County, the species occurs primarily east of the MHCP study area, from the Santa Margarita Mountains on the Riverside County-San Diego County border southward towards Dulzura, and east to the desert slope. Large populations are found in Pala, Lake Wohlford, Twin Flats, Boden Canyon, Clevenger Canyon, Escondido, Valley Center, Ramona, and Featherstone Canyon. Over 90% of the remaining stands of this species are estimated to occur in San Diego County (Pavlik et al. 1991). Within the MHCP study area, small stands and/or individual trees are found in Carlsbad (vicinity of Agua Hedionda), and larger stands occur in Escondido (Lake Wohlford and Daley Ranch).⁷ Engelmann oak occurs in canyons and on open slopes in foothill and coastal regions, where it is associated with Engelmann oak woodland, chaparral, and grassland.

Within the MHCP, two major populations of Engelmann oak have been identified in Escondido: Lake Wohlford and Daley Ranch (see MHCP Database Records Map). Both populations are considered critical locations.

Threats and Limiting Factors. The primary threats to this species are development and livestock grazing.

Special Considerations. Engelmann oak is a deciduous tree. Seedlings are fire-tolerant, but mature trees are “fire-sensitive” (Pavlik et al. 1991). Engelmann oak is wind-pollinated, and seeds (acorns) are both self- and animal-dispersed. The level of survey effort for this species in the study area is considered relatively high.

Conservation Analysis

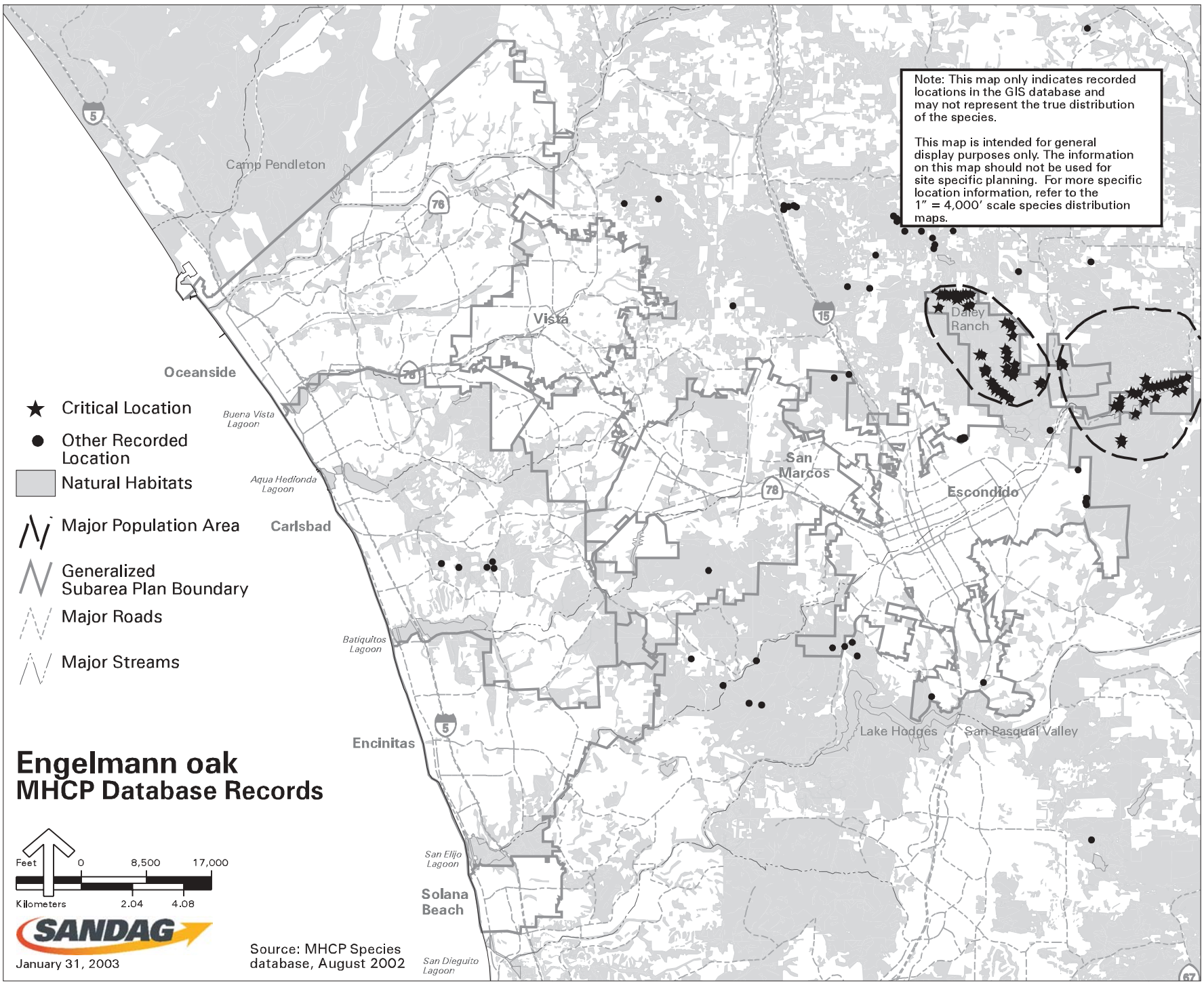
Conservation and Take Levels. The expected level of take of Engelmann oak is relatively low (Table 4-29). The majority of points (83%) falls within the FPA and will be conserved at 100% within hardline areas and at the FPA percentage within softline areas. No conservation is required for this species outside the FPA.

Overall, 84% of the major and critical location of this species is proposed to be conserved in the study area. This includes an estimated 72% of the Lake Wohlford population and

⁷ The Daley Ranch population was referred to as Escondido (Oat Hills, Dixon Lake) in the Standards and Guidelines (Ogden 1998).

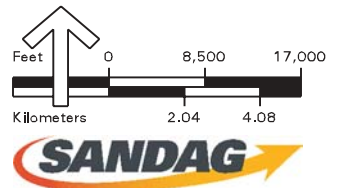
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- ▭ Major Population Area
- ▭ Generalized Subarea Plan Boundary
- ▭ Major Roads
- ▭ Major Streams

Englemann oak MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Diego Lagoon

Table 4-29**SUMMARY OF NET CONSERVATION FOR
ENGELMANN OAK**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved³	Major Populations Conserved	Critical Locations Conserved
Carlsbad	None present	1 of 3 (33%)	None identified	None identified
Encinitas	None present	None present	None present	None present
Escondido	168 (82%)	64 of 75 (85%)	84%	84%
Oceanside	None present	None present	None present	None present
San Marcos	19 (82%)	1 of 1 (100%)	None identified	None identified
Solana Beach	None present	None present	None present	None present
Vista	None present	None present	None present	None present
MHCP Total⁴	188 (82%)	66 of 79 (83%)	84%	84%

¹ Habitat for Engelmann oak is Engelmann oak woodland.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting suitable vegetation) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

⁴ Numbers may not total due to rounding.

95% of the Daley Ranch population. The critical location policy requires substantial conservation of these populations.

In addition to conserved point localities, an estimated 188 acres (82%) of potentially suitable habitat will be conserved as a result of the existing preserve design and preserve policies (Table 4-29).

Preserve Configuration Issues. The two major populations of Engelmann oak identified in the MHCP study area will be conserved in relatively large blocks of habitat (150 to 500+ acres) that include a mosaic of vegetation. Conserved habitat that supports the Daley Ranch population, in particular, is sufficiently large that it is expected to support appropriate seed dispersal agents and buffer against edge effects. The Lake Wohlford population occurs partially in a softline area, and the final preserve design will need to minimize habitat fragmentation.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species and therefore contribute to species recovery. The MHCP preserve design and avoidance policies conserve the majority of known locations, while MHCP management practices will address threats that have resulted in the decline of this species throughout the study area. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Special Considerations. Mature Engelmann oaks may be adversely affected by unnatural fire regimes (e.g., frequent fires, high-intensity fires resulting from fire suppression policies). Effective conservation of this species must include a fire management plan that protects conserved populations from frequent or high-intensity fires. Adequate preserve design for this species must also include sufficient habitat to support seed dispersal agents.

Adaptive Management Program

If a subarea meets all required conditions and receives coverage for this species, it will be managed and monitored in conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for Engelmann oak. Conduct demographic and ecological research on Engelmann oak, and identify management requirements for this species. Specific studies might focus on germination requirements, seedling recruitment, specific habitat requirements, and management techniques (e.g., controlled burning, exclusion of grazing) for maintaining viable populations.

Parry's Tetracoccus*Tetracoccus dioicus***USFWS: Federal Species of Concern (former Category 2 Candidate)****CDFG: None****MHCP: None****Conservation Goals**

Ensure species persistence within the plan area by conserving major populations, critical locations, and required habitat of Parry's tetracoccus.

Conservation Strategy

Conserve and manage all major populations and critical locations along with an amount and configuration of suitable habitat to contribute to species recovery (including occupied habitat and adjacent habitat that supports appropriate pollinators). Implement species-specific management actions as necessary to enhance or protect habitat quality. These may include prohibiting adverse activities within preserve areas and developing fire management guidelines.

Coverage Determination and Permit Conditions

Coverage Determination. Covered.

Rationale. The MHCP will adequately conserve this species by conserving 75% of potential habitat. Although the species is only known from one location in the study area, it may occur within some preserve areas (e.g., Daley Ranch). No major populations or critical populations occur in the study area, but the species has the potential to occur in San Marcos and Escondido.

Conditions. The following conditions must be met by subarea plan to adequately conserve this species.

1. Fire management plans must be implemented for all conserved populations to promote biological goals (e.g., regeneration), while protecting individual plants and habitat from frequent or high-intensity fires and fire suppression activities. Develop fire management guidelines within conserved areas that incorporate controlled burns (or other fuel reduction methods in urban areas), while limiting fire frequency and emergency access.
2. All species-specific monitoring and management identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. Parry's tetracoccus occurs in Orange, Riverside, and San Diego counties, and in Baja California, Mexico (Skinner and Pavlik 1994). In San Diego County, the species occurs sporadically throughout the coastal foothills. Representative locations include Fallbrook (Red Mountain Grade), Agua Tibia Mountains, Rainbow, San Marcos Mountains, Vista, Ramona, Barona Valley, McGinty Mountain, Sequan Peak, Lee Valley, Dehesa, Tecate Junction, and Jacumba (H. Wier pers. comm.; Beauchamp 1986). This species has not been documented within the MHCP study area. Rieser (1994) reports Parry's tetracoccus from west of Twin Oaks Valley Road, in the San Marcos Hills; however, appropriate habitat and soils in this area occur just north of the MHCP boundary. Nonetheless, this species has a high potential for occurrence in chaparral and scrub habitats in Escondido and, possibly, San Marcos. Parry's tetracoccus occurs in chaparral and coastal sage scrub and is typically associated with gabbro soils.

Within the MHCP, no major populations or critical locations have been identified to date for this species (see MHCP Database Records Map).

Threats and Limiting Factors. The primary threats to this species are development and agriculture.

Special Considerations. Parry's tetracoccus is a shrub that is likely a fire-adapted species that may be enhanced by fire; however, the exact fire-response mechanism is not known. This species is presumably insect-pollinated (Crepet 1983), and seeds are presumably self-dispersed. The level of survey effort for this species in the study area is considered moderate, particularly in the northeastern portion of the study area.

Conservation Analysis

Conservation and Take Levels. Parry's tetracoccus is not currently known from the MHCP study area, although the species does occur to the east and southeast, in the MSCP study area and in the County of San Diego's unincorporated area. An estimated 75% of potentially suitable habitat for this species will be conserved in the FPA (Table 4-30). Within the FPA, 100% of any newly detected localities would be conserved in hardline areas, while the percent conservation in softline areas would be according to the FPA percentage (or mitigation ratio).

Preserve Configuration Issues. The proposed preserve design will conserve an estimated 75% of potentially suitable habitat for this species inside the FPA. Most of this acreage occurs in relatively large blocks of habitat that are expected to support appropriate pollinators and buffer against edge effects.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.

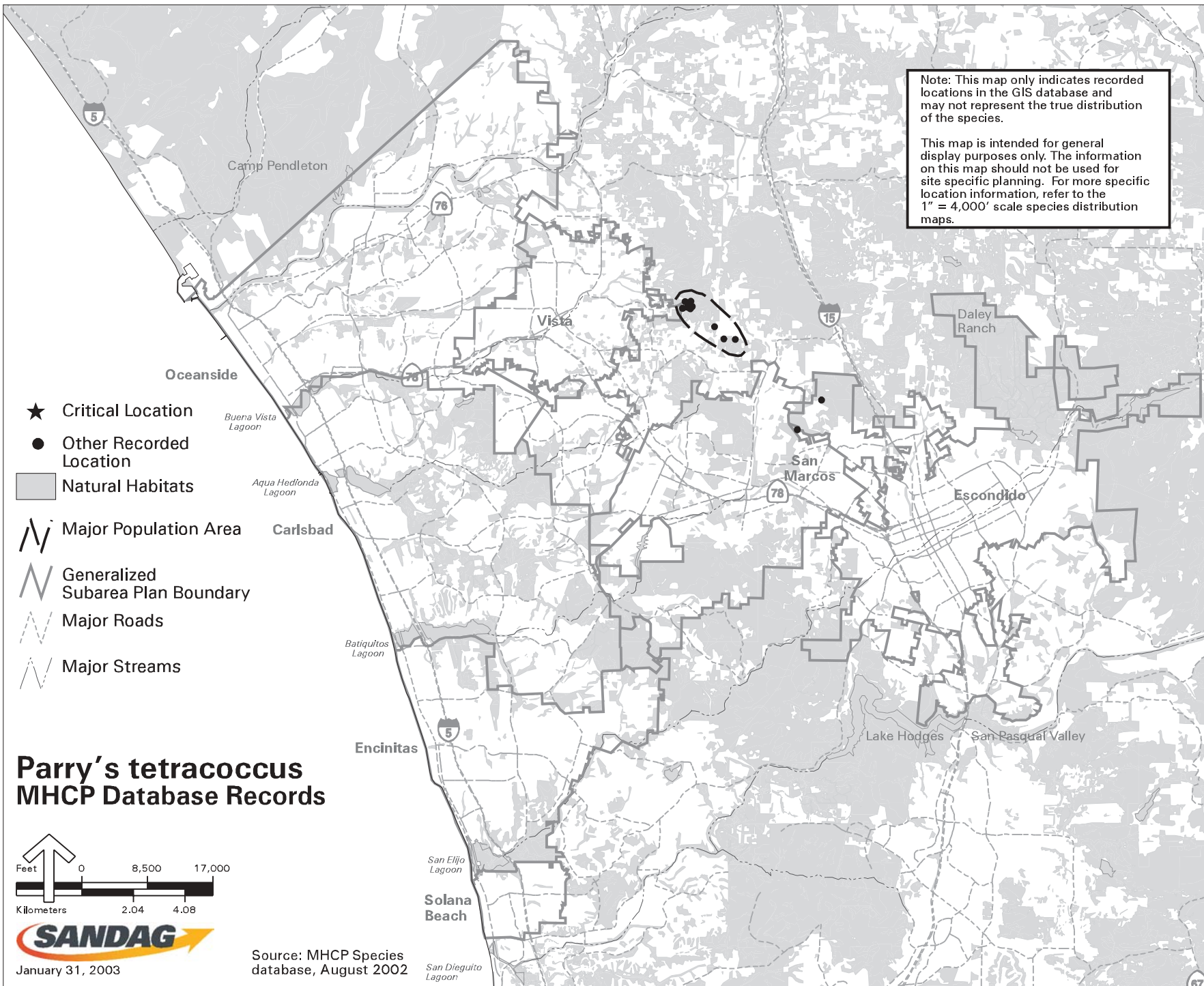


Table 4-30

**SUMMARY OF NET CONSERVATION FOR
PARRY'S TETRACOCCLUS**

City	Habitat Acreage Conserved^{1,2}	Location Points Conserved	Major Populations Conserved	Critical Locations Conserved
Carlsbad	69 (100%)	None known	None known	None known
Encinitas	None present	None present	None present	None present
Escondido	720 (81%)	0 of 1 (0%)	None known	None known
Oceanside	0 (0%)	None known	None known	None known
San Marcos	13 (43%)	None known	None known	None known
Solana Beach	None present	None present	None present	None present
Vista	4 (5%)	None known	None known	None known
MHCP Total³	806 (75%)	0 of 1 (0%)	None known	None known

¹ Habitat for Parry's tetracoccus is chaparral and coastal sage scrub on gabbro soils.

² Number indicates the acreage of appropriate habitat (i.e., habitat supporting both suitable vegetation *and* soil types) that is conserved. Number in parentheses indicates the percentage of appropriate habitat that is conserved.

³ Numbers may not total due to rounding.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to sustain and possibly enhance population viability for this species, if present in the FPA, and therefore contribute to species recovery. If Parry's tetracoccus is detected in the future, the MHCP preserve design and avoidance policies are expected to conserve the majority of known locations, while MHCP management practices will address threats that have resulted in the decline of this species in the region. The MHCP will increase funding for monitoring and management, which may improve species stability and long-term persistence.

Special Considerations. Parry's tetracoccus is likely a fire-adapted species; however, like other species that rely on fire for recruitment or regeneration, it may be adversely affected by unnatural fire regimes (e.g., frequent fires, high-intensity fires resulting from fire suppression policies). Effective conservation of this species must include a fire management plan that protects conserved populations from frequent or high-intensity fires. Adequate preserve design for this species must also include sufficient habitat to support pollinators.

Adaptive Management Program

If a subarea meets all required conditions and receives coverage for this species, it will be managed and monitored in conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Implement a research program for Parry's tetracoccus. Conduct demographic and ecological research on Parry's tetracoccus, and identify management requirements for this species. Specific studies might focus on germination requirements, specific habitat requirements, and management techniques (e.g., controlled burning) for maintaining viable populations.

SECTION 4.2

ANIMALS

4.2 ANIMALS

Of the 48 animals evaluated for coverage, 31 are considered adequately conserved by the MHCP, provided that all permit conditions are met. The other 17 species include 5 that could be covered with additional measures, and 12 for which no feasible conservation conditions are apparent.

- **Not covered, unless subarea plans adopt additional measures.** These species might be covered in cities that incorporate additional species-specific measures in their subarea plans: San Diego fairy shrimp, Quino checkerspot butterfly, Arroyo toad, San Diego horned lizard, and Pacific pocket mouse.
- **Not covered.** The plan does not meet take authorization standards or MHCP biological goals for the following species, and there is little opportunity to improve conservation for them:
 - (1) *Extirpated:* The red-legged frog, which is federally threatened, does not currently exist in the study area and is highly unlikely to exist in the future due to lack of suitable habitat and abundance of detrimental exotic species.
 - (2) *Insufficient Information:* Too little is known about the distribution, abundance, or biology of seven species to determine effects of the plan on their viability or to prescribe necessary and sufficient conservation conditions: sandy tiger beetle, oblivious tiger beetle, globose dune beetle, Hermes copper butterfly, long-billed curlew, Townsend's bat, and California mastiff bat. For some of these species, additional information obtained in the future may make it possible to devise species-specific conservation conditions to allow for coverage.
 - (3) *Insufficient Conservation:* The following species depend on grassland habitats, which will be insufficiently conserved by the MHCP to ensure species persistence in the plan area: grasshopper sparrow, northern harrier, tricolored blackbird, and burrowing owl.

4.2.1 Key to Reading Animal Species Evaluations

It is important that the reader understands the format and the limitations of the species evaluation contents. Each species evaluation is organized as follows:

Conservation Goals – This brief statement is tailored to reflect functional, attainable goals that the MHCP should strive for to contribute to the species' regional viability. For example, the MHCP cannot by itself ensure continued viability of the California gnatcatcher in southern California, but it can strive to maintain a viable stepping-stone connection between core populations north and south of the MHCP area.

Conservation Strategy – This section briefly lays out the overall strategy that would be necessary to achieve the goals, such as conserving critical populations and managing them to remove threats and increase population size.

Coverage Determination and Conditions for Coverage – This section summarizes results of the analysis of species coverage, including how well the plan is expected to achieve the Conservation Goals and Conservation Strategy defined above. It also provides species-specific permitting conditions that must be met for a city to receive take authorizations for the species or its habitat.

1. Coverage Determination. This places the species in one of the four categories defined (page 4-1): (1) covered; (2) covered, subject to species-specific conditions; (3) not covered, unless subarea plans adopt additional measures; and (4) not covered. Note that these determinations are not binding on the wildlife agencies and do not constitute their legal Findings under state and federal endangered species acts. However, these Coverage Determinations were reviewed by the agencies, and their future Findings for subarea plan Biological Opinions are expected to be generally consistent with these Determinations.
2. Rationale. Justifies the coverage determination by summarizing levels of conservation and take expected under the MHCP, and describing how well the plan reflects the conservation goals and strategies defined earlier for that species. In the event that some goals and strategies are not effectively met by the plan, additional permitting conditions become necessary.
3. Conditions. This is the most important section of each evaluation. It lists the permitting conditions that must be met for the participating cities to receive take authorizations for that species, keeping in mind that other MHCP policies also apply, even if they are not reiterated for each species.

Background – This section summarizes biological information pertinent to conservation planning and management for the species, including its distribution, abundance, and population trends; threats to the species and factors limiting its abundance; and special considerations for conserving, monitoring, and managing the species. Examples of special considerations might include information on the species' dispersal abilities, use of corridors, or susceptibility to non-native predators. A map showing MHCP database locations is included for each species having database records.

The background information provided in the species descriptions often references specific place names and locations within the MHCP area. The Reference Base Map (Section 4.1.1) depicts the place names and locations commonly used in the MHCP species accounts.

Conservation Analysis – This section summarizes the levels of conservation and take expected for the species, based on all the calculation methods and assumptions described in Section 2. For most species, one or more tables summarize the quantified levels of conservation expected under the FPA and MHCP policies. These tables must be interpreted with caution, due to the inherent limitations and biases in the biological database. For example, point counts do not represent population estimates, and points may be absent from some areas, due to lack of adequate surveys, even though the species occurs there. In light of such uncertainties, the conservation tables often contain the following terms:

- None known. Used where no point localities or major or critical locations have been detected, but there is a reasonable potential for the species to be present (e.g., suitable habitat present, point localities nearby).
- None present. Used where no point localities or major or critical locations have been identified, and there is a low potential for the species to be present (e.g., no or little suitable habitat, no known populations nearby).
- None in database. Used where sources indicate that the species has been found, but the data are not in the GIS database.
- None identified. Used only for major or critical populations, where point localities are present but have not been identified as major or critical populations.
- Unknown. Used for major or critical populations where percent conservation is unknown because locations are not in the database.

Tables quantifying levels of conservation are omitted for some species, where such quantification is meaningless with existing information. The conservation analysis section also discusses how the MHCP preserve configuration is expected to affect species viability via hypothesized effects on demographic and genetic connectivity, edge effects, and related issues. Finally, this section describes special considerations for conserving the species, such as managing to prevent human disturbance in nesting or roosting areas or adverse effects of exotic species.

Adaptive Management Program – In the Public Review Draft of this document, this section described priorities for monitoring and managing the species to guide development of the MHCP Biological Monitoring and Management Plan (which was not yet completed). Because the Monitoring and Management Plan is now available, this section now simply refers to that document for the various management and monitoring actions to be implemented for MHCP species. Where necessary, some monitoring and management actions are included in the species-specific permit conditions described earlier.

Riverside Fairy Shrimp*Streptocephalus woottoni***USFWS: Endangered****CDFG: None****MHCP: Narrow Endemic****MHCP: Obligate Wetland Species****Conservation Goals**

Ensure persistence of Riverside fairy shrimp in the plan area and contribute to the protection of genetic diversity for the species.

Conservation Strategy

Conserve all known major Riverside fairy shrimp populations, potential habitat, and vernal pool watersheds, including surface and subsurface hydrology that supports pool formation. Establish preserve boundaries that adequately protect the watersheds that maintain pools. Protect habitat and watersheds of all newly discovered vernal pools within the preserve. Prohibit activities within the preserve that could degrade Riverside fairy shrimp habitat. Adhere to all guidelines in and maintain consistency with the USFWS Recovery Plan for Vernal Pools of Southern California (USFWS 1998).

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP may help ensure persistence of the Riverside fairy shrimp in the area and contribute to regional genetic diversity, although this will require intensive management and monitoring. Only about 41% (9 of 22 acres) of mapped vernal pool habitat in the study area is within the FPA. An additional 29 acres are mapped within the San Marcos Major Amendment Area, which is not addressed in this plan. Both known species location points in the MHCP area are conserved at the Poinsettia pools in Carlsbad, which is a critical location. The species has not been recorded in the San Marcos pools. The MHCP Narrow Endemic Policy is expected to protect any additional populations found in the future. However it is uncertain whether management can overcome deleterious effects of habitat fragmentation on the species' metapopulation dynamics and genetic integrity, even if no further take is allowed.

Conditions. The following conditions must be met by subarea plans to adequately conserve this species.

1. All vernal pools and their watersheds within the MHCP study area must be 100% conserved, regardless of occupancy by this species and regardless of location inside or outside of the FPA, unless doing so would remove all economic uses of a property. In the event that no project alternative is feasible that avoids all impacts on a particular property, the impacts must be minimized and mitigated to achieve no net loss of biological functions and values through strict adherence to

- the Wetland Avoidance and Mitigation Criteria (Section 3.6.1 of MHCP Volume I), Standard Best Management Practices (Appendix B), and Revegetation Guidelines (Appendix C).
2. As part of the project review process (e.g., CEQA) for individual projects within the MHCP area, a qualified biologist possessing a Section 10(a)1(A) research permit for this species must survey all areas containing pools, using approved Riverside fairy shrimp survey protocol. Surveys shall be conducted when impacts could occur as a result of direct or indirect impacts by placement of a project in or adjacent to suitable habitat. Suitable habitat includes vernal pools as well as any other pools (natural or unnatural) that have potential to support fairy shrimp based on their physical, chemical, and biological attributes.
 3. All known or newly discovered populations of Riverside fairy shrimp and their habitat, including pool watersheds (surface and subsurface hydrology that support pool formation) and adequate adjacent upland habitat to allow for ecosystem processes to maintain this species, shall be preserved consistent with the Critical Population Policy (Appendix D) and managed as part of the preserve system.
 4. Management plans must prohibit and actively exclude any activities that could degrade vernal pool habitat, including but not limited to those activities listed in the threats section below.
 5. All species-specific monitoring identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. This narrow endemic species is known from only about nine general locations in southern California, including the Santa Rosa Plateau and the vicinity of Temecula in Riverside County (Eng, Belk, and Erikson 1990), several locations in southern Orange County (Dudek and Associates 1998), NAS Miramar (Simovich and Fugate 1992), Otay Mesa (Simovich and Fugate 1992), pools near Poinsettia Lane in west Carlsbad (D. Rideout personal communication), and numerous pools on Camp Pendleton (Ogden unpublished data). It also has been collected in Baja California, Mexico (Brown, Wier, and Belk 1994; USFWS 1998). Riverside fairy shrimp occupy pools in which the water persists into April or May and reaches a minimum depth of 30 centimeters (about 1 foot) at filling (Eng, Belk, and Erikson 1990). The species has also been observed in shallower pools on MCB Camp Pendleton (Ogden unpublished data). The Poinsettia Lane vernal pools in Carlsbad support critical and major populations within the MHCP area (see MHCP Database Records Map). The species has not yet been recorded in San Marcos vernal pools.

Threats and Limiting Factors. Urbanization, road construction, off-road vehicular traffic (including mountain biking), illegal dumping, degraded water quality, livestock grazing or equestrian uses, and edge effects. As a vernal pool endemic species, the Riverside fairy shrimp is limited by the distribution of soils and hydrology conducive to vernal pool development. Therefore, anything that disrupts the soils or hydrology is considered a limiting factor.

Special Considerations. This species may occupy pools other than vernal pools, including natural or man-made depressions that seasonally fill with water, as long as these pools have appropriate hydrological and chemical characteristics to support the species. Local watersheds surrounding occupied pools must be wholly or substantially conserved to collect sufficient water to sustain populations. Some pools may be supported by subsurface hydrology, which should also be considered when establishing watershed protection. Surface disturbance to pools by off-road vehicles, livestock grazing, mountain biking, or other such activities can break the clay hardpan and destroy the natural hydrology of pools at any time of year (i.e., even when pools are dry).

Conservation Analysis

Conservation and Take Levels. Only about 41% (9 of 22 acres) of mapped vernal pool habitat in the study area is within the FPA, with about 13 acres scattered outside the FPA in central and northern San Marcos (Table 4-31). An additional 29 acres of vernal pool habitat is mapped within the San Marcos Major Amendment Area, which is not addressed by this plan. There are two Riverside fairy shrimp location points in the MHCP, both of which are considered critical and are within the FPA in Carlsbad (100% conserved). The species has not been recorded in San Marcos pools. The MHCP no net loss policy for wetlands includes vernal pool habitat. Therefore, all vernal pools within the MHCP are expected to be 100% conserved regardless of location inside or outside the FPA. The MHCP Narrow Endemic Policy is expected to protect any additional populations found in the future. Impacts to pools in softline areas and areas outside the FPA will be avoided through site-specific preserve design, which must ensure that adequate buffer areas are established and maintained to preserve vernal pool hydrology. Riverside fairy shrimp occurring within vernal pools inside the FPA will be actively managed by the MHCP, while those outside the FPA will not necessarily be managed, unless they are added to the reserve by mitigation or other actions.

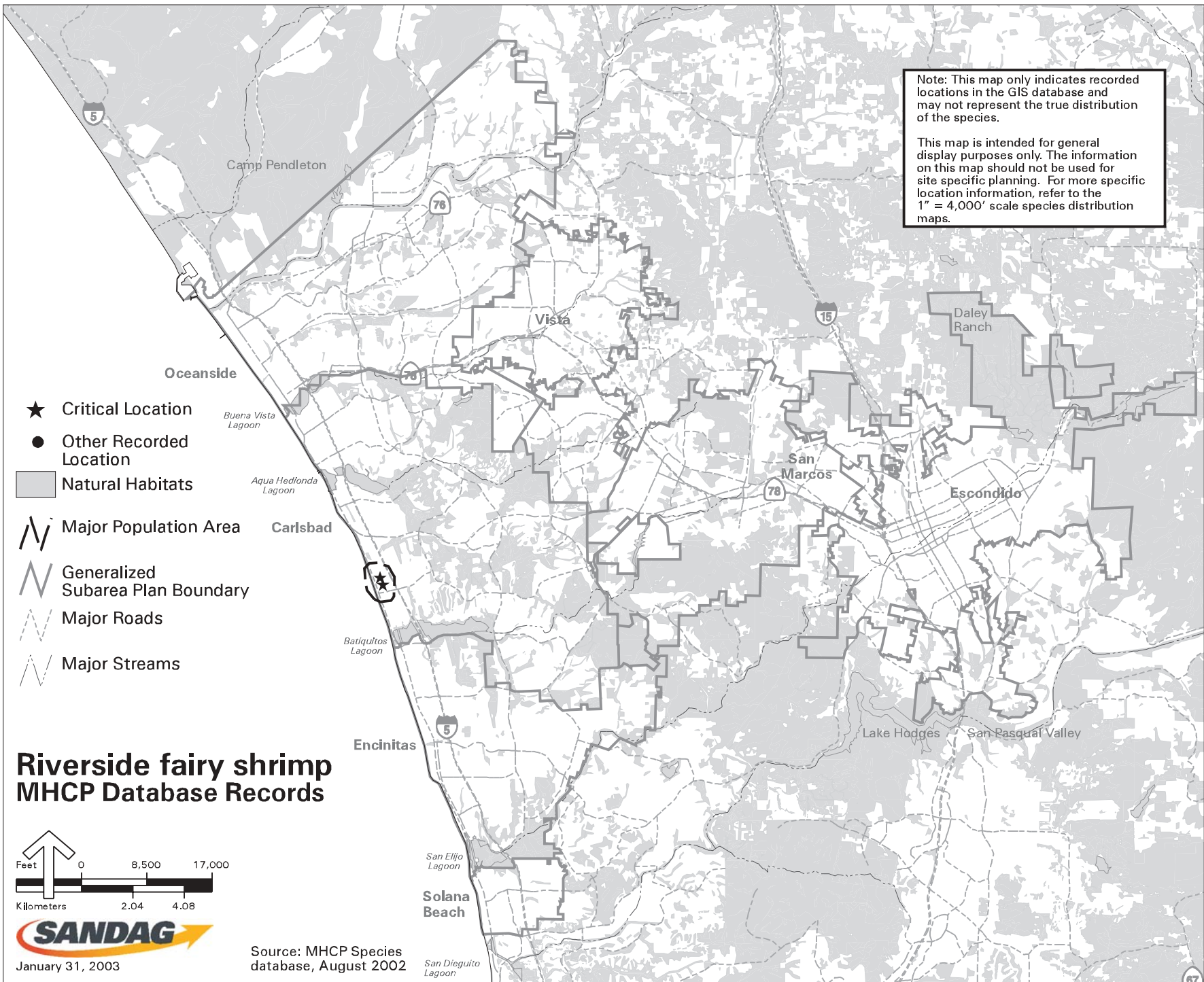
Table 4-31

**CONSERVATION SUMMARY FOR VERNAL POOL HABITAT
(ACRES) IN MHCP STUDY AREA**

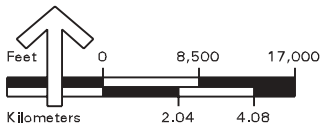
City	Total	In Major Amendment Areas	Inside MHCP Boundary	Inside FPA	Percent Conserved
Carlsbad	5	0	5	5	100%
Encinitas	-	-	-	-	-
Escondido	-	-	-	-	-
Oceanside	-	-	-	-	-
San Marcos	46	29	17	4	24%
Vista	-	-	-	-	-
Total	51	29	22	9	41%

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



Riverside fairy shrimp MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Dieguito Lagoon

Preserve Configuration Issues. Vernal pool communities are relatively self-contained systems dependent on local environmental conditions. However, pool complexes are connected by ecosystem processes that operate at broader scales, including fairy shrimp metapopulation dynamics. Riverside fairy shrimp exist in a metapopulation, where extirpation from any particular pool can be followed by recolonization from other nearby pools, such that individuals throughout the entire complex interbreed as a contiguous population (USFWS 1998). In addition, dispersal of fairy shrimp to more distant pools or pool complexes maintains gene flow throughout the regional fairy shrimp population. Therefore, although landscape level preserve configuration may be less important for fairy shrimp than for many other species, it is nevertheless important to species viability that complexes of pools be retained within a contiguous landscape. Local dispersal of fairy shrimp between pools in a complex may occur during periods of high inundation when several pools may be connected within a watershed (USFWS 1998). Long distance dispersal of Riverside fairy shrimp is thought to occur primarily by wind-blown eggs and by the transport of eggs and adults on the bodies of animals (e.g., on the feet of birds). Proximity to other vernal pools within a vernal pool complex is optimal for local recolonization and long-term persistence of the complex; however, isolated pools may receive immigrants by wind and bird dispersal as long as the distance between pools is not too great.

The distribution of vernal pools in the MHCP is very restricted, with few remaining pool complexes that can be conserved within contiguous landscapes. Populations of Riverside fairy shrimp in both sets of vernal pools (Carlsbad and San Marcos) are substantially isolated from other populations in the region. Vernal pools in Carlsbad are located along a narrow, linear strip of habitat between Poinsettia Lane and the train station. These pools are entirely within the preserve, and the existing hydrology appears adequate to support a viable vernal pool resource, as indicated by robust populations of several sensitive vernal pool species (see the species justification for vernal pool plant species, e.g., San Diego button-celery, for a more detailed description of the hydrological issues for these pools). It will be important to maintain the current hydrological regime to ensure that habitat is sustained. This will entail preserving the watershed necessary to support these pools, as measured by topography and soils. The potential for detrimental edge effects is high due to the linear configuration of these pools and their proximity to development. Risk of extinction of Riverside fairy shrimp within the plan area is high due to the single occurrence in the Poinsettia pools of Carlsbad. Riverside fairy shrimp are not known to occur in the San Marcos pools.

Effects on Population Viability and Species Recovery. The relatively small acreages of vernal pool habitat for the Riverside fairy shrimp and the high degree of isolation makes the MHCP fairy shrimp populations relatively unimportant demographically to the recovery of the species (e.g., these populations are not likely to produce significant numbers of dispersing individuals that reach other populations outside the MHCP). However, these isolated populations may be important reserves of genetic diversity. In this case, assuming that the genetic diversity of the species is studied and properly managed, conservation of these populations may contribute to the long-term viability of the species.

Special Considerations. Surveys should be done in any pools having appropriate hydrological and chemical characteristics to potentially support this species, which may include natural or man-made depressions not necessarily classified as vernal pools. Conservation and management for the species must also include management of the watershed surrounding pools and possibly the subsurface hydrology, both of which must be adequately conserved to provide sufficient water to sustain the pools. Some pools may be too isolated to be readily recolonized following local extinction. Therefore, artificial reintroduction of fairy shrimp may be required to expedite recolonization.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Additional research should be conducted to clarify ecological and management requirements of Riverside fairy shrimp, including metapopulation dynamics in the study area.
2. If indicated based by monitoring and research results, translocations among pools (from inside or outside of the MHCP study area) may be necessary to ensure demographic persistence and genetic diversity in conserved populations. Such actions must be guided by the species recovery plan and the best available science.

San Diego Fairy Shrimp*Branchinecta sandiegoensis***USFWS: Endangered****CDFG: None****MHCP: Narrow Endemic****MHCP: Obligate Wetland Species****Conservation Goals**

Ensure persistence of the San Diego fairy shrimp in the plan area and contribute to the protection of genetic diversity for the species.

Conservation Strategy

Conserve all known major San Diego fairy shrimp populations, potential habitat, and vernal pool watersheds, including surface and subsurface hydrology that supports pool formation. Establish preserve boundaries that adequately protect the watersheds that maintain pools. Protect habitat and watersheds of all newly discovered pools within the preserve. Prohibit activities within the preserve that could degrade San Diego fairy shrimp habitat. Adhere to all guidelines in and maintain consistency with the USFWS Recovery Plan for Vernal Pools of Southern California (USFWS 1998).

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, unless subarea plans adopt additional measures.

Rationale. The MHCP may help ensure persistence of San Diego fairy shrimp in the area and contribute to regional genetic diversity for the species, although this will require intensive management and monitoring. Only about 41% (9 of 22 acres) of mapped vernal pool habitat in the study area (excluding the San Marcos Major Amendment Area) is within the FPA. However, the one known population and critical location in the MHCP (the Carlsbad Poinsettia vernal pools) will be 100% conserved and managed. The other known population and critical location is in the San Marcos Major Amendment Area, whose 29 acres of vernal pool habitat are not addressed in this plan. It's uncertain whether management can overcome deleterious effects of habitat fragmentation on the species' metapopulation dynamics and genetic integrity, even if no further take is allowed.

Conditions. The following conditions must be met by subarea plans to adequately conserve this species.

1. All vernal pools and their watersheds within the MHCP study area must be 100% conserved, regardless of occupancy by this species and regardless of location inside or outside of the FPA, unless doing so would remove all economic uses of a property. In the event that no project alternative is feasible that avoids all impacts on a particular property, the impacts must be minimized and mitigated to achieve no net loss of biological functions and values through strict adherence to

- the Wetland Avoidance and Mitigation Criteria (Section 3.6.1 of MHCP Volume I), Standard Best Management Practices (Appendix B), and Revegetation Guidelines (Appendix C).
2. As part of the project review process (e.g., CEQA) for individual projects within the MHCP area, a qualified biologist possessing a Section 10(a)1(A) research permit for this species must survey all areas containing pools, using approved San Diego fairy shrimp survey protocol. Surveys shall be conducted when impacts could occur as a result of direct or indirect impacts by placement of a project in or adjacent to suitable habitat. Suitable habitat includes vernal pools as well as any other pools (natural or unnatural) that have potential to support fairy shrimp based on their physical, chemical, and biological attributes.
 3. All known or newly discovered populations of San Diego fairy shrimp and their habitat, including pool watersheds (surface and subsurface hydrology that support pool formation) and adequate adjacent upland habitat to allow for ecosystem processes to maintain this species, shall be preserved consistent with the Critical Population Policy (Appendix D) and managed as part of the preserve system.
 4. Management plans must prohibit and actively exclude any activities that could degrade vernal pool habitat, including but not limited to those activities listed in the threats section below.
 5. All species-specific monitoring identified in the MHCP Monitoring and Management Plan shall be implemented.

Background

Distribution, Abundance, and Trends. This species occurs in vernal pools from coastal Orange County to northern Baja California, Mexico, from near the coast (Orange County, Camp Pendleton) inland to Ramona (Simovich and Fugate 1992; Brown, Wier and Belk 1994; USFWS 1997a). In the MHCP area, this species is known from the Poinsettia pools in Carlsbad and pools within the San Marcos Major Amendment Area (see MHCP Database Records Map). San Diego fairy shrimp occur in vernal pools on mesas, in roadside ditches, and in shallow (<30 centimeters; <12 inches) tire ruts. Simovich and Fugate (1992) hatched eggs incubated at temperatures ranging from 10 to 15°C. Major populations occur in Carlsbad (near the railroad tracks north of Poinsettia Lane) and San Marcos (along Las Posas Road north and south of Highway 78). Both locations are considered critical in the MHCP.

Threats and Limiting Factors. Urbanization, road construction, off-road vehicular traffic (including mountain biking), illegal dumping, degraded water quality, livestock grazing or equestrian uses, and edge effects. As a vernal pool endemic species, the San Diego fairy shrimp is limited by the distribution of soils and hydrology conducive to vernal pool development. Therefore, anything that disrupts the soils or hydrology is considered a limiting factor.

Special Considerations. This species may occupy pools other than vernal pools, including natural or man-made depressions that seasonally fill with water, as long as

these pools have appropriate hydrological and chemical characteristics to support the species. Watershed surrounding pools must be adequately conserved to collect sufficient water to sustain the pools. Some pools may be supported by subsurface hydrology, which should also be considered when establishing watershed protection. Surface disturbance to pools by off-road vehicles, livestock grazing, mountain biking, or other such activities can break the clay hardpan and destroy the natural hydrology of pools at any time of year (i.e., even when pools are dry).

Conservation Analysis

Conservation and Take Levels. Only about 41% (9 of 22 acres) of mapped vernal pool habitat in the study area is within the FPA, with about 13 acres scattered outside the FPA in central and northern San Marcos (Table 4-32). An additional 29 acres of vernal pool habitat is mapped within the San Marcos Major Amendment Area, which is not addressed by this plan. There are two San Diego fairy shrimp location points in the MHCP (excluding the San Marcos Major Amendment Area), both of which are considered critical and are within the FPA in Carlsbad (100% conserved). The species is also known to occur in the San Marcos Major Amendment Area, which is not covered by this plan. The MHCP no net loss policy for wetlands includes vernal pool habitat. Therefore, all vernal pools within the MHCP are expected to be 100% conserved regardless of location inside or outside the FPA. The MHCP Narrow Endemic Policy is expected to protect any additional populations found in the future. Impacts to pools in softline areas and areas outside the FPA will be avoided through site-specific preserve design, which must ensure that adequate buffer areas are established and maintained to preserve vernal pool hydrology. San Diego fairy shrimp occurring within vernal pools inside the FPA will be actively managed by the MHCP, while those outside the FPA will not necessarily be managed, unless they are added to the reserve by mitigation or other actions.

Table 4-32

**CONSERVATION SUMMARY FOR VERNAL POOL HABITAT
(ACRES) IN MHCP STUDY AREA**

City	Total	In Major Amendment Areas	Inside MHCP Boundary	Inside FPA	Percent Conserved
Carlsbad	5	0	5	5	100%
Encinitas	-	-	-	-	-
Escondido	-	-	-	-	-
Oceanside	-	-	-	-	-
San Marcos	46	29	17	4	24%
Vista	-	-	-	-	-
Total	51	29	22	9	41%

Preserve Configuration Issues. Vernal pool communities are relatively self-contained systems dependent on local environmental conditions. However, pool complexes are connected by ecosystem processes that operate at broader scales, including fairy shrimp metapopulation dynamics. San Diego fairy shrimp exist in a metapopulation, where extirpation from any particular pool can be followed by recolonization from other nearby pools, such that individuals throughout the entire complex interbreed as a contiguous population (USFWS 1998). In addition, dispersal of fairy shrimp to more distant pools or pool complexes maintains gene flow throughout the regional fairy shrimp population. Therefore, although landscape level preserve configuration may be less important for fairy shrimp than for many other species, it is nevertheless important to species viability that complexes of pools be retained within a contiguous landscape. Local dispersal of fairy shrimp between pools in a complex may occur during periods of high inundation when several pools may be connected within a watershed (USFWS 1998). Long distance dispersal of San Diego fairy shrimp is thought to occur primarily by wind-blown eggs and by the transport of eggs and adults on the bodies of animals (e.g., on the feet of birds). Proximity to other vernal pools within a vernal pool complex is optimal for local recolonization and long-term persistence of the complex; however, isolated pools may receive immigrants by wind and bird dispersal as long as the distance between pools is not too great.

The distribution of vernal pools in the MHCP is very restricted, with few remaining pool complexes that can be conserved within contiguous landscapes. Populations of San Diego fairy shrimp in both sets of vernal pools (Carlsbad and San Marcos) are substantially isolated from other populations in the region. Vernal pools in Carlsbad are located along a narrow, linear strip of habitat between Poinsettia Lane and the train station. These pools are entirely within the preserve, and the existing hydrology appears adequate to support a viable vernal pool resource, as indicated by robust populations of several sensitive vernal pool species (see the species justification for vernal pool plant species, e.g., San Diego button-celery, for a more detailed description of the hydrological issues for these pools). It will be important to maintain the current hydrological regime to ensure that habitat is sustained. This will entail preserving the watershed necessary to support these pools, as measured by topography and soils. The potential for detrimental edge effects is high due to the linear configuration of these pools and their proximity to development. Risk of extinction of San Diego fairy shrimp within the plan area is high due to the isolation of occupied pools at Poinsettia Lane in Carlsbad and in the San Marcos Major Amendment Area.

Effects on Population Viability and Species Recovery. The relatively small acreages of vernal pool habitat for the San Diego fairy shrimp and the high degree of isolation make the MHCP fairy shrimp populations relatively unimportant demographically to the recovery of the species (e.g., these populations are not likely to produce significant numbers of dispersing individuals that reach other populations outside the MHCP). However, these isolated populations may be important reserves of genetic diversity. In this case, assuming the genetic diversity of the species is studied and properly managed, conservation of these populations does contribute to the long-term viability of the species. Once the MHCP is amended to include the pools in the San Marcos Major

Amendment Area, conservation of the San Marcos vernal pools may preserve additional genetic diversity for this species.

Special Considerations. Surveys should be done in any pools having appropriate hydrological and chemical characteristics to potentially support this species, which may include natural or man-made depressions not necessarily classified as vernal pools. Conservation and management for the species must also include management of the watershed surrounding pools and possibly the subsurface hydrology, both of which must be adequately conserved to provide sufficient water to sustain the pools. Some pools may be too isolated to be readily recolonized following local extinction. Therefore, artificial reintroduction of fairy shrimp may be required to expedite recolonization.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Conduct additional research to clarify ecological and management requirements of San Diego fairy shrimp, including metapopulation dynamics in the study area.
2. If indicated based by monitoring and research results, translocations among pools (from inside or outside of the MHCP study area) may be necessary to ensure demographic persistence and genetic diversity in conserved populations. Such actions must be guided by the species recovery plan and the best available science.

Sandy Beach Tiger Beetle

Cicindela hirticollis gravida

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: None

Conservation Goals

Enhance habitat quality and allow for natural recolonization or reintroduction. Contribute to regional population viability and species recovery.

Conservation Strategy

Include within the preserve system all suitable habitat. Enhance habitat quality by minimizing human activity that results in the trampling or crushing of beetles and habitat (e.g., hiking or driving off-road vehicles through habitat). Manage the fluvial dynamics of adjacent aquatic habitat to ensure suitable habitat conditions are sustained.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, due to insufficient information.

Rationale. It is impossible to determine adequacy of conservation for this species based on existing information. The species has not been recorded in the study area. Potentially suitable sandy beaches and intertidal zones are scattered and highly affected by human activities in the study area, and hence are unlikely to support this species now or in the future.

Conditions. This species could potentially be covered in the future, if intensive surveys verify its distribution and abundance in appropriate habitats, and if species-specific conditions for conservation and management could be implemented by subarea plans, based on additional research on the species' life requisites.

Background

Distribution, Abundance, and Trends. The sandy beach tiger beetle is restricted to sand dunes and intertidal areas along the immediate coast from the San Francisco Bay area south into Baja California, Mexico. There are no documented sandy beach tiger beetle locations in the MHCP area. This species inhabits light-colored sandy beach in the upper aquatic zone adjacent to freshwater (e.g., mouths of streams) and barrier beaches. There are no major populations or critical locations identified in the plan area (no known localities in database).

Threats and Limiting Factors. The primary threat to this species is development of coastal areas and trampling or crushing by humans and off-road vehicles.

Special Considerations. None identified.

Conservation Analysis

Conservation and Take Levels. It is impossible to quantify expected levels of conservation and take for this species based on existing information. Potential habitat may occur in sandy areas around coastal lagoons or at the delta of freshwater streams inside of preserve areas. Coastal beaches in the study area (including most of the beach areas in Oceanside) are heavily used for recreational activities and are not suitable habitat. There are no known point localities in the plan area.

Preserve Configuration Issues. The distribution of suitable habitat was naturally fragmented even before development. The preserve design will have minimal effect on the connectivity of potential sandy beach tiger beetle habitat relative to existing conditions.

Effects on Population Viability and Species Recovery. The sandy beach tiger beetle is not currently known from the plan area and the plan is expected to have little or no effect on this subspecies. However, if populations are discovered in the future, the MHCP may contribute to the species regional population viability and species recovery via management and monitoring.

Special Considerations. The potential for trampling and crushing of beetles and habitat by human activities such as hiking and off-road vehicle use should be eliminated in suitable habitat.

Adaptive Management Program

Not applicable.

Oblivious Tiger Beetle

Cicindela latesignata obliviosa

USFWS: None (former Federal Species of Concern, presumed extinct)

CDFG: None

MHCP: Narrow Endemic

Conservation Goals

Enhance habitat quality and allow for natural recolonization or reintroduction. Contribute to regional population viability and species recovery.

Conservation Strategy

Include within the preserve system all suitable habitat. Enhance habitat quality by minimizing human activity that results in the trampling or crushing of beetles and habitat (e.g., hiking or driving off-road vehicles through habitat). Manage the dynamics of tidal basins and adjacent aquatic habitat to ensure suitable habitat conditions are sustained on sandy dunes and mudflats.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, due to insufficient information.

Rationale. It is impossible to determine adequacy of conservation for this species based on existing information. Although the species was historically recorded in intertidal areas from Encinitas to Camp Pendleton, the species has not been detected in recent decades and is presumed extinct.

Conditions. This species could potentially be covered in the future, if intensive surveys verify its distribution and abundance in appropriate habitats, and if species-specific conditions for conservation and management could be implemented by subarea plans, based on additional research on the species' life requisites.

Background

Distribution, Abundance, and Trends. The tiger beetles (*C. latesignata*) are found along coastal southern California and northwestern Baja California, Mexico. The oblivious tiger beetle subspecies (*C. l. obliviosa*) formerly occurred only along coastal San Diego County, from Encinitas north to the mouth of the Santa Margarita River. There are no documented oblivious tiger beetle locations within the MHCP area. This subspecies was an exclusively marine littoral tiger beetle associated with intertidal areas of beaches and lagoons, including mudflats in the lower tidal zone (CNDDDB 1996). There are no major populations in the study area, but salt marshes and estuaries of Carlsbad, Oceanside, and Encinitas, including associated dune and upper beach habitat, were considered critical locations in the MHCP Biological Goals Standards and Guidelines. However, the

subspecies is currently presumed extinct (Essig Museum of Entomology, UC Berkeley; www.mip.berkeley.edu/essig/endins/grave.htm).

Threats and Limiting Factors. The primary threat to this species has been development of coastal areas and trampling or crushing by humans and off-road vehicles.

Special Considerations. Almost nothing is known about the biology of this presumably extinct subspecies.

Conservation Analysis

Conservation and Take Levels. It is impossible to quantify expected levels of conservation and take for this species based on existing information. Mudflats and beach areas on the periphery of tidal lagoons may have a low potential to support the species within the plan area. Due to high conservation of lagoons and estuaries (Section 3.2) the expected level of take of this species or its habitat is very low. Coastal beaches in the area are heavily used for recreation and are not suitable habitat. There are no known point localities in the plan area.

Preserve Configuration Issues. The distribution of suitable sandy beach and mudflat habitat was naturally fragmented even before developments. The preserve design will have minimal effect on the connectivity of potential tiger beetle habitat relative to existing conditions.

Effects on Population Viability and Species Recovery. The oblivious tiger beetle is not currently known from the plan area. However, if populations are discovered in the future, the plan may contribute to the species' regional population viability and recovery via management and monitoring.

Special Considerations. The potential for trampling and crushing of beetles and habitat by human activities such as hiking and off-road vehicle use should be eliminated in suitable habitat.

Adaptive Management Program

Not applicable.

Globose Dune Beetle

Coelus globosus

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: None

Conservation Goals

Enhance habitat quality and allow for natural recolonization or reintroduction. Contribute to regional population viability and species recovery.

Conservation Strategy

Include within the preserve system all suitable habitat. Enhance habitat quality by minimizing human activity that results in the trampling or crushing of beetles and habitat (e.g., hiking or driving off-road vehicles through habitat). Enhance or restore dune habitat using native dune plant species in protected areas.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, due to insufficient information.

Rationale. It is impossible to determine adequacy of conservation for this species based on existing information. The species has not been recorded in the MHCP study area, and the sandy foredune and hummock habitats it requires have been nearly eliminated in the study area. The study area is therefore unlikely to support this species now or in the future.

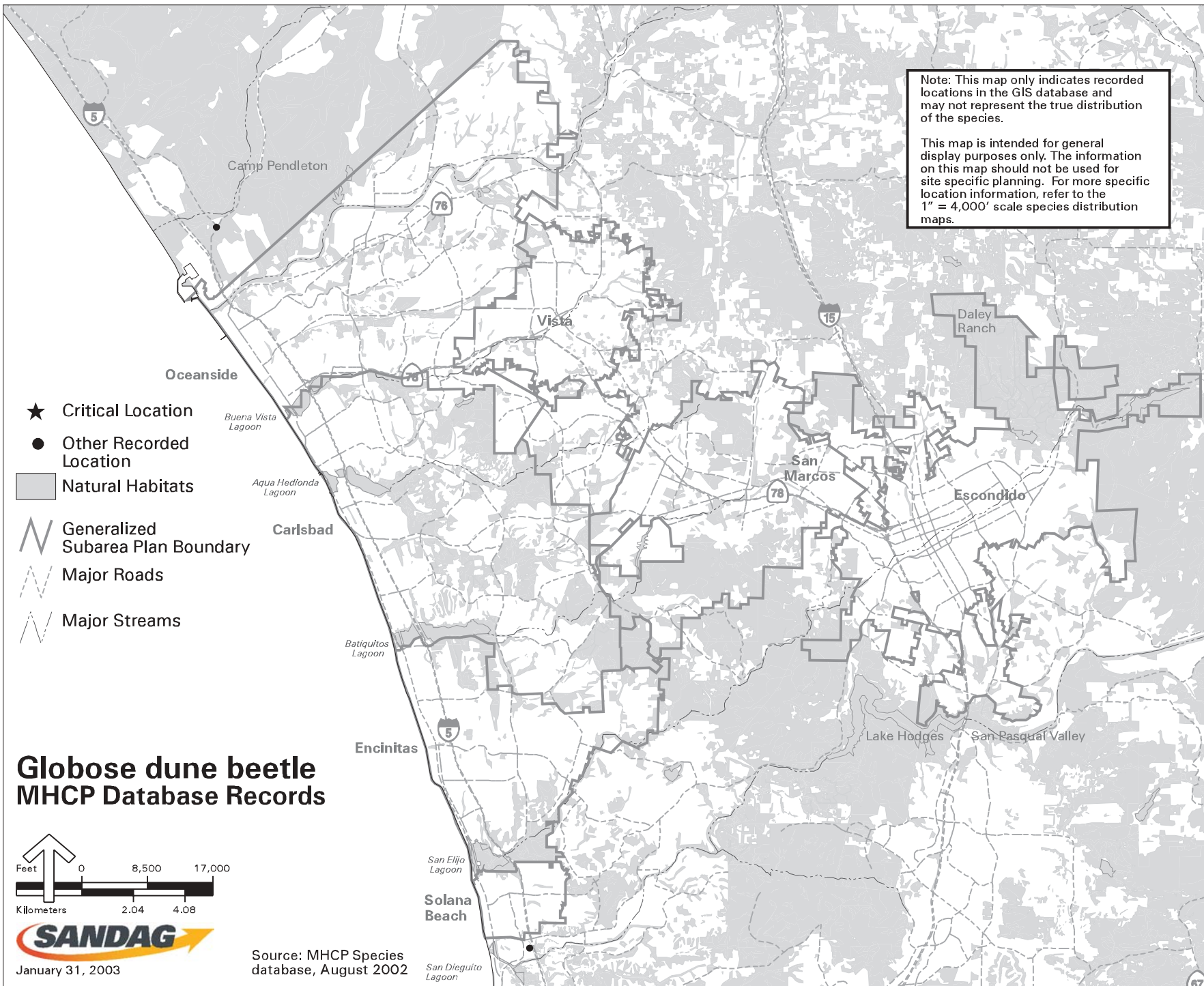
Conditions. This species could potentially be covered in the future, if intensive surveys verify its distribution and abundance in appropriate habitats, and if species-specific conditions for conservation and management could be implemented by subarea plans, based on additional research on the species' life requisites.

Background

Distribution, Abundance, and Trends. The globose dune beetle is restricted to the immediate coast from about Sonoma County south to the vicinity of Ensenada, Baja California, Mexico. It also occurs on all the Channel Islands except San Clemente and in the Tijuana estuary at Border Field State Park. There are no documented globose dune beetle locations within the MHCP area. The dune beetle inhabits foredunes and sand hummocks at the site of the first coastal vegetation immediately above high-tide (J. Brown personal communication). It is often found burrowed in the sand under dune vegetation. There are no major populations or critical locations in the plan area (see MHCP Database Records Map).

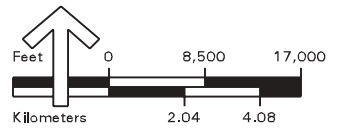
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- ▬ Generalized Subarea Plan Boundary
- ▬ Major Roads
- ▬ Major Streams

Globose dune beetle MHCP Database Records



Source: MHCP Species database, August 2002

Threats to Species Survival. Urbanization, trampling, and edge effects threaten this species. Recreational activities have destroyed most suitable habitat in the southern portion of its range (Brown personal communication).

Special Considerations. None identified.

Conservation Analysis

Conservation and Take Levels. It is impossible to quantify expected levels of conservation and take for this species based on existing information. Only the periphery of tidal lagoons may still support potential habitat for the species. Dune vegetation along the oceanfront has been removed by urban development and intensive recreation. The expected level of take of this species or its habitat is extremely low or none.

Preserve Configuration Issues. Given the limited extent of potential habitat and the existing level of development in the plan area, the preserve design will not adversely affect the current connectivity of the dune beetle habitat relative to existing conditions.

Effects on Population Viability and Species Recovery. The globose dune beetle is not currently known from the plan area. However, if populations are discovered in the future, the plan may contribute to the species regional population viability and species recovery via management and monitoring.

Special Considerations. The potential for trampling and crushing of beetles and habitat by human activities such as hiking and off-road vehicle use should be eliminated in suitable habitat.

Adaptive Management Program

Not applicable.

Harbison's Dun Skipper Butterfly

Euphyes vestris harbisoni

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: None

MHCP: Narrow Endemic

Conservation Goals

Ensure persistence of this species in the plan area. Contribute to regional population viability and species recovery. Allow for natural recolonization or reintroduction into unoccupied or restored habitat. Conserve all major populations and critical locations.

Conservation Strategy

Include within the open space preserve system patches of oak woodland and riparian habitat with abundant patches of *Carex spissa*, the dun skipper's larval host plant. Minimize competition between nonnative plants and the larval host plant. Implement species-specific management actions, as necessary, to increase habitat quality and population size. Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP will adequately conserve this species by conserving all 3 known locations (all considered critical locations), and about 95% of the potential habitat (oak woodlands and riparian) within the study area, mostly within relatively large and contiguous habitat blocks (e.g., on Daley Ranch).

Conditions. The following species-specific conditions must also be met by subarea plans requesting take of this species or its habitat:

1. As part of the project review process (e.g., CEQA) for individual projects within the MHCP area, a qualified biologist must survey, using approved survey techniques, all areas containing suitable habitat (oak woodlands and riparian areas, especially those supporting *Carex spissa*). Surveys shall be conducted when impacts could occur as a result of direct or indirect impacts by placement of a project in or adjacent to suitable habitat. Surveys should occur prior to any proposed impact both within and outside of the FPA.
2. Projects within the FPA shall restrict activities that could degrade Harbison's dun skipper habitat by modifying stream flow, degrading water quality, or introducing nonnative plants or predators into riparian systems.

3. Projects having direct or indirect impacts to Harbison's dun skipper shall adhere to the following measures to avoid or reduce impacts:
 - a) Avoid and minimize removal of native vegetation to the maximum extent practicable. Determination of adequate avoidance and minimization of impacts shall be consistent with Sections 3.6 and 3.7 of the MHCP plan. Deviations from these guidelines shall require written concurrence of the USFWS and CDFG. For temporary impacts, the work site shall be returned to preexisting contours and revegetated with appropriate native species. All revegetation shall occur at the ratios specified in Section 4.3 of the MHCP plan. All revegetation plans shall be prepared and implemented consistent with Appendix C (Revegetation Guidelines) and shall require written concurrence of the USFWS and CDFG. If written objections are not provided by the wildlife agencies within 30 days of receipt of written request for concurrence by the local jurisdiction, then the deviation may proceed as approved by the local agency. The wildlife agencies shall provide written comments specifying wildlife agency concerns.
 - b) Projects shall be carried out consistent with Appendix B (Standard Best Management Practices).
 - c) Maintain biological buffers of at least 100 feet adjacent to occupied Harbison's dun skipper habitat, measured from the outer edge of oak woodland or riparian vegetation. Within this 100-foot buffer, no new development shall be allowed, and the area shall be managed for natural biological values as part of the preserve system. Buffers less than 100 feet shall require written concurrence of the USFWS and CDFG within 30 days of receipt of request for written concurrence from the local jurisdiction.
 - d) Where impacts cannot be totally avoided, larvae and possibly adults shall be salvaged for relocation or other research or management purposes under guidance of the wildlife agencies.
4. Manage suitable unoccupied habitat to maintain or mimic effects of natural fluvial processes (e.g., periodic substrate scouring and deposition).
5. Maintain natural riparian connections with upstream riparian habitat to ensure linkages to suitable habitat within the North County MSCP Subarea and City of San Diego MSCP Subarea.

Background

Distribution, Abundance, and Trends. Harbison's dun skipper is a local endemic subspecies of butterfly that occurs in a series of scattered and disjunct colonies throughout western San Diego County. The known range of this species extends from San Diego County to as far north as the Santa Ana Mountains of Orange County (Orsak

1977). Typically this species is not found within about 10 miles of the coast. The largest known populations are in the Ramona, Escondido, and Fallbrook areas (Brown 1991) and Tecate Peak and Dulzura (J. Brown personal communication). Within the MHCP area, Harbison's dun skipper is known from north and east Escondido and adjacent to south San Marcos (Elfin Forest area) (see MHCP Database Records Map). This species is restricted to riparian areas, intermittent streams, and oak woodlands where its larval host plant, San Diego sedge (*Carex spissa*), is present. San Diego sedge usually occurs in scattered groupings on channel banks of streams and ephemeral drainages. Wetland habitats in which San Diego sedge is not expected to occur include vernal pools, disturbed wetlands, and tamarisk scrub. A search of San Diego sedge localities in 1980-1981 indicated that Harbison's dun skipper was present at nearly all locations where the plant was found in considerable numbers, but the insect was never found in the absence of the plant (Brown 1982). The populations in Escondido are considered major populations and critical locations within the MHCP study area.

Threats and Limiting Factors. The subspecies' decline is attributed to habitat loss, introduction of pollutants and litter (such as automobile tires) into riparian systems, and elimination of host plant populations through competition with invasive nonnative plants (Brown and McGuire 1983; Brown 1991; M. Klein personal communication).

Special Considerations. None identified.

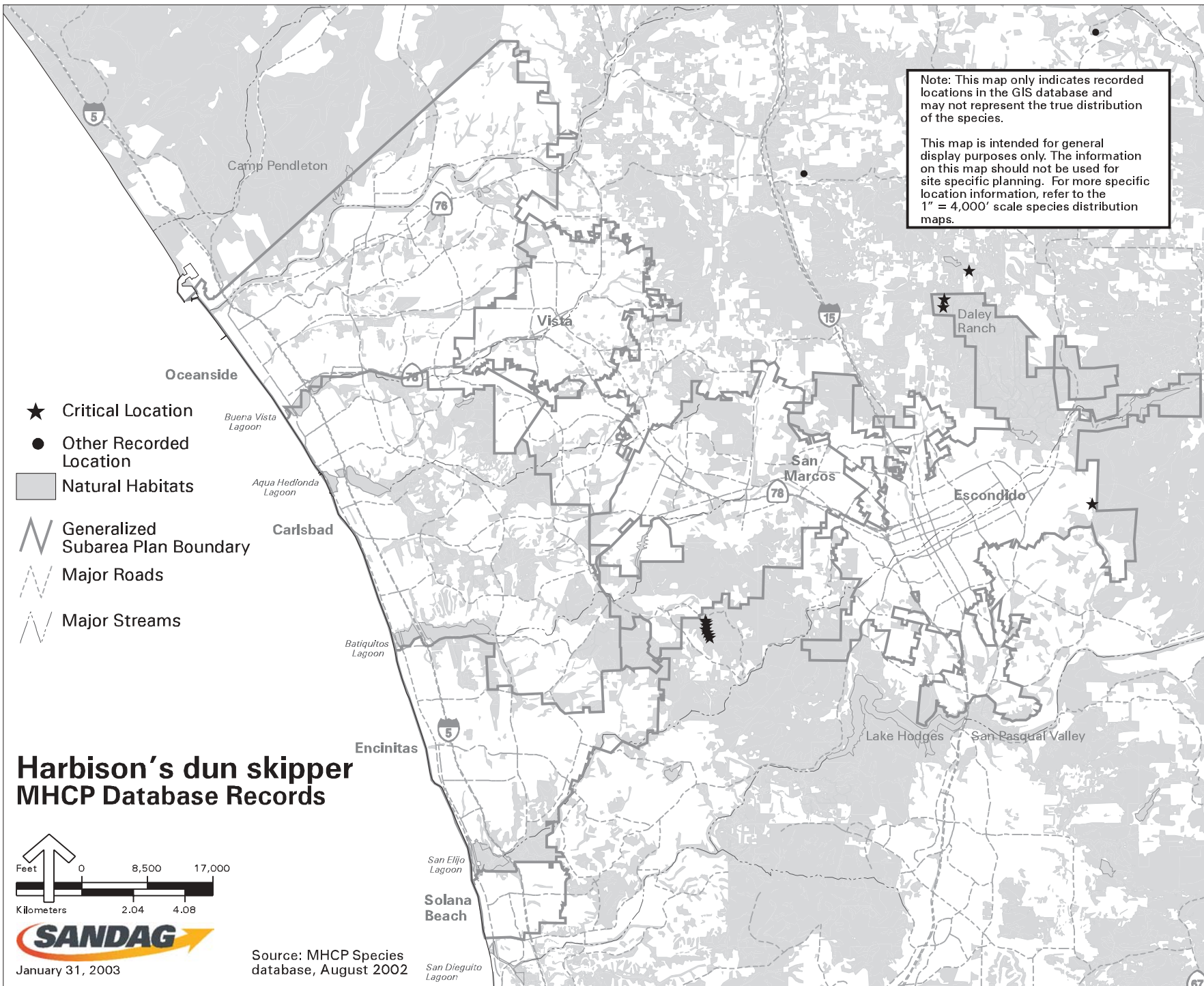
Conservation Analysis

Conservation and Take Levels. Maximum conservation of the riparian ecological community (100% overall, with 76% inside the FPA) and the high level of conservation of the oak woodland ecological community (79%) (Section 3.2) will substantially benefit this species. The MHCP vegetation database is too coarse to identify the distribution of the larval host plant; therefore, only a subset of the conserved habitat is actually suitable for this species. The critical locations and major populations in Escondido are included in hardline preserve areas and will be 100% conserved. The FPA also includes all three point localities (100%) (Table 4-33), two on Daley Ranch and one in eastern Escondido.

Preserve Configuration Issues. The majority of oak woodlands conserved in Escondido and San Marcos are within the BCLA and contained within large blocks of native habitats, which enhance the connectivity of the preserve for this species (85% of oak woodlands within the BCLA are being conserved). The maximum level of conservation for riparian habitat further increases preserve connectivity. The MHCP preserve is not expected to affect the ability of this species to disperse relative to existing conditions. Establishment of additional major populations in the preserve should be a priority to reduce the threat of extirpation of the Escondido population by stochastic events, such as brush fires. Any management actions implemented with the MHCP that would decrease the current fragmentation of this habitat and increase habitat area and connectivity would benefit the species and contribute to population recovery, especially where the abundance of larval host plants was increased.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- Generalized Subarea Plan Boundary
- Major Roads
- Major Streams

Harbison's dun skipper MHCP Database Records

Feet 0 8,500 17,000
 Kilometers 2.04 4.08

January 31, 2003

Source: MHCP Species database, August 2002

San Dieguito Lagoon

Table 4-33

**SUMMARY OF CONSERVATION FOR
HARBISON'S DUN SKIPPER BUTTERFLY**

City	Habitat Acres Conserved ¹		Location Points Conserved ²	Major Populations Conserved	Critical Locations Conserved
	Net Acres (%)	BCLA Acres (%)			
Carlsbad	478 (99%)	445 (99%)	None known	None known	None known
Encinitas	274 (100%)	257 (100%)	None known	None known	None known
Escondido	1,055 (87%)	743 (87%)	3 (100%)	Major Populations in Escondido are 100% conserved	Critical locations in Escondido are 100% conserved
Oceanside	1,093 (100%)	789 (100%)	None known	None known	None known
San Marcos	208 (98%)	87 (95%)	None known	None known	None known
Solana Beach	1 (100%)	None present	None known	None known	None known
Vista	255 (93%)	77 (100%)	None known	None known	None known
MHCP Total ³	3,364 (95%)	2,396 (95%)	3 of 3 (100%)	None known	Critical habitat in riparian areas is 100% conserved, and in oak woodlands are 79% conserved

¹ Habitat includes all riparian and oak woodland vegetation communities. The larval host plant *Carex spissa* may not occur in all areas where habitat is otherwise suitable. Therefore, this is an overrepresentation of the actual amount of suitable habitat.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to maintain and possibly enhance population viability of the Harbison's dun skipper through increased management and monitoring and might contribute to species recovery. The MHCP preserve and policies will maintain consistency with other recovery planning and management goals for species. The MHCP will increase regional coordination and funding for monitoring and management, which may improve current management of dun skipper habitat and species stability.

Special Considerations. Suitable habitat must be maintained in large contiguous patches. Males of this species will venture into upland habitats (coastal sage scrub and chaparral; M. Klein personal communication) adjacent to occupied riparian habitats, suggesting that wide upland buffers to riparian areas should be maintained. Enhancement of potentially suitable habitat should be pursued throughout the eastern portion of the preserve to encourage colonization of new sites. Management should attempt to counter threats posed by changes in water quality or amount, stream alterations, exotic predators, and other disturbances.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Conduct studies that identify ecological and management requirements of Harbison's dun skipper.

Salt Marsh Skipper Butterfly

Panoquina errans

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: None

Conservation Goals

Ensure persistence of this species in the plan area. Contribute to regional population viability and species recovery. Allow for natural recolonization or reintroduction into unoccupied or restored habitat. Conserve all major populations and critical locations.

Conservation Strategy

Include within the open space preserve system large areas of salt marsh and saltpan habitat where larval host plants are plentiful. Implement species-specific management actions, as necessary to increase habitat quality and population size. Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP will adequately conserve this species by conserving the one known location in the study area (salt marsh in upper Aqua Hedionda Lagoon) as well as all potential habitat and critical locations (saltmarsh in coastal lagoons), and by managing preserve areas consistent with species' needs.

Conditions. The following conditions must also be met by subarea plans to adequately conserve this species:

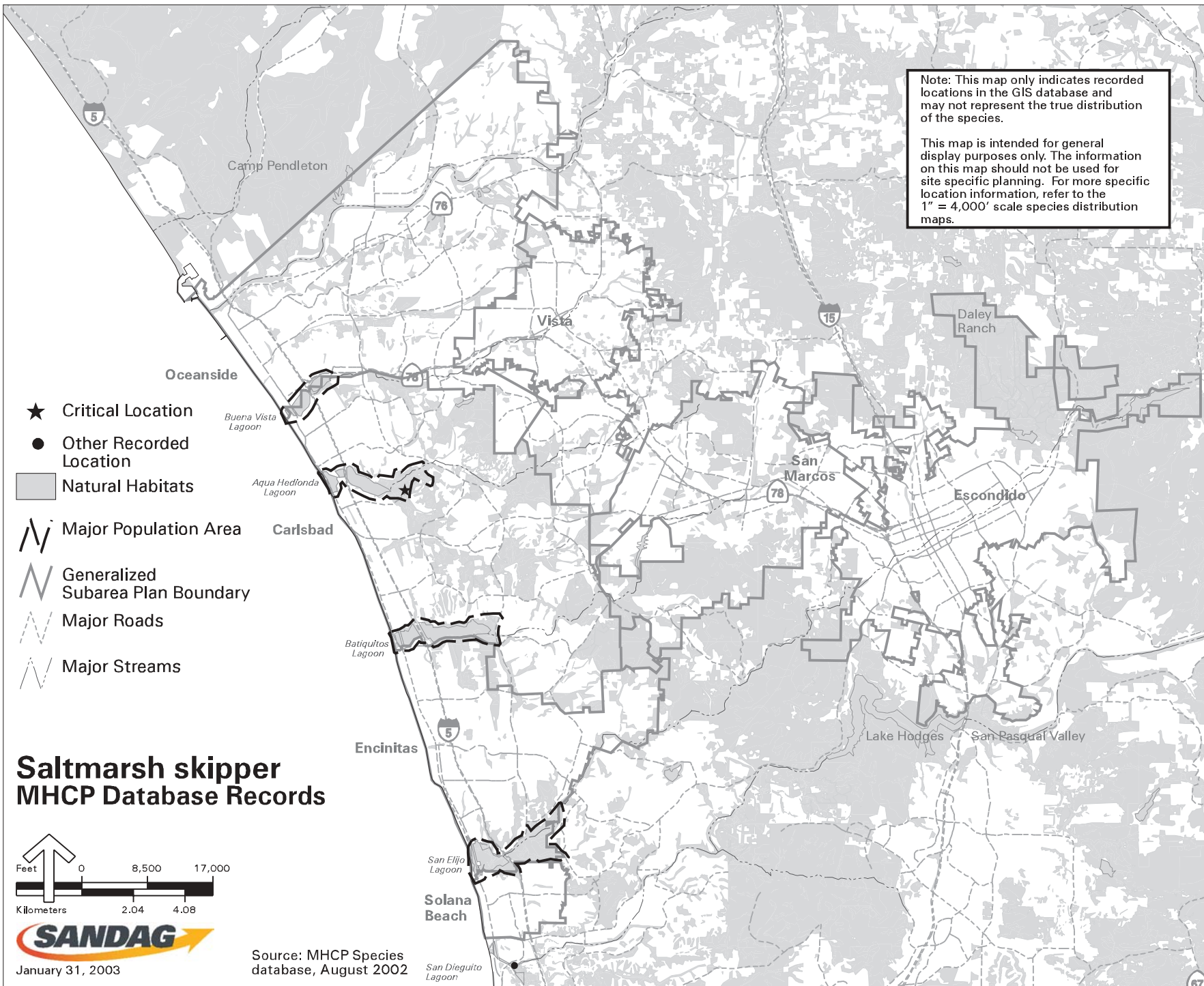
1. Maintain natural tidal flushing of lagoons to maintain sufficient saltgrass habitat for the species. Periodic dredging may be required to open lagoon mouths, as indicated by results of monitoring.

Background

Distribution, Abundance, and Trends. The salt marsh skipper is restricted to coastal salt marshes and coastal estuaries from Los Angeles County south to the southern tip of Baja California, Mexico (Brown 1991). Within the MHCP area, this species occurs in salt marsh and saltpan habitats within Encinitas, Carlsbad, and Oceanside (see MHCP Database Records Map). Both adults and larvae are frequently associated with salt grass (*Distichlis spicata*) but have also been observed in association with other plant species (Emmel and Emmel 1973). The salt marsh skipper occurs in salt marsh habitat associated with nearly every coastal lagoon in San Diego County. The salt marshes and

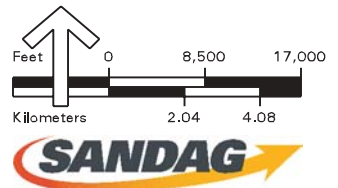
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- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- ▭ Major Population Area
- ▭ Generalized Subarea Plan Boundary
- ▭ Major Roads
- ▭ Major Streams

Saltmarsh skipper MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

saltpan habitats within Encinitas, Carlsbad, and Oceanside are considered major populations and critical locations.

Threats and Limiting Factors. This species is threatened by urbanization, road construction, off-road vehicular traffic, trampling, and invasions by exotic grasses and other nonnative vegetation.

Special Considerations. Salt marsh skipper caterpillars are nocturnal foragers, and may be especially susceptible to trampling or crushing by humans or vehicles at night. Monitoring should include nighttime surveys for caterpillars (M. Klein personal communication).

Conservation Analysis

Conservation and Take Levels. Maximum conservation of the lagoon and marsh ecological community (100%) (Section 3.2.1) will substantially benefit this species. The primary host plant, salt grass, is abundant in salt marsh and saltpan vegetation communities and will be substantially conserved. The critical locations in Encinitas, Carlsbad, and Oceanside are included in hardline preserve areas and will be 100% conserved. The FPA also includes the only point locality in the plan area (Table 4-34).

Preserve Configuration Issues. The MHCP will not adversely affect connectivity of salt marsh skipper habitat, or the ability of skippers to disperse between patches of suitable habitat, relative to existing conditions. The habitat of the salt marsh skipper is naturally patchily distributed, with coastal salt marsh habitat and mudflats separated by upland habitats. Upland habitats between the four lagoons have already been mostly removed by development. Nevertheless, limited dispersal between lagoons may still occur.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to maintain and possibly enhance population viability of the species and therefore contribute to species recovery. The MHCP preserve and policies are consistent with current recovery planning and management goals for species. The MHCP will increase regional coordination and funding for monitoring and management, which may improve current management of salt marsh and mudflat habitats and species stability.

Special Considerations. Adequate buffer areas should be maintained around salt marsh and mudflat habitats to minimize disturbances and edge effects.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Table 4-34

**SUMMARY OF CONSERVATION FOR
SALT MARSH SKIPPER BUTTERFLY**

City	Habitat Acres Conserved¹	Location Points Conserved²	Major Populations Conserved	Critical Locations Conserved
Carlsbad	147 (100%)	1 (100%)	Agua Hediona and Batiquitos Lagoons conserved at 100%	Agua Hediona and Batiquitos Lagoons conserved at 100%
Encinitas	123 (100%)	None known	San Elijo and Batiquitos Lagoons conserved at 100%	San Elijo and Batiquitos Lagoons conserved at 100%
Escondido	None present	None present	None present	None present
Oceanside	4 (100%)	None present	None known	None known
San Marcos	None present	None present	None present	None present
Solana Beach	6 (100%)	None known	None known	None known
Vista	None present	None present	None known	None known
MHCP Total ³	280 (100%)	1 of 1 (100%)	All Major Populations Conserved	Critical breeding habitat in coastal lagoons is 100% conserved

¹ Habitat includes salt marsh and salt pan vegetation communities.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Conduct studies that identify ecological and management requirements of salt marsh skipper.

Hermes Copper Butterfly

Lycaena hermes

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: None

Conservation Goals

Ensure persistence of this species in the plan area. Contribute to regional population viability and species recovery. Allow for natural recolonization or reintroduction into unoccupied or restored habitat.

Conservation Strategy

Include within the open space preserve system large areas of coastal scrub habitat where larval host plants are plentiful. Implement species-specific management actions, as necessary to increase habitat quality and population size. Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, due to insufficient information.

Rationale. Potential effects of the plan cannot be ascertained for this species, which probably does not occur in the study area. There are no known occurrences in the study area. Although about 66% of vegetation communities potentially used by the species (coastal sage scrub and chaparral) would be conserved, vegetation communities are not mapped with sufficient detail to determine habitat adequacy for this species. The Hermes copper is restricted to vegetation having abundant redberry (*Rhamnus crocea*) and flat-topped buckwheat (*Eriogonum fasciculatum*) in close association, especially in areas farther inland than the MHCP study area.

Conditions. The species could potentially be conserved in the future if surveys revealed that sufficient habitat (intermixed redberry and buckwheat) would be conserved in large, contiguous habitat areas within the study area.

Background

Distribution, Abundance, and Trends. The Hermes copper butterfly is restricted to western San Diego County and a small portion of northern Baja California, Mexico. Within San Diego County this species has been recorded from Otay Ranch north to Fallbrook, from Mission Gorge east to Guatay (Brown 1991), and on McGinty Mountain and Sequan Peak (J. Brown personal communication). Documented Hermes copper butterfly locations within the MHCP area are lacking. The Hermes copper butterfly occurs in coastal sage scrub and southern mixed chaparral in which its larval host plant, redberry (*Rhamnus crocea*), constitutes at least 5% of the shrub cover. It has been suggested that natural colonization may be very slow due to the sedentary nature of the

adult butterfly (J. Brown personal communication). Many former localities have been developed or disturbed. There are no major populations or critical locations in the plan area and no known localities in the database.

Threats and Limiting Factors. The decline of the Hermes copper butterfly is attributed to loss of habitat from urban development and destruction of colonies by wildfire (Brown 1991). Wildfire as well as controlled burns for weed management may be the greatest threats to Hermes copper populations at this time (M. Klein, personal communication).

Special Considerations. None identified.

Conservation Analysis

Conservation and Take Levels. The moderate level of conservation of the coastal scrub and chaparral ecological communities (Section 3.2.4) may benefit this species (Table 4-35); however, the vegetation database is too coarse to identify the distribution of the larval host plant. Therefore, only an unestimated subset of these vegetation communities is actually suitable for this species, and it is unknown to what degree such suitable habitat is conserved. There are no point localities in the plan area, although the species may occur in some eastern portions of the study area, such as Daley Ranch and eastern Vista, San Marcos, and Carlsbad (M. Klein personal communication).

Preserve Configuration Issues. This species requires habitat having abundant redberry in close association with flat-topped buckwheat. The amount and distribution of such vegetation associations is unknown in the study area, so plan effects on the amount and configuration of suitable habitat cannot be fully ascertained. About 69% of coastal sage scrub and about 73% of chaparral within the BCLA will be conserved. The potential for dispersal and recolonization of suitable habitat in the preserve is generally maintained through conservation of substantial blocks of suitable habitat adjacent to habitat areas outside the plan area.

Effects on Population Viability and Species Recovery. It is impossible to estimate plan effects on population viability and recovery due to lack of information on the distribution of this species and its larval host plant in the study area. Implementation of the MHCP may maintain and possibly enhance population viability of the Hermes copper butterfly through increased management and monitoring, and might contribute to species recovery. The MHCP preserve and policies will maintain consistency with other recovery planning and management goals for species. The MHCP will increase regional coordination and funding for monitoring and management, which may improve current management of Hermes copper butterfly habitat and species stability.

Table 4-35

**SUMMARY OF CONSERVATION FOR
HERMES COPPER BUTTERFLY**

City	Habitat Acres Conserved ¹	
	Net Acres (%)	BCLA Acres (%)
Carlsbad	2,150 (67%)	2,068 (68%)
Encinitas	2,167 (74%)	1,182 (75%)
Escondido	5,395 (76%)	5,113 (81%)
Oceanside	713 (51%)	616 (67%)
San Marcos	2,258 (52%)	2,217 (56%)
Solana Beach	30 (36%)	29 (55%)
Vista	321 (59%)	290 (69%)
MHCP Total ²	12,134 (66%)	11,516 (71%)

¹ Habitat includes coastal sage scrub, chaparral, southern maritime chaparral, and coastal sage scrub/chaparral mix vegetation communities.

² Numbers may not total due to rounding.

Special Considerations. Controlled burns must be applied with caution in reserve areas to ensure they do not endanger any Hermes copper populations that may be present.

Adaptive Management Program

Not applicable.

Quino Checkerspot Butterfly

Euphydryas editha quino

USFWS: Endangered

CDFG: None

Conservation Goals

Recognizing that the Quino checkerspot butterfly may be extirpated from the plan area, maintain potential for natural recolonization by conserving large blocks of habitat, and support conservation efforts outside the study area consistent with the species recovery plan.

Conservation Strategy

Conserve and manage any existing large patches of host plant populations within large preserve blocks to maintain habitat potential and facilitate recolonization from other areas. Prohibit activities within the preserve that could degrade Quino checkerspot habitat, and implement management measures to reduce the risk of catastrophic fire. Periodically survey potential habitat east of Interstate 15 to identify any new populations and conserve them if found. Contribute a portion of development or mitigation fees collected under the MHCP to regional conservation efforts for the species to help maintain viable populations outside the study area, where larger preserve areas are possible.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, unless subarea plans adopt additional measures supporting species recovery outside the study area.

Rationale. The MHCP will likely have no effect on this species, which is no longer known to occur in the study area. The Quino checkerspot requires huge, unfragmented landscapes to accommodate its metapopulation dynamics. Habitats in the MHCP study area are too fragmented to reliably support the species or to contribute to species recovery.

1. Conditions. A subarea plan may receive take authorization for this species (to cover the unlikely event that Quino checkerspot is discovered living within the study area) if the city implements actions to support species recovery outside the study area. Such actions must further implementation of specific tasks identified by the Quino Checkerspot Recovery Plan in a manner that demonstrably contributes to species recovery. For example, a city might purchase mitigation land within designated Quino critical habitat areas, or it might dedicate a mitigation or development fees towards regional conservation programs for the Quino checkerspot butterfly. If a subarea plan is requesting take authorizations for this species, the following conditions would apply:

1. All newly discovered populations of Quino checkerspot east of Interstate 15 shall be treated as critical populations and avoided until criteria for delisting of the species have been met (USFWS 2000).
2. Where impacts cannot be totally avoided, larvae and possibly adults shall be salvaged for relocation or other purposes under guidance of the wildlife agencies.
3. Where impacts cannot be totally avoided, they must be mitigated at appropriate MHCP ratios for the affected vegetation communities in suitable Quino checkerspot habitat outside the study area, in a location that would help secure contiguous blocks of habitat identified by the USFWS as important to species recovery.

Background

Distribution, Abundance, and Trends. The Quino checkerspot butterfly formerly occurred in western portions of Riverside, Orange, and San Diego counties extending south into northern Baja California, Mexico. In recent years (1996-1997) this species has been located at Otay Mountain, Jacumba, Oak Grove, and Otay Mesa (Brown 1991; J. Brown personal communication; D.Faulkner personal communication). Currently, the Quino checkerspot may be locally extirpated from the MHCP area (no known localities in database), which was excluded from the recent critical habitat designation for the species as not being essential to species recovery (USFWS 2002b). Potential habitat for Quino checkerspot in the region includes vegetation communities with relatively open areas that typically include patches of plantain (*Plantago spp.*) and a variety of adult nectar sources. Owl's clover (*Castilleja spp.*) is sometimes used as a secondary larval food source (D. Faulkner personal communication). These habitats include vernal pools, lake margins (Emmel and Emmel 1973), nonnative grassland, perennial grassland, disturbed habitat, disturbed wetlands, and open areas within shrub communities (Mattoni et al. 1997). This butterfly is currently extremely rare; however, 50 years ago the Quino checkerspot may have been one of the most abundant butterfly species in southern California (Murphy 1990).

Threats and Limiting Factors. The decline of this species is attributed to habitat loss and fragmentation from development, habitat degradation, complex metapopulation dynamics (extirpation of local populations without recolonization), and pressures resulting from the prolonged droughts of the late 1980s and early 1990s in California (Murphy 1990; Brown 1991; USFWS 2000).

Special Considerations. This species apparently needs large, unfragmented areas of natural habitat to facilitate its natural metapopulation dynamics, which involve regional expansions and contractions of populations, with periodic recolonizations of satellite sites from core sites (Murphy 1990; Mattoni et al. 1997). Local populations that may become extirpated rely on recolonization from individuals dispersing from nearby populations. Recolonization is less likely for more isolated populations. The general direction of dispersal appears to be from south to north (D. Faulkner personal communication 1999),

which may mean that recolonization of the plan area from populations north of the MHCP (e.g., from Critical Habitat Unit 2 in southwestern Riverside County) is unlikely. This species is difficult to detect in some years due to the species' patterns of dispersal, reliance on specific host plants, and lengthy diapause.

Conservation Analysis

Conservation and Take Levels. The level of conservation and take for this species is difficult to assess because the species is probably extirpated from the MHCP area, and because the fine-scale at which Quino habitat elements occur (e.g., populations of larval host plants) is not distinguished at the MHCP scale of mapping. No take of Quino butterflies is expected to occur in the study area, unless a new population is discovered in the future. Potential habitat will be 100% conserved where it occurs within wetlands, such as vernal pools, lake margins, and disturbed wetlands, based on the no net loss of wetlands policy. Grasslands will be only 32% conserved, and the coastal scrub ecological community will be conserved at about 61%. Where specific locations of Quino habitat are found, they should be 100% conserved under the narrow endemic and critical location policies. There are currently no known major populations or critical locations in the MHCP.

Preserve Configuration Issues. The Quino checkerspot formerly existed in a metapopulation within the MHCP due to the naturally patchy distribution of Quino checkerspot habitat (Murphy 1990). Unique features of metapopulation dynamics include local extirpation and recolonization of patches as they “wink” off (extirpation) and on again (recolonization). The two factors that drive the rates of extirpation and colonization are patch size and patch isolation by distance (MacArthur and Wilson, 1967). The Quino checkerspot has the ability to fly relatively long distances (over 1 kilometer [0.6 mile]) over natural habitat to colonize unoccupied patches of habitat, and dispersal and recolonization appears to occur from south to north (D. Faulkner personal communication 1999). Fragmentation of the habitat, as a result of urbanization, and the configuration of the preserve boundaries increase the effective distance between patches and decrease the size of remaining patches of habitat. This increases the rate of extirpation and decreases the rate of recolonization, ultimately leading to metapopulation collapse and regional extirpation. Fragmentation as such may be responsible for the decline and extirpation of the Quino checkerspot within the MHCP area and suggests that a self-sustaining metapopulation can no longer be supported within the MHCP area. Consequently, the proposed preserve configuration, or any possible configuration short of one including major Quino habitat restoration, may not allow for sustainable reestablishment (by recolonization or reintroduction) of the Quino checkerspot metapopulation within the study area.

Effects on Population Viability and Species Recovery. As discussed above, the current situation appears not to support a viable population. Therefore, while the MHCP may not contribute to the further decline of the species, it is unlikely to support a viable population or contribute significantly to species recovery.

Special Considerations. Dispersal from existing populations to suitable habitat within the plan area is unlikely. Further research should investigate the species dispersal abilities and metapopulation dynamics.

Adaptive Management Program

Not applicable.

Western Spadefoot Toad*Scaphiopus [Spea] hammondi*

USFWS: None

CDFG: Species of Special Concern

Conservation Goals

Ensure persistence of this species in the plan area. Contribute to regional population viability and species recovery. Allow for natural recolonization or reintroduction into unoccupied or restored habitat. Provide unconstrained access to both aquatic breeding habitat and adjacent upland aestivating habitat.

Conservation Strategy

Include within the open space preserve system all potential breeding habitat in riparian areas, vernal pools, and freshwater streams and ponds. Include substantial upland habitat around suitable aquatic breeding habitat, and provide safe road undercrossings between suitable habitat areas. Implement species-specific management actions, as necessary to increase habitat quality and population size. Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP may allow this species to persist in the study area by conserving potential breeding areas under the no net loss of wetlands policy, by conserving 3 of 4 known population locations, and by managing preserve areas consistent with species' needs. It is difficult to quantify conservation of upland areas needed by the species adjacent to breeding habitats, but the species will suffer from fragmentation and edge effects in these upland habitats.

Conditions. The following conditions must be met by subarea plans to adequately conserve this species:

1. As part of the project review process (e.g., CEQA) for individual projects, a qualified biologist will survey, using approved survey methods, all areas of the property containing potentially suitable breeding habitat (ephemeral ponds, vernal pools, washes, riparian areas) or upland foraging habitat (open scrublands, woodlands, grasslands) that is contiguous with potential breeding habitat. Surveys will also identify any known or likely movement corridors used by toads, including any existing road crossings or culverts, bridges, or other features used by dispersing toads. They will also identify locations where road undercrossings and fencing could be created to benefit toads by reducing roadkill on either new or existing roadways. Surveys shall occur prior to any proposed impact both inside and outside of the FPA. Surveys shall be conducted when impacts to

- western spadefoot toad could occur as a result of direct or indirect impacts by placement of the project in or adjacent to occupied habitat or through creation of suitable conditions for nonnative predators (e.g., bullfrogs). All pertinent agencies (including CDFG, USFWS, and County of San Diego Vector Control Program) will be informed about the location of any toad populations.
2. Although western spadefoot toads is not an MHCP Narrow Endemic, all currently known or future discovered populations will be treated consistent with requirements of the Narrow Endemics Policy, including the following: (a) maximum avoidance of impacts, to the degree feasible while maintaining reasonable use of the property; (b) for unavoidable impacts, species-specific mitigation designed to minimize adverse effects to species viability and to contribute to species recovery; and (c) no more than 5% gross cumulative loss inside the FPA or 20% gross cumulative loss outside the FPA.
 3. Projects having direct or indirect impacts to the western spadefoot toad shall adhere to the following measures to avoid or reduce impacts:
 - a) The removal of breeding pools, streams, and adjacent dispersal/adult burrowing areas shall be avoided to the maximum extent practicable. Determination of adequate avoidance and minimization of impacts shall be consistent with Sections 3.6 and 3.7 of the MHCP plan. Deviations from these guidelines shall require written concurrence of the USFWS and CDFG. For temporary impacts, the work site shall be returned to preexisting contours and revegetated with appropriate native species. All revegetation shall occur at the ratios specified in Section 4.3 of the MHCP plan. All revegetation plans shall be prepared and implemented consistent with Appendix C (Revegetation Guidelines) and shall require written concurrence of the USFWS and CDFG. If written objections are not provided by the wildlife agencies within 30 days of receipt of written request for concurrence by the local jurisdiction, then the deviation may proceed as approved by the local agency. The wildlife agencies shall provide written comments specifying wildlife agency concerns.
 - b) Projects proposing impacts to occupied habitat during the breeding season (January through May) shall be required to trap emerged adults and relocate them to appropriate, conserved habitat areas within the FPA. Trapping of larvae (tadpoles) and juveniles shall be required if they are found in breeding pools. Captured larvae or juveniles shall be relocated to appropriate, conserved habitat areas within the FPA.
 - c) Projects shall be carried out consistent with Appendix B (Standard Best Management Practices).
 - d) Project-construction vehicle travel shall be limited to daylight hours, as western spadefoot toad use roadways primarily during nighttime hours. New roads near occupied toad habitat shall include provisions for barriers to minimize traffic mortality. Culverts and fencing designed to funnel toads through culverts shall be included within the road design to allow safe crossings between potential

- habitat areas (including both wetland breeding areas and upland foraging areas). Culverts and fences will be located to maximize value to toads, unless this is totally precluded by engineering constraints, in which case the biologically most beneficial design that is feasible will be implemented.
- e) Projects that cannot be conducted without placing equipment or personnel in sensitive habitats shall be timed to avoid the breeding season of the western spadefoot toad when eggs and tadpoles are present.
- f) Silt fencing/drift fence and pitfall traps shall be installed around the impact area adjacent to occupied western spadefoot toad habitat at least 21 days prior to impact to minimize access by toads and to allow for removal of western spadefoot toad from the impact area. A biologist experienced with the identification, handling, and ecology of toads shall implement and oversee proper execution of the toad exclusion fencing, relocation efforts, and monitoring. The exclusion fencing shall be maintained until the completion of all construction activities within or adjacent to occupied western spadefoot toad habitat. For the duration of construction, the enclosure shall be surveyed on a daily basis early in the morning and any toads that may have breached the fencing shall be relocated.
- g) Bullfrogs and other exotic species that prey upon or displace toads should be removed from the site as part of an ongoing management plan.
4. Western spadefoot toad populations within the FPA shall be managed to provide adjacent adult burrowing habitat, control of predatory or competing nonnative species such as bullfrogs and mosquito-fish, and control of water pollution and nonnative vegetation in the breeding pools and adjacent burrowing habitat. Activities that may degrade habitat value will be precluded, including draining of wetlands, mosquito control, livestock grazing, off-road vehicle activity, and degradation of water quality. Management will actively coordinate with any pertinent Vector Control programs to develop methods to minimize impacts on spadefoot toads and their habitat, such as changing the timing of any pesticide spraying or use of other alternative control techniques.
5. Wetlands that contain suitable, unoccupied breeding habitat areas within the FPA will be delineated and protected from development or uses that negatively affect runoff and ponding processes to ensure adequate ponding during normal (e.g., not El Niño) rain years. These areas shall be the recipient areas for relocation efforts for approved projects that impact occupied western spadefoot toad habitat.
6. Any wetlands created for mitigation for impacts to wetlands occupied by western spadefoot toads must be demonstrated to be capable of supporting the species prior to impacts, to ensure no net loss of occupied breeding habitat.

Background

Distribution, Abundance, and Trends. This species occurs west of the coastal ranges from Point Conception to northern Baja California, Mexico, and in the Central Valley of California (Zeiner et al. 1988). Within the MHCP area, western spadefoot toad is known from Buena Vista Lagoon, Page Creek in north Escondido, and San Marcos Creek in southeast Carlsbad (see MHCP Database Records Map). It is fairly common on Daley Ranch in north Escondido (MBA 1995). The western spadefoot toad is primarily a species of lowlands, frequenting washes, vernal pools, floodplains of rivers, alluvial fans, playas, and alkali flats, but also ranges into the foothills, mountains, and desert (Stebbins 1985). It prefers areas of open vegetation and short grasses where the soil is sandy or gravelly. It breeds during the winter (January through May) in backwaters of quiet streams, ephemeral ponds, and vernal pools. During the dry season of the year, toads live beneath the soil surface in burrows in upland habitats adjacent to the pools. There are no major populations or critical locations in the plan area.

Threats and Limiting Factors. Spadefoot toads are threatened by urbanization, road construction, off-road vehicular traffic, illegal dumping, livestock grazing, invasive species (such as bullfrogs and mosquito fish), pollutants (such as agricultural chemicals) and other edge effects that degrade habitat quality. Low frequency ground vibrations, such as those caused by electric motors, have been shown to cause this species to prematurely emerge from dormancy, which normally is triggered by vibrations caused by rainfall (Dimmett and Ruibal 1980).

Special Considerations. Toads need unconstrained access to both aquatic breeding habitat and adjacent upland habitat where they aestivate. They are especially vulnerable to roadkill during dispersal, but will use culverts or other road undercrossings provided they are funneled to them by appropriate fencing.

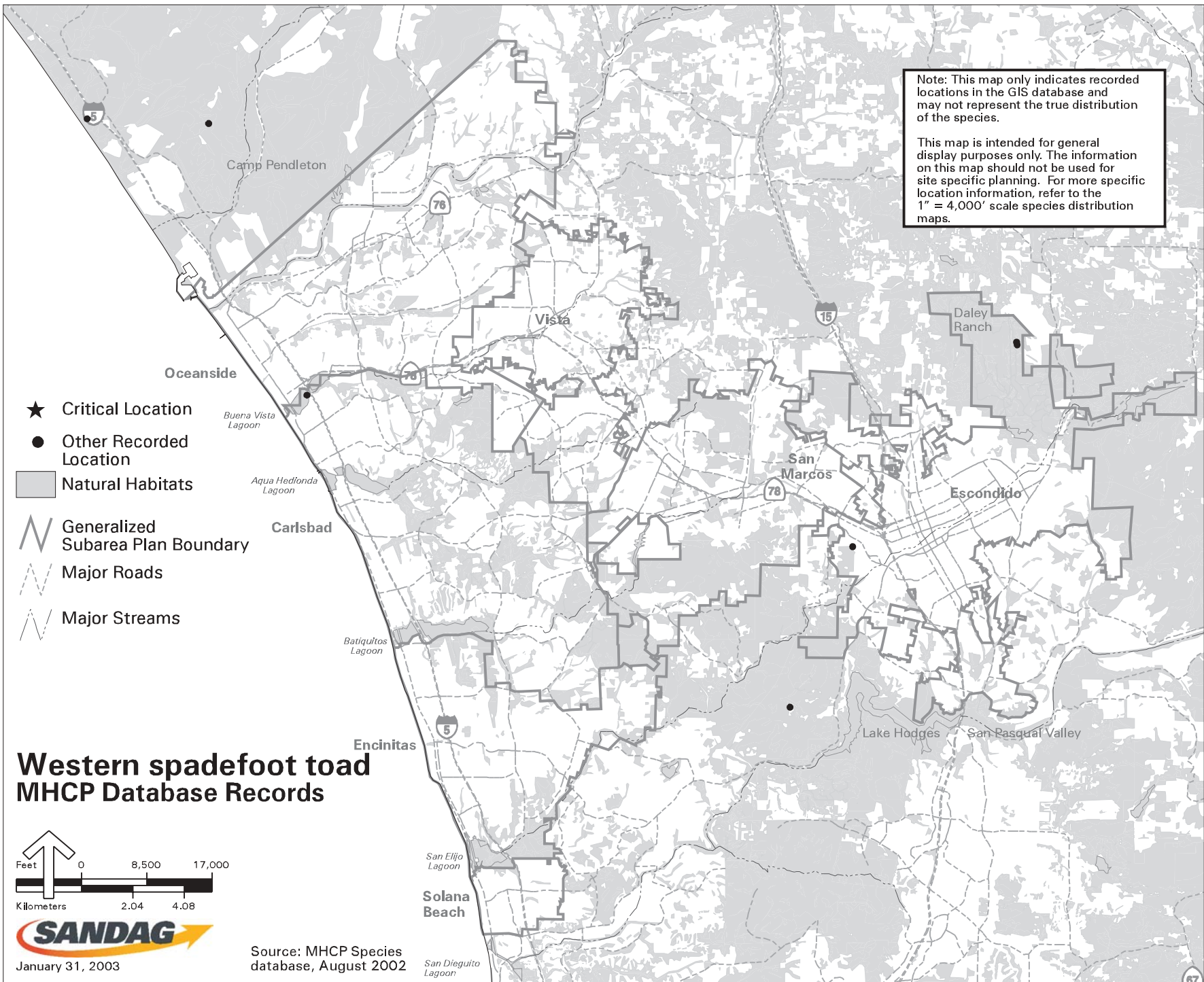
Conservation Analysis

Conservation and Take Levels. Maximum conservation of wetland habitats under the no net loss policy will substantially benefit this species. Conservation of upland communities adjacent to aquatic breeding habitat will also benefit this species, although this additional contribution is difficult to quantify. Not all aquatic freshwater habitat in the preserve is suitable for breeding, and suitable microhabitats cannot be discriminated based on the existing vegetation community database. The FPA also includes all three point localities in the plan area (Table 4-36).

Preserve Configuration Issues. The MHCP will not adversely affect connectivity of aquatic and riparian habitat relative to existing conditions. The quantity of upland habitat may be reduced in many areas where upland habitats adjacent to breeding habitat were not included in the FPA. Preserve management will need to minimize and manage edge effects such as human disturbance, collection of animals for pets, predation by domestic pets in breeding habitat, and upland and upstream activities that affect water quality.

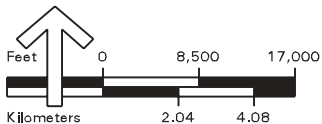
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- Generalized Subarea Plan Boundary
- Major Roads
- Major Streams

Western spadefoot toad MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Dieguito Lagoon

Table 4-36

**SUMMARY OF CONSERVATION FOR
WESTERN SPADEFOOT TOAD**

City	Habitat Acres Conserved ¹		Location Points Conserved ²
	Aquatic	Riparian	
Carlsbad	249 (100%)	459 (100%)	1 (100%)
Encinitas	122 (100%)	274 (100%)	None known
Escondido	317 (100%)	401 (100%)	2 (67%)
Oceanside	399 (100%)	1,088 (100%)	None known
San Marcos	11 (100%)	186 (100%)	None known
Solana Beach	3 (100%)	1 (100%)	None known
Vista	2 (100%)	255 (100%)	None known
MHCP Total ³	1,104 (100%)	2,664 (100%)	3 of 4 (75%)

¹ Habitat includes freshwater, natural floodchannel/streambed, and freshwater marsh aquatic vegetation communities, and all riparian vegetation communities. Other upland habitats near aquatic breeding habitat may also be suitable but are not quantified here.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Raccoons, opossums, and skunks may prey on toads; therefore, continued access to spadefoot toad habitat should be maintained for large mammalian predators, such as coyotes and bobcats, which keep these toad predator populations at low levels.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to maintain population viability of the species and may contribute to species recovery. The MHCP preserve and policies are consistent with current recovery planning and management goals for species. The MHCP will increase regional coordination and funding for monitoring and management, which may improve current management of aquatic and upland habitats and species stability.

Special Considerations. Substantial upland habitat (at least 1,500 feet) should be maintained around aquatic breeding habitats to increase available aestivating habitat and reduce disturbances and edge effects. Mosquito control measures, including addition of mosquito fish or use of pesticides, may harm toads and should be avoided in or near the preserve.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Conduct studies to determine the spatial relationship between breeding and nonbreeding habitats of western spadefoot toad.

Arroyo Southwestern Toad

Bufo microscaphus californicus

USFWS: Endangered

CDFG: Species of Special Concern, Protected

Conservation Goals

Recognizing that this species is already largely extirpated from the study area, maintain the potential for natural recolonization or reintroduction, and thereby contribute to species recovery.

Conservation Strategy

Conserve and manage remaining habitat areas to allow for potential recolonization or reintroduction along major river or stream corridors. Conserve extensive stretches of riparian and instream habitat and adjacent upland habitats to provide contiguous breeding, foraging, and sheltering (aestivation) areas. Manage riparian systems to allow natural fluvial processes (flooding, deposition, scouring) and successional patterns to continue, where feasible. Survey to identify new population areas or potential reintroduction sites. Protect any newly found populations within the study area. Provide suitable upland buffer and foraging areas around riparian habitat, and provide safe road undercrossings between suitable habitat areas. Facilitate coordination of local, state, and federal conservation and management actions for this species, including coordination with the USFWS arroyo southwestern toad endangered species recovery plan.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, unless subarea plans adopt additional species-specific measures.

Rationale. The MHCP cannot achieve the conservation goals or conservation strategy for this species without additional conservation and management commitments. Although the MHCP no net loss policy for wetlands may limit the loss of potential breeding habitat, the plan does not assure sufficient upland habitats adjacent to wetlands to meet the species' needs. Due to existing levels of habitat fragmentation and degradation, the arroyo toad is nearly extirpated from the study area, with only one recent observation along the San Luis Rey River in eastern Oceanside, outside of the FPA. Only about 33% of suitable breeding habitat and 57% of optimal breeding habitat (based on a habitat model by W. Barto) are within the FPA. In addition, natural fluvial processes that create and maintain toad habitat have already been largely disrupted by altered stream flows and watershed degradation in and upstream of the study area, and most potential breeding habitats in the study area are infested with detrimental exotic species that are difficult to control.

Conditions. A subarea plan may receive take authorization for this species if it applies the following additional, species-specific conditions:

1. As part of the project review process (e.g., CEQA) for individual projects within the MHCP area, a qualified biologist possessing a Section 10(a)1(A) research permit for this species must survey all areas of the property containing potentially suitable breeding habitat for arroyo toads, including but not limited to survey areas included on the MHCP Database Records Map, which shows potential suitable arroyo southwestern toad habitat, or upland foraging habitat that is contiguous with potential breeding habitat. Surveys shall be conducted by a qualified biologist using approved survey protocol. Surveys shall occur prior to any proposed impact as part of the project review process (e.g., CEQA process) both within and outside of the FPA. Surveys shall be conducted when impacts to arroyo toad could occur as a result of indirect impacts by placement of the project adjacent to occupied habitat or through creation of suitable conditions for nonnative predators (e.g., bullfrogs, freshwater game fish).
2. Any newly found population with more than 25 adults shall be treated consistent with the Critical Population Policy (Appendix D), including (a) maximum avoidance of impacts, to the degree feasible while maintaining reasonable use of the property; (b) for unavoidable impacts, species-specific mitigation designed to result in no net loss in species viability and to contribute to species recovery; and (c) no more than 5% gross cumulative loss, regardless of location inside or outside of the FPA.
3. Arroyo toad populations within the FPA shall be managed to provide adjacent adult burrowing habitat, control of predatory or competing nonnative species such as bullfrogs and mosquito-fish, and control of water pollution and nonnative vegetation in the breeding pools and adjacent burrowing habitat. Activities that may degrade habitat value will be precluded, including draining of wetlands, mosquito control, livestock grazing, off-road vehicle activity, and degradation of water quality. Management will actively coordinate with any pertinent Vector Control programs to develop methods to minimize impacts on arroyo toads and their habitat, such as changing the timing of any pesticide spraying or use of other alternative control techniques.
4. Sufficient upland foraging habitat shall be conserved and managed adjacent to any newly found population to promote continued viability of the population. "Sufficient Upland Foraging Habitat" shall be defined as all natural habitat or agricultural land contiguous with and within 1 kilometer (0.6 mile) of the edge of suitable breeding habitat, excluding habitat patches not expected to be reachable by toads due to intervening development or movement barriers (e.g., large or heavily traveled roads). Conservation of less than 1 kilometer (0.6 mile) of contiguous foraging habitat shall require USFWS and CDFG written concurrence within 30 days of receipt of written request for concurrence by the local jurisdiction.

5. Suitable unoccupied habitat preserved within the FPA shall be managed to maintain or mimic effects of natural fluvial processes (e.g., periodic substrate scouring and deposition) and to maintain suitable low-gradient sandy stream habitat. Applicable Regional Water Quality Control Board criteria shall be adhered to.
6. Natural riparian connections with upstream riparian habitat shall be maintained to ensure linkage to suitable occupied and unoccupied habitat within the MHCP, County MSCP North Segment, and City of San Diego MSCP Subarea Plan.
7. Projects impacting occupied arroyo toad habitat, or potential habitat contiguous with and within 1 kilometer (0.6 mile) of occupied habitat, shall adhere to the following measures to avoid or reduce impacts:
 - a) The removal of native vegetation and habitat shall be avoided and minimized to the maximum extent practicable. Determination of adequate avoidance and minimization of impacts shall be consistent with Sections 3.6 and 3.7 of the MHCP plan. Deviations from these guidelines shall require written concurrence of the USFWS and CDFG. For temporary impacts, the work site shall be returned to preexisting contours and revegetated with appropriate native species. All revegetation shall occur at the ratios specified in Section 4.3 of the MHCP plan. All revegetation plans shall be prepared and implemented consistent with Appendix C (Revegetation Guidelines) and shall require written concurrence of the USFWS and CDFG. If written objections are not provided by the wildlife agencies within 30 days of receipt of written request for concurrence by the local jurisdiction, then the deviation may proceed as approved by the local agency. The wildlife agencies shall provide written comments specifying wildlife agency concerns.
 - b) All habitat destroyed that is not in the approved project footprint shall be disclosed immediately to the jurisdictional city, USFWS, and CDFG, and shall be compensated at a minimum ratio of 5:1.
 - c) Projects shall be carried out consistent with Appendix B (Standard Best Management Practices).
 - d) Project-construction vehicle travel shall be limited to daylight hours, as arroyo toads use roadways primarily during nighttime hours. New roads adjacent to occupied toad habitat shall include provisions for barriers to minimize traffic mortality. Culverts and fencing designed to funnel toads through culverts shall be included within the road design to allow safe crossings.
 - e) Projects shall be designed to avoid the placement of equipment and personnel within the stream channel or on sand and gravel bars, banks, and adjacent upland habitats used by arroyo toads.

- f) Projects that cannot be conducted without placing equipment or personnel in sensitive habitats shall be timed to avoid the breeding season of the arroyo toad (generally March through August) when eggs and tadpoles are present. To minimize further effects to breeding populations and to reduce sedimentation and erosion, such projects shall be timed so that work within or near the stream channel is conducted during the dry season when flows are at their lowest or are nonexistent.
- g) Silt fencing/drift fence and pitfall traps shall be installed around the impact area adjacent to occupied arroyo toad habitat at least 21 days prior to impact to minimize access by toads and to allow for removal of arroyo toads from the impact area. A permitted biologist experienced with the identification, handling, and ecology of the arroyo toad shall implement and oversee proper execution of the toad exclusion fencing, relocation efforts, and monitoring. The exclusion fencing shall be maintained until the completion of all construction activities within or adjacent to occupied arroyo toad habitat. For the duration of construction, the enclosure shall be surveyed on a daily basis early in the morning, and any toads that may have breached the fencing shall be relocated.
- h) Bullfrogs and other exotic species that prey upon or displace arroyo toad shall be removed from the site as part of an ongoing management plan.
- i) To minimize injury to or mortality of individual arroyo toads, the USFWS may authorize qualified project biologists to relocate individual arroyo toads to nearby suitable habitat. Authorization will be granted only to jurisdictions with signed implementing agreements and issued permits that cover arroyo toads and will require coordination with the wildlife agencies and written concurrence.
- j) Require road projects (including new roads or improvements to existing roads) passing within 1 kilometer (0.6 mile) of known breeding habitats to consider, based on an appropriate, site-specific biological study approved by the wildlife agencies, whether creating underpasses and associated toad fencing would benefit toad populations in the area. Where there would be benefits to allowing toads safe dispersal routes across roads, appropriately designed underpasses and associated toad fencing shall be constructed as part of the project.

Background

Distribution, Abundance, and Trends. The arroyo southwestern toad is distributed along rivers and larger creeks on the coastal slope from southern San Luis Obispo County south to northwestern Baja California, Mexico. Documented arroyo toad locations are lacking for the MHCP area, except for one recent record outside the FPA near the eastern boundary of Oceanside. Records exist for the San Luis Rey River in the immediate vicinity of Bonsall and on Camp Pendleton as well as multiple locations in the MSCP area (see Potential Suitable Arroyo Southwestern Toad Habitat Map). A questionable

record from the San Luis Rey River within the MHCP study area requires verification (T. Case personal communication). No major or critical populations have been identified in the MHCP area, and the species may be functionally extirpated from the study area (i.e., despite one recent observation, it is highly unlikely that the species can continue to persist in the study area under existing conditions).

The arroyo toad occurs along rivers and creeks that sustain a sufficient flow to allow the development of tadpoles. Eggs and tadpoles require still backwaters along the sandy or gravelly banks of clear, slow-moving streams and rivers (Stebbins 1985; Sweet 1992). Adults forage and burrow in upland habitats adjacent to breeding areas. Upland habitats include oak woodlands, open grasslands, coastal sage scrub, and fallow agricultural fields (Griffin and Case 2001). Adults are known to range up to 3,000 feet from breeding pools (Griffin et al. 1999). Increased human activities have encroached on arroyo toad habitat over the last 50 years and have caused precipitous declines in this species' abundance.

Threats and Limiting Factors. Major threats include urbanization, road construction, off-road vehicular traffic, trampling, livestock grazing, sand mining, streamflow alteration and reservoir construction, introduced aquatic predators including bullfrog and game fish, and edge effects (Griffin et al. 1999, USFWS 1999b).

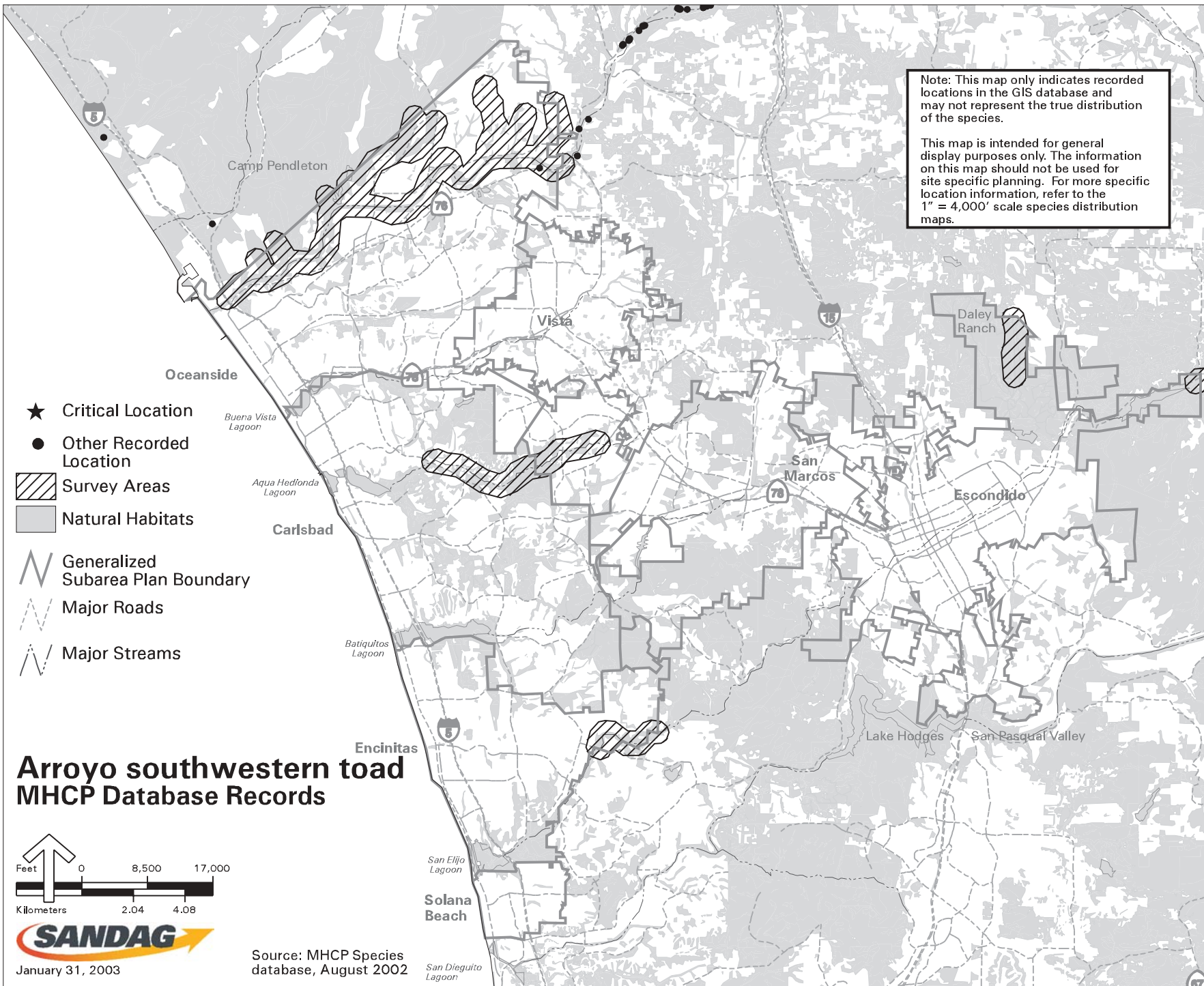
Special Considerations. The breeding season is generally from March to July, but sometimes to September (Stebbins 1954). Newly emerged toadlets require streamside gravel bars for basking and shallow banks for dispersal. High velocity releases from upstream impoundments can flush eggs and toadlets from suitable habitat and can seriously impact the population. Toads need unconstrained access to both aquatic breeding habitat and adjacent upland habitat (within 1 kilometer [0.6 mile] of riparian corridors) where they aestivate. Adult toads often migrate upstream and downstream in search of suitable breeding habitat (Griffin et al. 1999), and tadpoles can be washed significant distances downstream. Recolonization of potential habitat along the San Luis Rey River in Oceanside, from occupied sites farther upstream, is therefore possible.

Conservation Analysis

Conservation and Take Levels. Although it is possible that arroyo southwestern toads occur sporadically within the MHCP study area, it is not possible to quantify the population, and it is unlikely that the study area currently supports sustainable populations. All potential breeding habitat within the MHCP is 100% conserved based on the no net loss of wetlands habitat. However, the fluvial processes that create and maintain the sand and gravel bars required for breeding are not protected by this plan. Furthermore, few riparian corridors in the study area are buffered by sufficient upland habitats to ensure that all life requisites can be met, and some such areas may be insufficiently conserved within the FPA. Conservation of the riparian ecological community and the upland ecological communities (e.g., coastal scrub and chaparral) will enhance conservation of this species habitat. No take is expected under the plan.

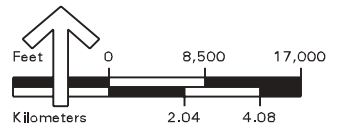
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- ★ Critical Location
- Other Recorded Location
- ▨ Survey Areas
- Natural Habitats
- Generalized Subarea Plan Boundary
- Major Roads
- - - Major Streams

Arroyo southwestern toad MHCP Database Records



Source: MHCP Species database, August 2002

San Dieguito Lagoon

Preserve Configuration Issues. The FPA conserves few large upland areas adjacent to potential breeding habitat to ensure that all life requisites can be met to sustain local populations. Riparian species are especially vulnerable to edge effects due to the linear nature of riparian habitat (high edge-to-core area ratio). Therefore, substantial upland buffers should be provided wherever possible. No major dispersal barriers appear to exist along the San Luis Rey River to prevent colonization from occupied sites upstream, outside the MHCP area. Most other drainages in the MHCP begin within urbanized areas or are otherwise highly unlikely to receive dispersing toads from outside the study area.

Effects on Population Viability and Species Recovery. All existing potential breeding habitat will be conserved under the no net loss policy; however, this is not expected to significantly contribute to nor impact species viability and recovery. The species is not known to occur in the study area, except for one recent observation outside the FPA, and insufficient upland foraging habitat is found along most riparian habitats in the study area to support viable populations. However, if arroyo southwestern toads recolonize portions of the study area, conservation of the new population(s) and protection of adjacent upland habitats may contribute to species viability and recovery.

Special Considerations. If a new population of arroyo southwestern toad were discovered within the MHCP area, it should be managed for recovery in conjunction with the MHCP adaptive management program for other species.

Adaptive Management Program

Not applicable.

California Red-legged Frog*Rana aurora draytoni***USFWS: Threatened****CDFG: Species of Special Concern, Protected****MHCP: Obligate Wetland Species****Conservation Goals**

Recognizing that this species is extirpated from the study area, maintain the potential for natural recolonization or reintroduction, and thereby contribute to species recovery.

Conservation Strategy

Conserve and manage remaining habitat areas to allow for potential recolonization or reintroduction along major river or stream corridors. Conserve extensive stretches of freshwater wetlands, riparian, and instream habitats to provide contiguous breeding, foraging, and sheltering areas. Manage riparian systems to allow natural fluvial processes (flooding, deposition, scouring) and successional patterns to continue, where feasible. Survey to identify new population areas or potential reintroduction sites. Protect any newly found populations within the study area. Protect upland buffer areas around riparian habitat. Facilitate coordination of local, state, and federal conservation and management actions for this species, including coordination with the USFWS California red-legged frog endangered species recovery plan.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, due to extirpation and the infeasibility of reintroduction or recolonization.

Rationale. The MHCP is expected to have no effect on conservation of this species. Red-legged frogs are extirpated from the study area and are highly unlikely to return due to lack of suitable habitat, an abundance of detrimental exotic species, and other negative factors.

Conditions. Not applicable.

Background

Distribution, Abundance, and Trends. Historically, the subspecies *R. a. draytonii* ranged from Mendocino County to northwestern Baja California, Mexico, along the coastal plains and into the coastal ranges, as well as in the Sierra foothills from Tehama County to Tulare County. This species is believed to be extirpated from large areas of its range, including San Diego County. The southernmost population known to remain at this time is on the Santa Rosa Plateau in Riverside County (USFWS 1995b). This population is declining, with only 3 individuals observed in the spring of 1998. The species was historically common in northern San Diego County. California red-legged frog frequents

marshes, slow parts of streams, lakes, reservoirs, ponds, and other usually permanent water sources. It occurs primarily in wooded areas in lowlands and foothills, although it can also be found in grassland. It is typically associated with deep-water pools (at least 0.5 meter [1.6 feet] in depth) fringed by thick vegetation (Zweifel 1955), especially arroyo willow or native cattails. There are no known major or critical populations in the MHCP study area, and no known localities in the database.

Threats and Limiting Factors. Major threats include introduced aquatic predators, streamflow alteration, urbanization, road construction, off-road vehicular traffic, livestock grazing, agricultural pesticides, edge effects, and sand and gravel mining (San Diego Herpetological Society 1980a; Hayes and Jennings 1986; Storm 1960; Davidson et al. 2002).

Special Considerations. Control of nonnative predators (e.g., carp, largemouth bass, bull frogs) and competitors (e.g., bull frogs) is necessary to maintain populations. However, control of such exotic species is extremely difficult in perpetuity. Drift of pesticides from agricultural areas has recently been demonstrated a likely cause of this species' extirpation from large areas of its former range (Davidson et al. 2002).

Conservation Analysis

Conservation and Take Levels. No take is expected under the plan, since the species is probably extirpated from the study area and highly unlikely to return. All potential breeding habitat within the MHCP is 100% conserved based on no net loss of wetlands habitat. All potentially suitable habitat will be protected by maximum conservation of the riparian ecological community. However, the quality of the habitat would depend on active management to maintain water quality, to protect suitable breeding pools, and to control nonnative competitors and predators.

Preserve Configuration Issues. The FPA conserves few or no areas with potential to sustain local populations. Some connectivity of potential habitat is maintained through the maximum conservation of the riparian ecological community. Riparian species are especially vulnerable to edge effects due to the linear nature of riparian habitat (high edge-to-core area ratio). Therefore, substantial upland buffers should be provided wherever possible. Further discussion of preserve configuration is irrelevant, because a viable population of red-legged frogs is not known to exist within the MHCP study area and is unlikely to occur in the future.

Effects on Population Viability and Species Recovery. The MHCP is not expected to contribute to nor impact species viability or recovery.

Special Considerations. If a new population of California red-legged frog were discovered within the MHCP area, it should be managed for recovery in conjunction with the MHCP adaptive management program for other species.

Adaptive Management Program

Not applicable.

Southwestern Pond Turtle

Clemmys marmorata pallida

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: Species of Special Concern

Conservation Goals

Ensure persistence of this species in the plan area. Contribute to regional population viability. Allow for natural recolonization or reintroduction into unoccupied or restored habitat. Increase population size within the plan area.

Conservation Strategy

Include within the open space preserve system all potential habitat within riparian habitat and freshwater ponds and lakes. Include substantial upland nesting habitat within 500 feet of suitable aquatic habitat. Implement species-specific management actions, as necessary to increase habitat quality and population size. Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP will adequately conserve this species by conserving 100% of potential wetland and open water habitat in the study area and by managing preserve areas consistent with species' needs. It is difficult to quantify conservation of upland areas needed by the species adjacent to breeding habitats, but the species will suffer from fragmentation and edge effects in these upland habitats.

Conditions. The following conditions must be met by subarea plans to adequately conserve this species:

1. As part of the project review process (e.g., CEQA) for individual projects within the MHCP area, a qualified biologist must survey all areas of the property containing or adjacent to suitable aquatic habitat (streams, ponds, riparian, and marsh areas) for this species. Impacts proposed in natural upland vegetation that is contiguous with and within 1,500 feet of potential aquatic habitats may affect turtle nests or hibernating turtles. Consequently, whenever possible, potential suitable habitats within 1,500 feet of the proposed impact area shall be surveyed, unless this adjoining habitat can be demonstrated not to be appropriate for nesting or hibernating. Surveys shall be conducted during the presumed active period (March through October) prior to any proposed impact as part of the project review process (e.g., CEQA process) both within and outside of the FPA. Any report of a pond turtle observed during the initial survey shall require a follow-up intensive trapping study to determine if breeding is occurring. Evidence of

- breeding shall include individuals representing multiple-year classes, presence of adult male and female turtles, or nest locations.
2. Avoid and minimize impacts to critical breeding locations, including at Buena Vista Lagoon, Escondido Creek, and the San Luis Rey River. Although western pond turtle is not an MHCP Narrow Endemic, all currently known or future discovered populations will be treated consistent with requirements of the Narrow Endemics Policy, including the following: (a) maximum avoidance of impacts, to the degree feasible while maintaining reasonable use of the property; (b) for unavoidable impacts, species-specific mitigation designed to minimize adverse effects to species viability and to contribute to species recovery; and (c) no more than 5% gross cumulative loss inside the FPA or 20% gross cumulative loss outside the FPA.
 3. Any identified pond turtle breeding area, including aquatic, riparian, marsh, and associated uplands, shall be delineated and conserved. The breeding area shall be conserved such that the full range of life activities can continue at an equivalent level, preferably through avoidance/minimization of impacts to the site. Sufficient upland nesting/hibernating habitat shall be provided adjacent to occupied turtle habitat on a case-by-case basis and shall require the written concurrence of the USFWS and CDFG within 30 days of receipt of request for written concurrence from the local jurisdiction.
 4. Projects having direct or indirect impacts to the southwestern pond turtle shall adhere to the following measures to avoid or reduce impacts:
 - a) The removal of native vegetation and habitat shall be avoided and minimized to the maximum extent practicable. Determination of adequate avoidance and minimization of impacts shall be consistent with Sections 3.6 and 3.7 of the MHCP plan. Deviations from these guidelines shall require written concurrence of the USFWS and CDFG. For temporary impacts, the work site shall be returned to preexisting contours and revegetated with appropriate native species. All revegetation shall occur at the ratios specified in Section 4.3 of the MHCP plan. All revegetation plans shall be prepared and implemented consistent with Appendix C (Revegetation Guidelines) and shall require written concurrence of the USFWS and CDFG. If written objections are not provided by the wildlife agencies within 30 days of receipt of written request for concurrence by the local jurisdiction, then the deviation may proceed as approved by the local agency. The wildlife agencies shall provide written comments specifying wildlife agency concerns.
 - b) Projects shall be implemented consistent with Appendix B (Standard Best Management Practices).
 - c) Projects shall avoid or minimize placement of equipment and personnel within the stream and adjacent natural habitats in known turtle locations.

- d) If necessary and acceptable to the wildlife agencies, turtles shall be captured and held in an approved facility until the site is restored and acceptable for reintroduction.
 - e) Individuals found in areas that are determined to be nonbreeding sites may be relocated to unoccupied, appropriate breeding areas within the MHCP preserve.
5. Known breeding populations and areas shall be included in the MHCP monitoring protocol.

Background

Distribution, Abundance, and Trends. This subspecies of pond turtle occurs in southern California and northern Baja California, Mexico. Within the MHCP area, pond turtles are documented in Buena Vista Lagoon, Escondido Creek, San Luis Rey River, and the upper reaches of Pilgrim Creek on adjacent Camp Pendleton (see MHCP Database Records Map). The southwestern pond turtle inhabits slow-moving permanent or intermittent streams, small ponds, and small lakes (Rathbun et al. 1992). The Buena Vista Lagoon, Escondido Creek, and San Luis Rey River are considered major populations and critical locations.

Threats and Limiting Factors. Southwestern pond turtle populations have declined because of the loss and alteration of aquatic habitats, predation on young by introduced aquatic species (e.g., bullfrogs, bass, and catfish), collection for pets, enhanced predation (e.g., dogs, raccoons, skunks), and competition with exotic turtles (Holland 1991; San Diego Herpetological Society 1980b).

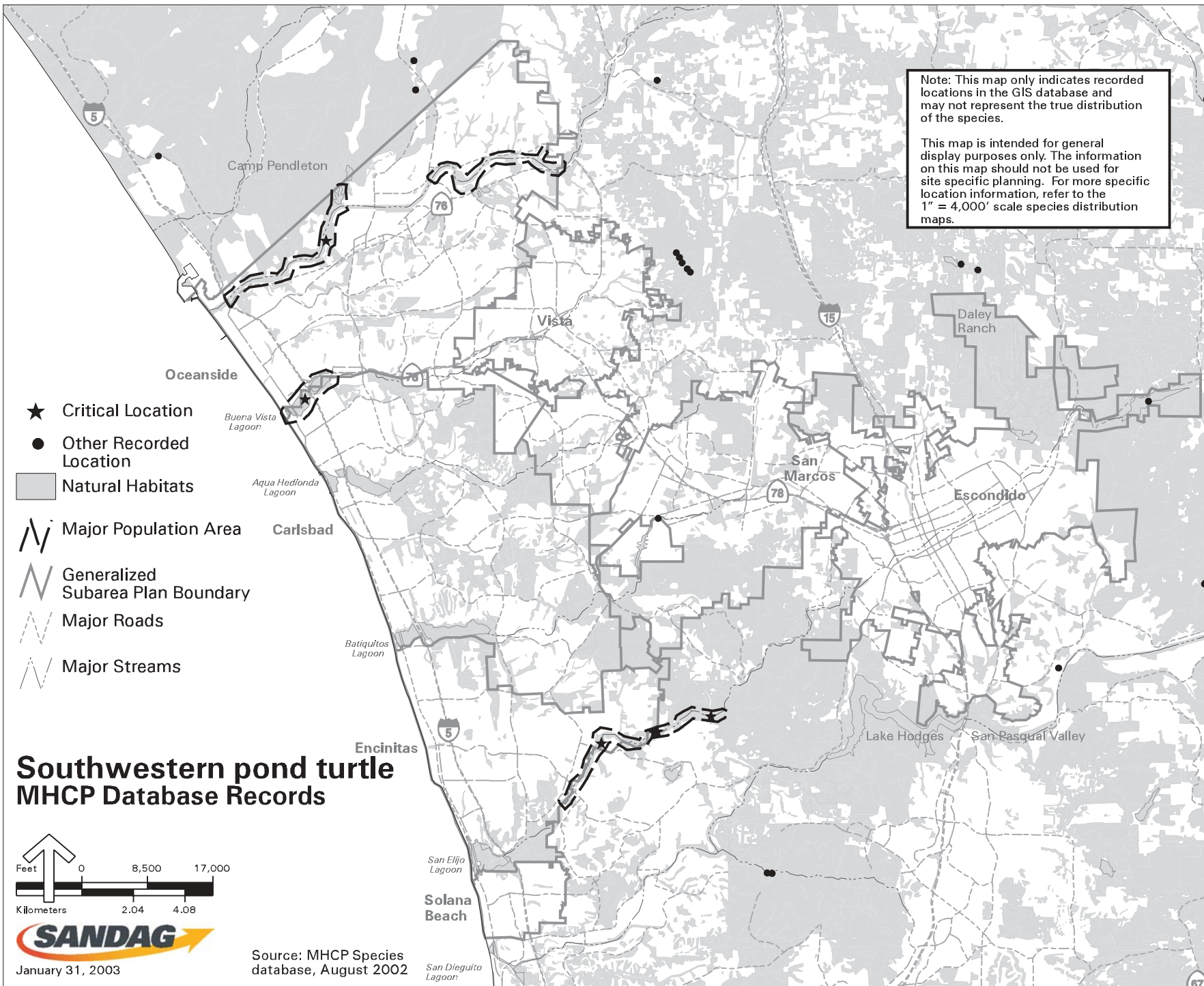
Special Considerations. The pond turtle requires adjacent uplands (up to 1,500 feet on either side of a populated watercourse) for nesting; logs, rocks, or vegetation mats for basking; and emergent marsh vegetation for cover.

Conservation Analysis

Conservation and Take Levels. Maximum conservation of the lagoon and marsh and riparian ecological communities (100%; Section 3.2) will substantially benefit this species. However, not all aquatic freshwater habitat in the preserve is suitable for pond turtles, and the subset of suitable habitat cannot be quantified with existing data. Conservation of some upland communities within 1,500 feet of suitable aquatic habitat may also benefit this species, although this contribution is difficult to quantify, and fragmentation of these upland areas will increase somewhat. The critical locations and major populations in Buena Vista Lagoon, Escondido Creek, and San Luis Rey River will be 100% conserved. The FPA also includes all point localities in the plan area (Table 4-37).

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- ▭ Major Population Area
- ▭ Generalized Subarea Plan Boundary
- ▭ Major Roads
- ▭ Major Streams

Southwestern pond turtle MHCP Database Records

SANDAG

 January 31, 2003

Source: MHCP Species database, August 2002

Preserve Configuration Issues. The MHCP is not expected to adversely affect connectivity of aquatic and riparian pond turtle habitat relative to existing conditions. The quantity of upland nesting habitat may be reduced in areas where upland habitats in the preserve extend less than 1,500 feet from suitable aquatic habitat. Preserve management will need to minimize and manage edge effects, such as human disturbance, collection of animals for pets, predation by domestic pets in breeding habitat, and upland and upstream activities that affect water quality. Raccoons, opossums, and skunks prey on turtles; therefore, continued access to pond turtle habitat should be maintained for large mammalian predators, such as coyotes and bobcats, which may help control populations of these turtle predators.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to maintain and possibly enhance population viability of the species. The MHCP preserve and policies are consistent with current recovery planning and management goals for species. The MHCP will increase regional coordination and funding for monitoring and management, which may improve current management of aquatic and riparian habitats and species stability.

Special Considerations. Adequate (1,500 feet) upland buffer areas should be maintained around aquatic habitats to increase available nesting habitat and reduce disturbances and edge effects (Holland 1994).

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Conduct studies to determine the spatial relationship between breeding and nonbreeding habitats of southwestern pond turtle.

Table 4-37

**SUMMARY OF CONSERVATION FOR
SOUTHWESTERN POND TURTLE**

City	Habitat Acres Conserved ¹		Location Points Conserved ²	Major Populations Conserved	Critical Locations Conserved
	Aquatic	Riparian			
Carlsbad	249 (100%)	459 (100%)	1 (100%)	None known	None known
Encinitas	122 (100%)	274 (100%)	4 (100%)	None known	None known
Escondido	317 (100%)	401 (100%)	1 (100%)	Escondido Creek conserved at 100%	Escondido Creek conserved at 100%
Oceanside	399 (100%)	1,088 (100%)	1 (100%)	San Luis Rey River and Buena Vista Lagoon conserved at 100%	San Luis Rey River and Buena Vista Lagoon conserved at 100%
San Marcos	11 (100%)	186 (100%)	None known	None known	None known
Solana Beach	3 (100%)	1 (100%)	None known	None known	None known
Vista	2 (100%)	255 (100%)	None known	None known	None known
MHCP Total ³	1,104 (100%)	2,664 (100%)	7 of 7 (100%)	All major populations are 100% conserved	All critical locations are 100% conserved

¹ Habitat includes freshwater, natural floodchannel/streambed, and freshwater marsh aquatic vegetation communities, and all riparian vegetation communities. Does not include hibernating and nesting habitat in uplands.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

San Diego Horned Lizard

Phrynosoma coronatum blainvillei

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: Species of Special Concern

Conservation Goals

Ensure persistence of the San Diego horned lizard in the plan area. Contribute to regional population viability by enhancing habitat quality and minimizing edge effects, including impacts related to nonnative ant species.

Conservation Strategy

Conserve large blocks of San Diego horned lizard habitat (primarily chaparral, southern maritime chaparral, coastal sage scrub, coastal sage scrub/chaparral mix, grassland, and oak woodlands) within the MHCP. Include large core habitat areas contiguous with similar habitat outside the MHCP or that are adequately linked by San Diego horned lizard dispersal corridors to similar habitat inside the MHCP. Implement measures to control invasions by nonnative ants into native habitats.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, unless subarea plans adopt additional species-specific measures.

Rationale. The MHCP will conserve about 59% of suitable habitat (including about 68% of that within the BCLA) for this species. However, habitat fragmentation and edge effects are expected to make about 76% of this acreage unsuitable for the species. Only about 24% of the conserved habitats will be more than 200 m (656 ft) from developed edges and therefore assumed relatively free of invasion by Argentine ants. Control measures to preclude or minimize invasions by Argentine ants are not currently available. Only a few habitat areas in the study area may be large enough to sustain the species. Connectivity is poor for this species, which generally cannot successfully cross paved roads

Conditions. A subarea plan may receive take authorization for habitat of this species if it implements the following species-specific conditions:

1. Conserve at least one additional habitat block within the study area that is large enough (at least 400 acres), and low enough in edge effects and habitat degradation, to sustain a viable population of horned lizards.
2. Institute an aggressive and proactive management and monitoring program designed to control Argentine ants, maintain native ant species relied upon by horned lizards, and translocate or reintroduce horned lizards into preserve areas

from which it is extirpated to maintain a functional metapopulation within the MHCP study area in perpetuity.

Background

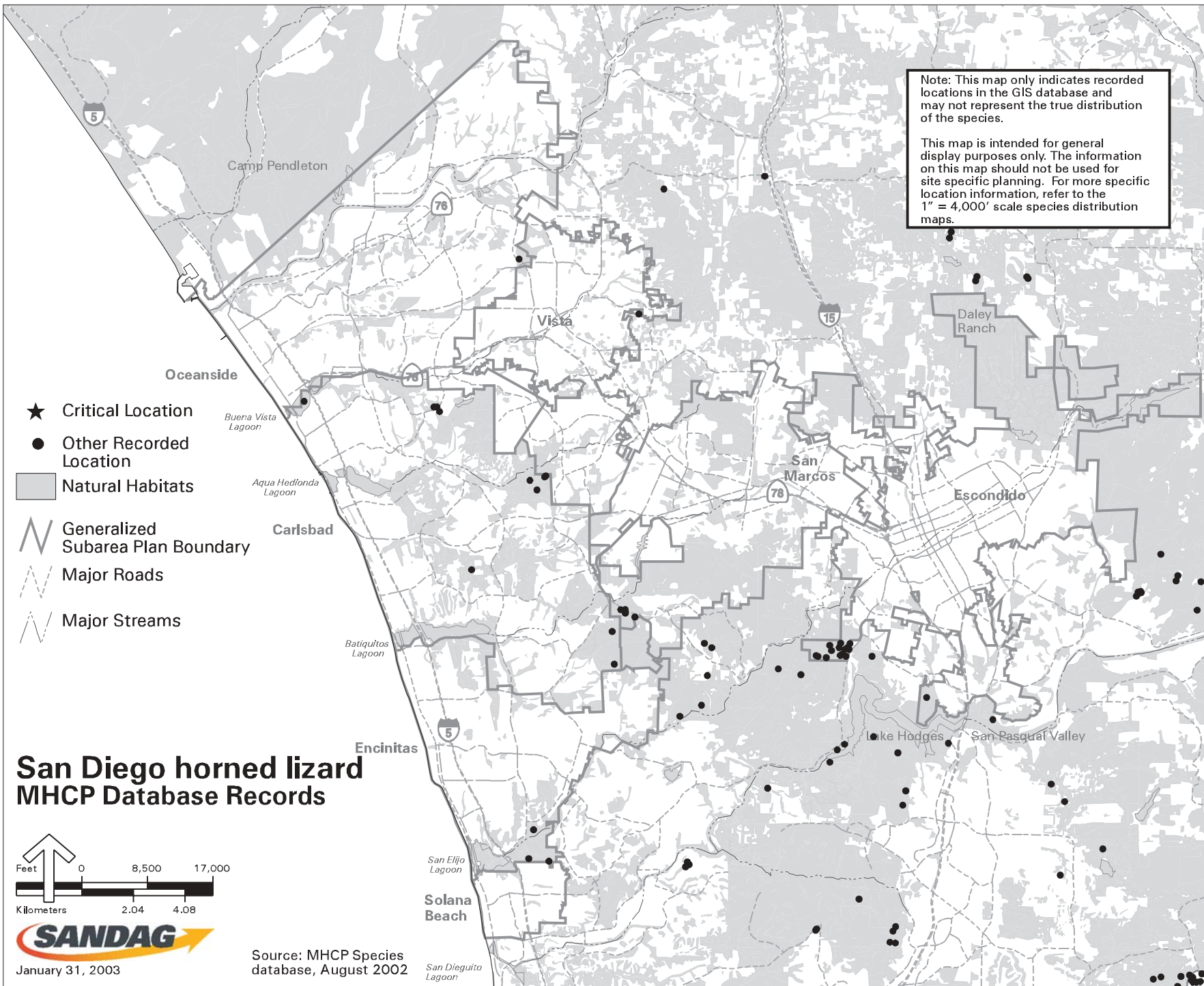
Distribution, Abundance, and Trends. The San Diego horned lizard occurs along the coastal slope of southern California at elevations below 8,000 feet. This species is found in a variety of habitats ranging from open, sandy areas to dense chaparral, including coastal sage scrub, grasslands, and open coniferous forests. The distribution of horned lizards is locally patchy and dependent upon a variety of factors, including microhabitat characteristics (e.g., areas with loose sand; R. Fisher personal communication) and the availability of its primary food item, harvester ants. Documented San Diego horned lizard locations within the MHCP area (see MHCP Database Records Map) include scattered sightings in east Oceanside, Carlsbad (e.g., Carlsbad Highlands, Aviara, and east La Costa), south Encinitas, southwest San Marcos, and southwest Escondido (near Harmony Grove). There are no major or critical populations identified in the MHCP area. This species has declined significantly during the last 50 years as a result of habitat loss and other threats.

Threats and Limiting Factors. The principal threats to the San Diego horned lizard are habitat loss, fragmentation, and degradation. San Diego horned lizards can also be impacted by off-road vehicle activity, overgrazing by livestock, collection for pets, ecological effects of introduced ant species, and predation by introduced predators (e.g., cats and dogs). Invasions by Argentine ants (*Linepithema humile*), which are now superabundant in and near developed areas in southern California, eliminate native ants species, which typically comprise over 95% of the horned lizard's diet (Fisher et al. 2002). San Diego horned lizards avoid eating Argentine ants, lose weight when forced to eat them, and disappear from areas where they have invaded (Suarez et al. 2000). Argentine ants readily invade all mesic habitats (e.g., riparian areas) as well as more xeric upland areas within about 200 m (656 ft) of irrigated landscapes.

Special Considerations. Fisher et al. (2002) studied spatial patterns in the abundance of this subspecies throughout its range. They found that horned lizard abundance was strongly negatively correlated with presence of Argentine ants, which in turn was strongly correlated with the relative amount of developed edge around a site. Other factors affecting lizard abundance included vegetation (positive correlation with scrub and chaparral indicator plants) and soil (positive correlation with sandy substrates). Horned lizards were absent or very uncommon on nearly all of the smaller habitat areas they sampled.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location

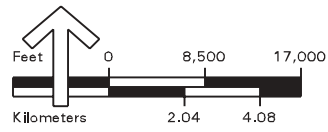
■ Natural Habitats

— Generalized Subarea Plan Boundary

--- Major Roads

--- Major Streams

San Diego horned lizard MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Diegouito Lagoon

The San Diego horned lizard forages almost exclusively on harvester ants (e.g., *Pogonomyrmex* and *Pheidole* spp.). It consequently disappears where introduced Argentine ants competitively exclude harvester ants (San Diego Herpetological Society 1980b; T. Case personal communication; Suarez et al. 1998, 2000). Argentine ant invasion is a significant edge effect in San Diego horned lizard habitat. Argentine ants penetrate up to 200 meters (656 feet) into native habitat from the urban edge or irrigated landscaping (Suarez et al. 1998). Therefore, smaller fragments (e.g., <30 acres) of habitat would lack core area refugia that are not invaded by Argentine ants (Suarez et al. 1998) and even habitat areas of many hundreds of acres may not be able to sustain native harvester ants or viable populations of horned lizards. Horned lizards are known to switch to eating beetles or other insects where Argentine ants have displaced harvester ants (R. Fisher personal communication) but Suarez and Case (2002) demonstrated that horned lizards generally do not grow when fed these suboptimal prey.

Clutch size ranges from 6 to 16 eggs (Stebbins 1954) with a mean of 13 eggs (Pianka and Parker 1975). Egg-laying occurs from late May through June (Pianka and Parker 1975). Little is known about the home range of *P. coronatum*; however, a close relative in Arizona (*P. solare*) typically establishes a well-defined home range (Baharav 1975). The mean maximum distance between capture points for males was 98 feet and for females was 49 feet, or a 0.7-acre home range for males and a 0.2-acre home range for females (assuming a circular home range).

Conservation Analysis

Conservation and Take Levels. About 22 of 34 point localities (65%) in the study area will be conserved, and approximately 14,521 acres (59%) of potential horned lizard habitat will be conserved (Table 4-38). However, these calculations greatly overstate actual conservation of suitable or occupied horned lizard habitat, because only an unknown proportion of these vegetation communities has the open, sandy areas this species requires, and because approximately 76% of this acreage is subject to severe edge effects, including an abundance of Argentine ants.

Preserve Configuration Issues. The FPA preserve design includes large blocks of suitable habitat on the periphery of the MHCP (e.g., north Oceanside, north and south San Marcos, north and east Escondido, and east Carlsbad) that are contiguous with similar areas outside of the MHCP. Gene flow within and across the MHCP area is likely to be impaired except where contiguous corridors of occupiable breeding habitat exist. The FPA preserve design does not provide a contiguous corridor for horned lizards across the whole MHCP area. It is possible that most or all north-south gene flow across the center of the MHCP area has already been eliminated by current development conditions. It is unlikely that dispersal occurs across wide areas of unsuitable or developed land.

Table 4-38

**SUMMARY OF CONSERVATION FOR
SAN DIEGO HORNED LIZARD**

City	Habitat Acres Conserved ¹		Location Points Conserved ²
	Net Acres (%)	BCLA Acres (%)	
Carlsbad	2,659 (58%)	2,566 (61%)	4 (40%)
Encinitas	1,377 (72%)	1,283 (73%)	3 (100%)
Escondido	6,450 (76%)	6,134 (82%)	15 (100%)
Oceanside	1,287 (41%)	1,143 (54%)	0 (0%)
San Marcos	2,370 (46%)	2,289 (55%)	0 (0%)
Solana Beach	30 (36%)	29 (55%)	None known
Vista	348 (28%)	306 (57%)	None known
MHCP Total ³	14,521 (59%)	13,749 (68%)	22 of 34 (65%)

¹ Habitat includes chaparral, southern maritime chaparral, coastal sage scrub, coastal sage scrub/chaparral mix, grassland, and oak woodlands vegetation communities.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

A single road with moderate traffic volumes may be an absolute barrier to dispersal (R. Fisher personal communication). Therefore, fragments of habitat currently isolated by unsuitable habitat or development are not likely to be naturally recolonized following local extinctions.

The preserve includes 13,749 acres (68%) of the potential horned lizard habitat contained by the BCLA (Table 4-38). The BCLA was delineated to include the most important large blocks of habitat, critical locations, and areas of high biological value. FPA conservation of the BCLA therefore provides a useful measure for comparing the proposed preserve to a biologically preferred preserve design, given the existing degree of fragmentation in the plan area. Consequently, although about 59% of total potential habitat will be preserved, approximately 68% of the most important potential habitat will be conserved. However, most of this acreage will be adversely affected by such edge effects as Argentine ant invasions. As shown in Section 3.1.2 and Figure 2-4, only about 4,872 acres of all conserved natural habitat, or about 23% of the total conserved habitat, will lie more than 200 meters (656 feet) from preserve boundaries or habitat edges and may continue to support the native harvester ants that horned lizards eat. In addition, riparian corridors or other mesic habitats will likely serve as invasion conduits for Argentine ants into the core of even the largest reserve areas, thereby effectively reducing the potential habitat for horned lizards even more. It is unlikely that all but the largest upland reserve areas, contiguous with other similar habitats outside the MHCP, can sustain populations of horned lizards within the study area.

Effects on Population Viability and Species Recovery. The population size for the San Diego horned lizard within the MHCP is difficult to estimate because densities are highly variable from one site to the next (R. Fisher personal communication; Fisher et al. 2002). Nevertheless, only the largest habitat blocks that are contiguous with extensive habitat outside the MHCP area are likely to support viable populations of horned lizards. Conservation and active management of these areas might contribute to population stability and species recovery, but this would require intensive management and monitoring to ensure.

Smaller isolated patches are not likely to support populations over the long term; therefore, active management, including monitoring and possible translocation, would be required to maintain these smaller populations. Protection and management of these smaller fragments in the FPA may contribute to species recovery and could enhance gene flow across the MHCP area. Loss of smaller isolated fragments of habitat outside the FPA would not impact population viability and species recovery because these fragments are already severely impacted by existing development.

Special Considerations. A suitable prey base must be available in habitat where recolonization or reintroduction is desired. Harvester ants are a critical component of the San Diego horned lizard diet; therefore, impacts to harvester ants by nonnative ants must be minimized. No effective measures for controlling Argentine ants in reserve areas are yet available. Roads are dispersal barriers and should be avoided across large preserve blocks.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Initiate translocation experiments if research results indicate need. Select translocation individuals from near by (genetically similar) larger populations that would be most likely to provide dispersing individuals (gene flow) under natural conditions.
2. Implement a program of introducing individuals into suitable formerly occupied and potential habitat to initiate new populations or recolonize extirpated populations within the preserve system, as deemed necessary to maintain or enhance the genetic diversity of the metapopulation.
3. Do not attempt to translocate individuals to habitat lacking suitable prey base (e.g., where harvester ants have been displaced by Argentine ants).
4. Coordinate with ongoing research on dispersal abilities of this species (e.g., T. Case, UCSD; R. Fisher, SDSU) to estimate colonization ability and expected levels of gene flow within and between the MHCP study area.

Orange-throated Whiptail

Cnemidophorus hyperythrus beldingi

USFWS: None

CDFG: Species of Special Concern, Protected

Conservation Goals

Ensure species persistence within the plan area and contribute to regional viability of the species by conserving large blocks of habitat and connections to natural habitat outside the plan area boundary.

Conservation Strategy

Conserve large blocks of orange-throated whiptail habitat (primarily open coastal sage scrub and chaparral mosaics) within the plan area and maintain contiguity with large blocks of habitat outside of the plan area. Maintain linkages between habitat blocks that consist of habitat suitable for dispersal of this species.

Coverage Determination and Permit Conditions

Coverage Determination. Covered.

Rationale. The MHCP will adequately conserve this species by conserving approximately 66% of the total habitat for the species (including 71% of that within the BCLA), maintaining broad linkages to habitats outside the study area, and managing preserve areas for the benefit of the species. The species seems less affected by fragmentation and edge effects than other coastal sage scrub reptiles (such as the San Diego horned lizard). The FPA will also conserve about 60% of recorded locations (55 of 92 points). Conservation of the additional 400-500 acres of coastal sage scrub in the unincorporated core area will also benefit this species.

Conditions. Not applicable.

Background

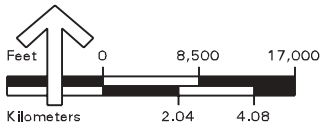
Distribution, Abundance, and Trends. The orange-throated whiptail is locally common within its range in the extreme southwest corner of California, which includes parts of Orange, Riverside, and San Diego counties, and northern Baja California, Mexico, at elevations below 2,800 feet. Its range is closely associated with that of its preferred prey, the termite *Reticulitermis hesperus*. Documented orange-throated whiptail locations within the MHCP area (see MHCP Database Records Map) include scattered sightings in east Oceanside, Carlsbad (e.g., Carlsbad Highlands, Aviara, and east La Costa), north and south Encinitas, and southwest and east Escondido (near Harmony Grove and San Pasqual Valley). Orange-throated whiptails are most often associated with open sage scrub habitats with a vegetative cover of about 50% and abundant open ground, but are also found in sparse grasslands, open chaparral, riparian scrub, and oak woodlands

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.

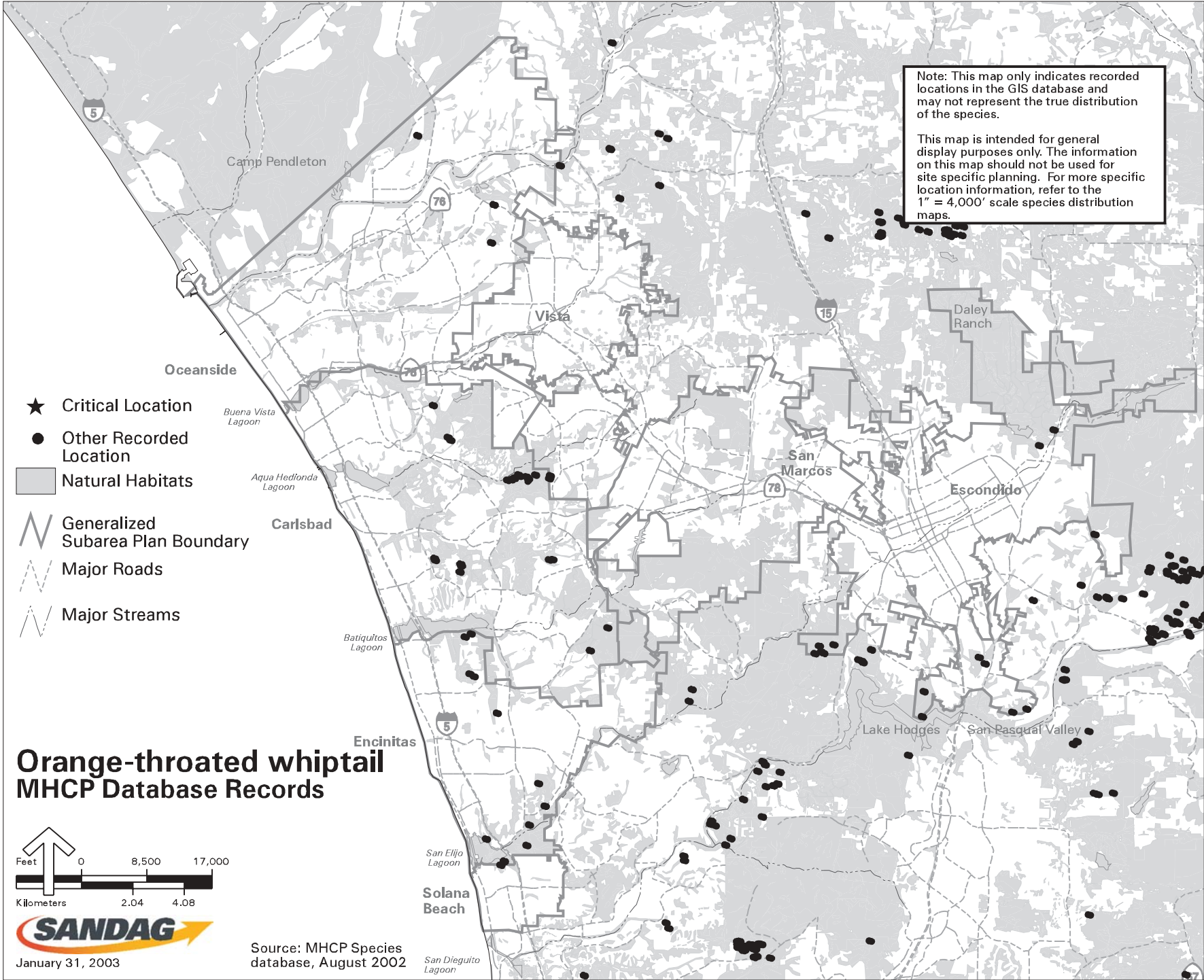
- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- Generalized Subarea Plan Boundary
- Major Roads
- Major Streams

Orange-throated whiptail MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002



(McGurty 1981; V. Horchar personal communication). Distribution in shrub habitats is uneven, such that whiptail densities can be relatively high where adequate food and habitat structure exist. Densities of orange-throated whiptails appear to be lower in north coastal San Diego County (e.g., Camp Pendleton) than are observed in south San Diego County (Dave King personal communication). Home range size for males is approximately 0.07 acre and for females is approximately 0.15 acre (Bostic 1965). This species is not territorial. There are no major populations or critical locations identified for this species within the MHCP area, although substantial populations are expected throughout some of the larger blocks of habitat (e.g., northeast Escondido, north Oceanside, south San Marcos). This species has declined significantly during the last 50 years as a result of habitat loss.

Threats and Limiting Factors. The principal threat to the orange-throated whiptail is degradation and loss of habitat. This species can also be impacted by off-road vehicle activity, over-grazing by livestock, and predation by introduced predators (e.g., cats and dogs) (San Diego Herpetological Society 1980b).

Special Considerations. One particular species of termite (*Reticulitermes hesperus*) constitutes a significant portion of the whiptail's diet. It is possible that invasive nonnative ant species (i.e., Argentine ant (*Linepithema humile*) and fire ant (*Solenopsis invicta*) could significantly reduce or eliminate the termite prey base in smaller, edge-affected habitat patches (T. Case personal communication; Suarez et al. 1998). However, orange-throated whiptails seem to be less affected by such edge effects than is the San Diego horned lizard (R. Fisher and E. Ervin, personal communications). Unlike many other species of *Cnemidophorus* lizards, this species is not known to reproduce parthenogenetically (asexually).

Conservation Analysis

Conservation and Take Levels. Approximately 12,163 (66%) acres of the primary potential orange-throated whiptail habitat (coastal sage scrub, maritime succulent scrub, chaparral, southern maritime chaparral, or coastal sage scrub/chaparral mix) will be conserved by the MHCP (Table 4-39). This includes 55 of 92 (60%) of known location points in the MHCP database; however, whiptail populations are not well represented by point counts due to unequal survey intensities and methods. Therefore, the habitat acreages are more representative of the conservation level for this species. While conservation of the coastal scrub, chaparral, and oak woodland ecological communities will benefit this species, it is generally only the more open components of these ecological communities that support whiptails. The vegetation mapping is not at a scale that allows quantification of only the open habitat component; therefore, while whiptails may occur in other vegetation communities, only the characteristically open vegetation communities were used for habitat quantification (i.e., coastal sage scrub and coastal sage scrub/chaparral mix).

Preserve Configuration Issues. Population sizes on large habitat patches (greater than about 100 acres) in the MHCP are likely to vary widely. Large patches connected by

dispersal corridors are much more likely to support viable populations of orange-throated whiptails. Little is known about dispersal distances for whiptails; however, it is unlikely that dispersal occurs across wide areas of unsuitable or developed land. A single road with moderate traffic volumes may be an absolute barrier to dispersal (R. Fisher personal communication). This species has a relatively small home range; therefore, gene flow within and across the MHCP area is likely to be impaired except where contiguous corridors of occupiable breeding habitat exist. Smaller patches (less than 25 acres) of habitat that are currently isolated by developed or disturbed land in the coastal areas probably cannot support whiptails without intensive management. Following local extirpation, it is unlikely that these isolated patches will be naturally recolonized.

The preserve includes 11,545 acres (71%) of the potential whiptail habitat contained by the BCLA (Table 4-39). Consequently, although about 66% of total potential habitat will be preserved, approximately 71% of the most important potential habitat will be conserved. Additional acres included in the FPA but not in the BCLA generally are isolated, small, or degraded fragments of habitat that may be of lesser biological value.

Effects on Population Viability and Species Recovery. The population size for the orange-throated whiptail in the FPA is likely to be at least several thousand. Implementation of the MHCP is expected to result in no net loss of viability for the orange-throated whiptail due to conservation of several large, contiguous blocks of habitat, each of which is expected to continue supporting viable populations of orange-throated whiptail. Most of these larger preserve areas on the periphery of the MHCP area are also adequately connected to other large habitat blocks outside the MHCP study area. Many fragments of habitat in the interior of the MHCP area are already isolated under existing conditions. Dispersal of whiptails to these fragments is probably rare or nonexistent, so these fragments are not likely to be recolonized once the whiptail is locally extirpated. The FPA does not protect many of these smaller isolated fragments, but loss of these fragments should not appreciably affect the species viability. Protection and management of the few larger blocks of habitat in the FPA may contribute to species recovery and could enhance gene flow across the MHCP area.

Special Considerations. A termite, *Reticulitermes hesperus*, is the primary prey of this lizard. However orange-throated whiptails are able to adjust their diet where termites are absent (T. Case pers comm.). Roads may be severe barriers to dispersal for the orange-throated whiptail (R. Fisher personal communication) and should avoid crossing large preserve blocks.

Table 4-39

**SUMMARY OF CONSERVATION FOR
ORANGE-THROATED WHIPTAIL**

City	Habitat Acres Conserved ¹		Location Points Conserved ²
	Net Acres (%)	BCLA Acres (%)	
Carlsbad	2,179 (67%)	2,097 (69%)	12 of 33 (36%)
Encinitas	1,267 (74%)	1,182 (75%)	18 of 24 (75%)
Escondido	5,395 (76%)	5,113 (81%)	20 of 26 (76%)
Oceanside	713 (51%)	616 (67%)	3 of 5 (60%)
San Marcos	2,258 (52%)	2,217 (56%)	None known
Solana Beach	30 (35%)	29 (55%)	2 of 2 (100%)
Vista	321 (59%)	290 (69%)	0 of 2 (0%)
MHCP Total³	12,163 (66%)	11,545 (71%)	55 of 92 (60%)

¹ Habitat quantified includes southern coastal bluff scrub, chaparral, maritime succulent scrub, coastal sage scrub, southern maritime chaparral, and coastal sage scrub/chaparral mix vegetation communities.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Coordinate management with other whiptail research programs. Coordinate with ongoing research on dispersal abilities of this species to estimate colonization ability and expected levels of gene flow within and between the MHCP study area.
2. Implement a program of introducing individuals into formerly occupied and potential habitat to initiate new populations or recolonize extirpated populations within the preserve system, as deemed necessary to maintain or enhance the genetic diversity of the metapopulation.
3. Select translocation individuals from nearby (genetically similar) larger populations that would be most likely to provide dispersing individuals (gene flow) under natural conditions. Do not attempt to translocate individuals to habitat lacking suitable prey base (e.g., where termites have been displaced by Argentine ants).

California Brown Pelican*Pelecanus occidentalis californicus***USFWS: Endangered****CDFG: Endangered, Fully Protected****MHCP: Obligate Wetland Species****Conservation Goals**

Ensure continued persistence of resident and wintering populations within the plan area by conserving undisturbed roosting areas and foraging habitat, especially in designated critical locations.

Conservation Strategy

Minimize human disturbance in critical roosting areas through control of access. Facilitate coordination of local, state, and federal conservation and management actions for this species, including coordination with the USFWS brown pelican endangered species recovery plan.

Coverage Determination and Permit Conditions

Coverage Determination. Covered. No take of individuals, including by harassment, is allowed for this state Fully Protected species.

Rationale. The MHCP will adequately conserve this species by conserving all critical foraging areas and protecting roosting areas from human disturbance. Five of 5 recorded locations (100%) will be conserved, along with essentially all foraging habitat (open waters in lagoons).

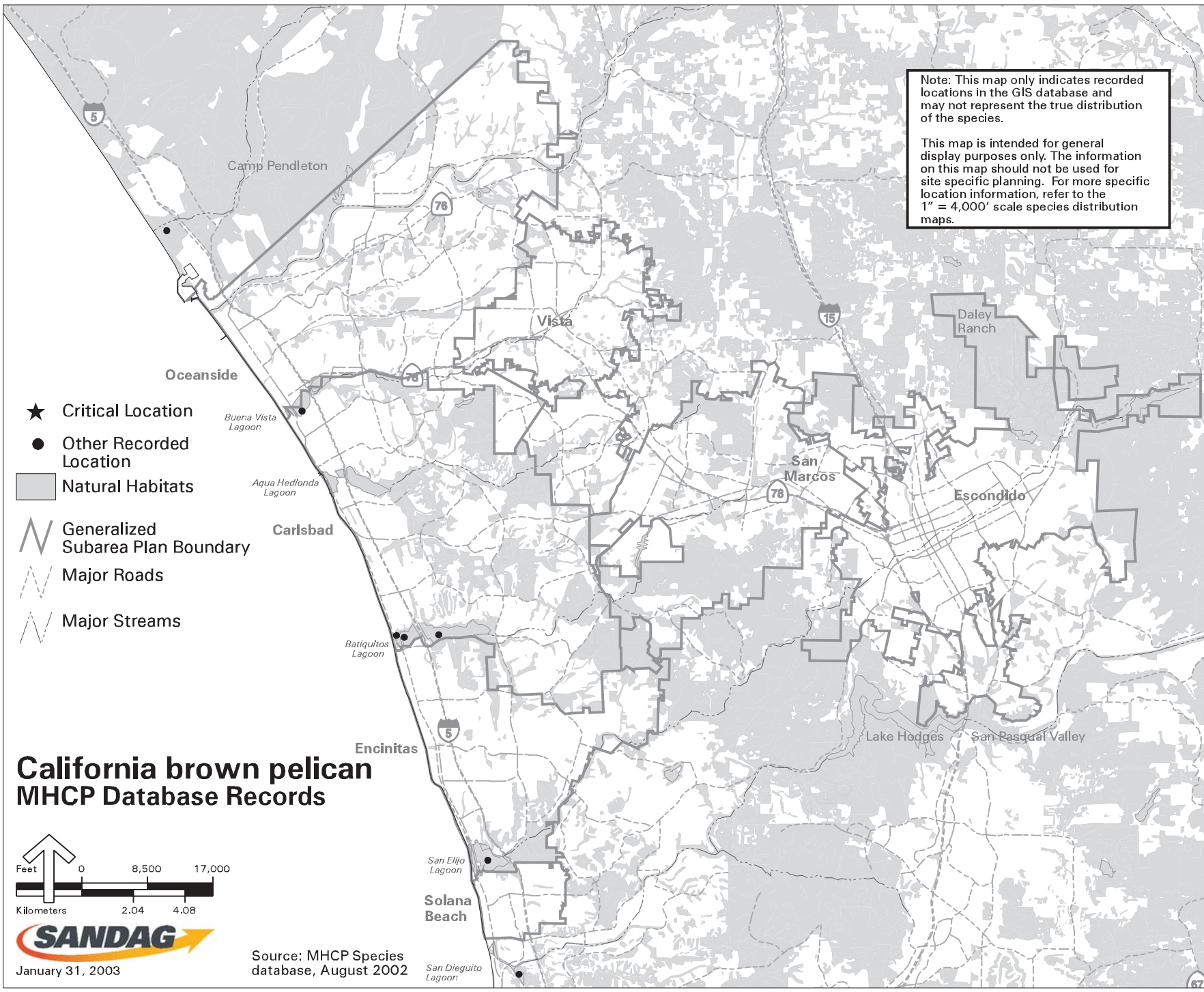
Conditions. No take of individuals, roosts, or nests is permitted for this fully protected species. Reserve management must control access to avoid harassment in roost areas.

Background

Distribution, Abundance, and Trends. Brown pelicans occur throughout the year as nonbreeders in San Diego County. The Coronado Islands is the closest breeding location of the local resident population associated with the Southern California Bight. Postbreeding and winter influx of pelicans from the Gulf of California into San Diego County considerably augments the resident population. Within the MHCP area, wintering pelicans occur along the coast and at lagoons (see MHCP Database Records Map). Summer influx of pelicans can be expected in years of failed breeding (or in El Niño years). The population declined to near extinction by the late 1960s due to DDT pesticide bioaccumulation. The population has recovered significantly since this pesticide was banned in the United States. The brown pelican is restricted to open ocean, coastal strand, harbors, bays, and estuaries. There are no major populations in the MHCP study area; however, coastal areas with restricted human access (e.g., jetties, private

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

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- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- Generalized Subarea Plan Boundary
- - - Major Roads
- ~ ~ ~ Major Streams

California brown pelican MHCP Database Records

Feet: 0, 8,500, 17,000

 Kilometers: 0, 2.04, 4.08

January 31, 2003

Source: MHCP Species database, August 2002

marinas) and shallow coastal waters are used by foraging pelicans and are considered critical locations.

Threats and Limiting Factors. This species declined sharply in the 1960s due to pesticide contamination of the food chain. Breeding populations have recently recovered. Brown pelicans are vulnerable to oil spills, competition with anchovy fisheries (anchovy is a primary pelican food species), and human disturbance at roosting sites (Anderson et al. 1975; Zeiner et al. 1990).

Special Considerations. Roost areas need to have minimal human disturbance. Brown pelicans are susceptible to the effects of bioaccumulation of toxins through the food chain due to their high trophic position (Anderson et al. 1975). Bioaccumulation of DDT was a major cause of population declines.

Conservation Analysis

Conservation and Take Levels. No take of individuals, including by harassment, is allowed for this species. Due to maximum conservation of the lagoon and marsh ecological community (Section 3.2), the expected level of take of habitats potentially used by this species is very low. All potential foraging habitat and all known location points in the study area are within the FPA and will be conserved, as summarized in Table 4-40.

Preserve Configuration Issues. All suitable habitat for the brown pelican is 100% conserved and adequately connected relative to the dispersal capability of this species. During the breeding season brown pelicans spend the majority of their time within 12 miles of the nest (Briggs et al. 1981), while throughout the rest of the year they may wander much greater distances. The four major lagoons included within the preserve are well within this distance and are sufficiently connected by suitable habitat in the open ocean.

Effects on Population Viability and Species Recovery. The preserve design will conserve all existing habitat and will increase species viability and continued recovery through increased management and conservation attention.

Special Considerations. Toxicity testing to check for bioaccumulation of toxins should be initiated when significant population declines are detected.

Table 4-40

**SUMMARY OF CONSERVATION FOR
CALIFORNIA BROWN PELICAN**

City	Habitat Acres Conserved ¹	Location Points Conserved ²	Critical Locations Conserved
Carlsbad	768 (100%)	4 (100%)	Agua Hediona and Batiquitos Lagoons conserved at 100%
Encinitas	161 (100%)	1 (100%)	San Elijo and Batiquitos Lagoons conserved at 100%
Escondido	None present	None present	None present
Oceanside	24 (100%)	None known	San Luis Rey River mouth and Buena Vista Lagoon are 100% conserved
San Marcos	None present	None present	None present
Solana Beach	1 (100%)	None known	None identified
Vista	None present	None present	None present
MHCP Total ³	955 (100%)	5 of 5 (100%)	Critical habitat in coastal lagoons 100% conserved

¹ Habitat quantified includes the estuarine vegetation community.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Continue longitudinal studies of the effectiveness of rehabilitation methods of pelicans affected by oil spills.

White-faced Ibis

Plegadis chihi

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: Species of Special Concern

MHCP: Obligate Wetland Species

Conservation Goals

Ensure species persistence within the MHCP area and manage preserve areas to increase breeding habitat quality.

Conservation Strategy

Conserve existing potential white-faced ibis habitats (i.e., brackish and freshwater marshes) in the coastal lagoons and Guajome Lake. Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Covered.

Rationale. The MHCP will adequately conserve this species by conserving 100% of marsh habitats and managing these habitats to benefit the species. Fourteen of 18 location points (78%) will be conserved.

Conditions. Not applicable.

Background

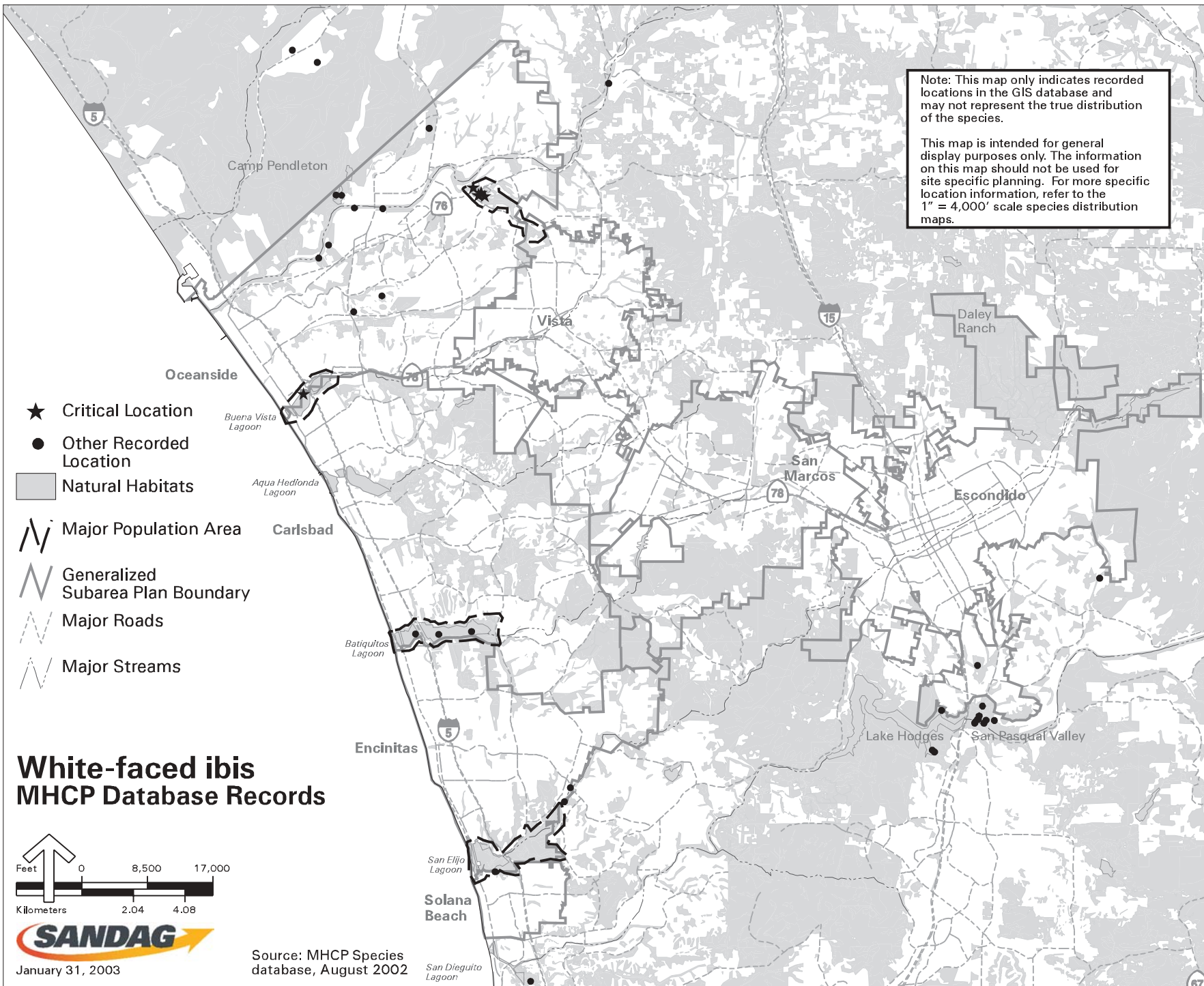
Distribution, Abundance, and Trends. San Diego County represents the southern extreme of the west coast distribution of this species. The white-faced ibis occurs regularly in small numbers in lower river valleys in San Diego County and is uncommon and localized in winter and a sporadic breeder on the coastal slope. Within the MHCP area, recent breeding colonies include Buena Vista Lagoon and Guajome Lake (see MHCP Database Records Map). White-faced ibis nest and forage in brackish and freshwater marsh habitats. The occurrences at Buena Vista, Batiquitos, and San Elijo lagoons, and Guajome Lake are considered major populations, and the breeding colonies at Buena Vista Lagoon and Guajome Lake are critical locations.

Threats and Limiting Factors. Loss of extensive marsh habitats, seasonal drying of wetlands for mosquito and cattail control, spraying for mosquito control, and nesting failures caused by pesticides (Remsen 1978; Terres 1980).

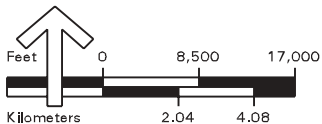
Special Considerations. Breeding areas need to have minimal human disturbance. Water in brackish portions of salt marsh must be fresh enough to support tall emergent vegetation such as cattails and tules, which are used for nesting.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



White-faced ibis MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Diego County

Conservation Analysis

Conservation and Take Levels. Maximum conservation of the lagoon and marsh ecological community (Section 3.2) will result in very low potential for take of this species (Table 4-41). Most (14 of 18, 78%) of the known location points in the study area are within proposed preserve areas.

Preserve Configuration Issues. The MHCP will not adversely affect connectivity of ibis habitat or the ability of individuals to disperse between patches of suitable habitat, relative to existing conditions. The habitat of the white-faced ibis is naturally patchily distributed, with brackish and freshwater habitat separated by upland habitats across which the ibis may have formerly dispersed. The MHCP preserve design facilitates continued access by coyotes and other larger predators to lagoon systems, thereby helping maintain ecological balance and avoiding large population increases of smaller predators (e.g., skunks and foxes) that may prey on ibis nests.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to maintain and possibly enhance population viability of the species and therefore contribute to species recovery. The MHCP preserve and policies are consistent with current management goals for species. The MHCP will increase regional coordination and funding for research, monitoring, and management, which may improve current management of marsh habitats and species stability.

Special Considerations. Conservation and management of wetlands habitats in and upstream from freshwater marsh and lagoon communities should include adequate buffer areas to help maintain water quality in ibis habitat.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Table 4-41

**SUMMARY OF CONSERVATION FOR
WHITE-FACED IBIS**

City	Habitat Acres Conserved¹ (% of FPA)	Location Points Conserved² (% of FPA)
Carlsbad	339 (100%)	4 (100%)
Encinitas	235 (100%)	1 (50%)
Escondido	37 (100%)	1 (100%)
Oceanside	160 (100%)	7 (70%)
San Marcos	10 (100%)	None in database
Solana Beach	9 (100%)	1 (100%)
Vista	None present	None in database
MHCP Total³	790 (100%)	14 of 18 (78%)

¹ Habitat includes southern coastal salt marsh and freshwater marsh vegetation communities. Only the upstream brackish water portions of salt marsh habitat are suitable for the ibis.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Northern Harrier

Circus cyaneus

USFWS: None

CDFG: Species of Special Concern

Conservation Goals

Ensure the persistence of the northern harrier in the plan area and contribute to regional species viability. Conserve large blocks of existing breeding and foraging habitat and critical locations for the northern harrier.

Conservation Strategy

Conserve large blocks of foraging habitat and potential breeding habitat, including critical grasslands near Camp Pendleton. Implement species-specific management actions, as necessary to increase habitat quality and population size. Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, due to insufficient conservation.

Rationale. Current levels of conservation expected under the current MHCP FPA and guidelines do not meet the conservation goals for this species. Few large grassland areas or agricultural areas will be conserved for foraging. No suitable nesting areas are expected to be conserved. Only about 32% of the extant grasslands in the study area are expected to be conserved, and the plan does not protect agricultural lands from development. Critical grassland areas near marsh habitats are partially conserved and will become further fragmented under the plan.

Conditions. Not applicable.

Background

Distribution, Abundance, and Trends. The northern harrier breeds in Canada and most of the United States, but is somewhat nomadic with respect to breeding locations. It winters south in Central America. San Diego County is at the southwestern limit of this species' breeding range. Postbreeding harriers from the north augment the resident population during winter (Unitt 1984). Documented northern harrier breeding locations are lacking within the MHCP area, although a recent sighting suggests that a pair may have bred in east Carlsbad during 2000 (Mayer personal communication), and foraging observations are frequent and widespread in the MHCP area. Camp Pendleton supports about six breeding pairs, some of which probably forage within MHCP boundaries. Potential breeding and foraging habitat for the harrier includes marshes, grasslands, agricultural fields, and open coastal sage scrub. There are no major populations in the plan area;

however, marsh and grassland habitats adjacent to Camp Pendleton, agriculture fields in San Luis Rey River valley, and the lagoons within the MHCP study area are considered critical areas (see MHCP Database Records Map).

Threats and Limiting Factors. The northern harrier is disappearing as a breeding resident from the coastal lowlands of San Diego County due to alteration of nesting and foraging habitats, detrimental agricultural activity during the breeding season, and reproductive failure due to human disturbance at nest sites, predation, and environmental contaminants (Remsen 1978; Hamerstrom 1986; Zeiner et al. 1990; P. Bloom pers. comm.).

Special Considerations. Sufficient foraging area (at least 640 acres of grassland, fields/pasture, and/or marsh) needs to be conserved adjacent to nesting site (P. Bloom pers. comm.).

Conservation Analysis

Conservation and Take Levels. The high level of conservation of the lagoon and marsh ecological community and the coastal scrub ecological community (Section 3.2) will benefit this species. However, only 32% of the potential breeding and foraging habitat in grasslands and 26 of 44 point localities (58%) are in areas to be conserved (Table 4-42).

Preserve Configuration Issues. The MHCP will not adversely affect connectivity of northern harrier habitat in wetland areas relative to existing conditions, but increased fragmentation of grassland habitats will adversely affect this species. Approximately 77% of potential foraging areas in the BCLA will be conserved. Although approximately 38% of coastal sage habitat and 68% of grassland habitat will not be protected by the preserve, the FPA will maintain some connectivity of coastal sage scrub throughout the study area and of grassland habitat in the critical areas adjacent to Camp Pendleton and Daley Ranch. However, all habitats will become more fragmented relative to existing conditions. Critical areas on agricultural land in the San Luis Rey River Valley are not included in the FPA.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to allow for continued foraging by northern harriers in portions of the plan area. However, the substantial loss of grassland foraging habitat and increased fragmentation of all habitats will reduce harrier use within the MHCP. The MHCP may increase regional coordination and funding for monitoring and management, which may improve current management of marsh and sage scrub habitats used by the species.

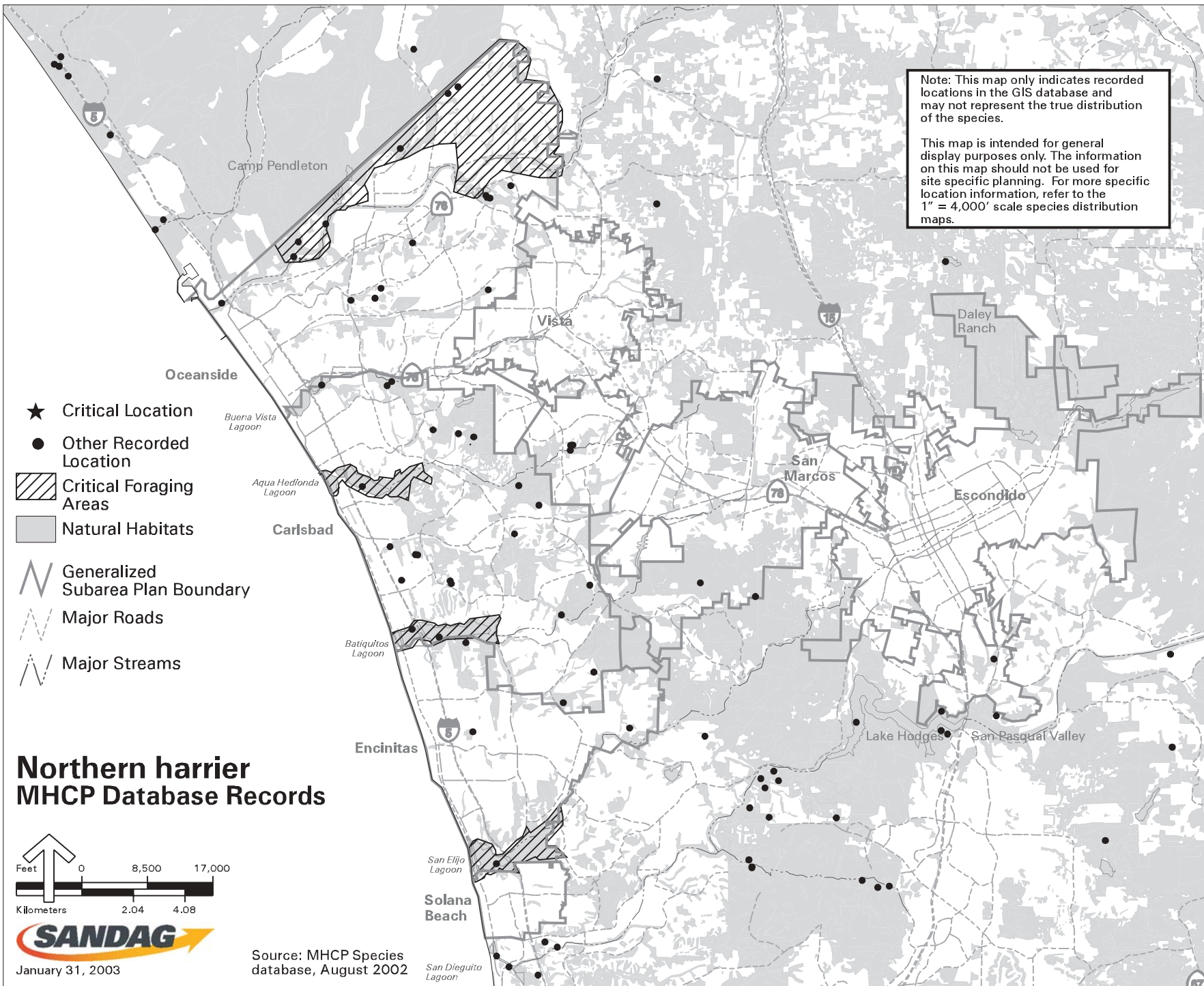
Special Considerations. Large blocks of foraging habitat must be conserved within the vicinity of nesting habitat. Human disturbance of nest sites should be minimized, and use of agricultural pesticides should be monitored to minimize impacts to harriers.

Adaptive Management Program

Not applicable.

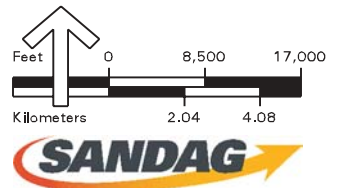
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

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- ★ Critical Location
- Other Recorded Location
- ▨ Critical Foraging Areas
- Natural Habitats
- Generalized Subarea Plan Boundary
- Major Roads
- Major Streams

Northern harrier MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

Table 4-42

**SUMMARY OF CONSERVATION FOR
NORTHERN HARRIER**

City	Habitat Acres Conserved ¹		Location Points Conserved ²	Critical Locations Conserved
	Net Acres (%)	BCLA Acres (%)		
Carlsbad	2,207 (61%)	2,100 (63%)	14 (71%)	Agua Hediona and Batiquitos Lagoons conserved at 100%
Encinitas	1,116 (73%)	1,048 (75%)	4 (88%)	San Elijo and Batiquitos Lagoons conserved at 100%
Escondido	1,971 (68%)	1,836 (83%)	1 (100%)	None present
Oceanside	1,434 (44%)	1,271 (57%)	7 (47%)	San Luis Rey River mouth and Buena Vista Lagoon are 100% conserved. Marsh habitat adjacent to Camp Pendleton is 100% conserved. Grasslands adjacent to Camp Pendleton are substantially conserved.
San Marcos	1,071 (42%)	990 (52%)	1 (30%)	None known
Solana Beach	15 (74%)	15 (90%)	None known	None known
Vista	163 (17%)	130 (47%)	0 (0%)	None known
MHCP Total ³	7,976 (54%)	7,390 (65%)	26 of 44 (58%)	Critical locations in coastal lagoons 100% conserved

¹ Habitat includes coastal sage scrub, grassland, and all marsh vegetation communities.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Cooper's Hawk*Accipiter cooperii***USFWS: None****CDFG: Species of Special Concern****Conservation Goals**

Ensure the persistence of Cooper's hawks in the plan area. Contribute to regional viability and species recovery by enhancing habitat quality.

Conservation Strategy

Include within the open space preserve system patches of oak woodland and oak riparian forest of adequate size for nesting and foraging habitat to support breeding and wintering Cooper's hawks. Conserve large blocks of existing breeding and foraging habitat and critical locations for the Cooper's hawk, including critical areas on the San Luis Rey River and Pilgrim Creek, and in oak woodland habitats in San Marcos and Escondido. Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Covered.

Rationale. The MHCP will adequately conserve this species by substantially conserving breeding habitats (including 100% of riparian forests and woodlands, and over 75% of oak woodlands) and by managing preserve areas consistent with species' needs. Although some foraging habitat will be lost, sufficient foraging habitats adjacent to breeding habitats will be conserved to ensure species persistence in the area.

Conditions. The following conditions must also be met by the MHCP to adequately conserve this species:

1. As part of the project review process (e.g., CEQA) for individual projects within the MHCP area, qualified biologists must survey all potential nesting areas during the nesting season. Surveys shall be conducted when impacts could occur as a result of direct or indirect impacts by placement of a project in or adjacent to suitable habitat. Preserve areas must include 300-foot biological buffers around nest sites where feasible.
2. Avoid tree pruning activities in or near reserve areas during the breeding season (March 1 through July 31).

Background

Distribution, Abundance, and Trends. The Cooper's hawk is distributed throughout much of the United States from southern Canada to northern Mexico. Potential breeding locations within the MHCP area include San Luis Rey River, Pilgrim Creek, and oak woodland habitats in San Marcos and Escondido (see MHCP Database Records Map). Dense stands of oak or riparian woodland are nesting habitats for Cooper's hawks. Breeding pairs use suburban exotic woodlands on a limited basis. There are no major populations in the MHCP, but the San Luis Rey River, Pilgrim Creek, and oak woodland habitats in San Marcos and Escondido are considered critical areas.

Threats and Limiting Factors. Habitat loss, pesticide contamination, and human disturbance at the nest site limit this species' population sizes (Remsen 1978; Anderson and Hickey 1970).

Special Considerations. Nesting sites need to have minimal human disturbance, with minimum buffers of 300 feet around nests.

Conservation Analysis

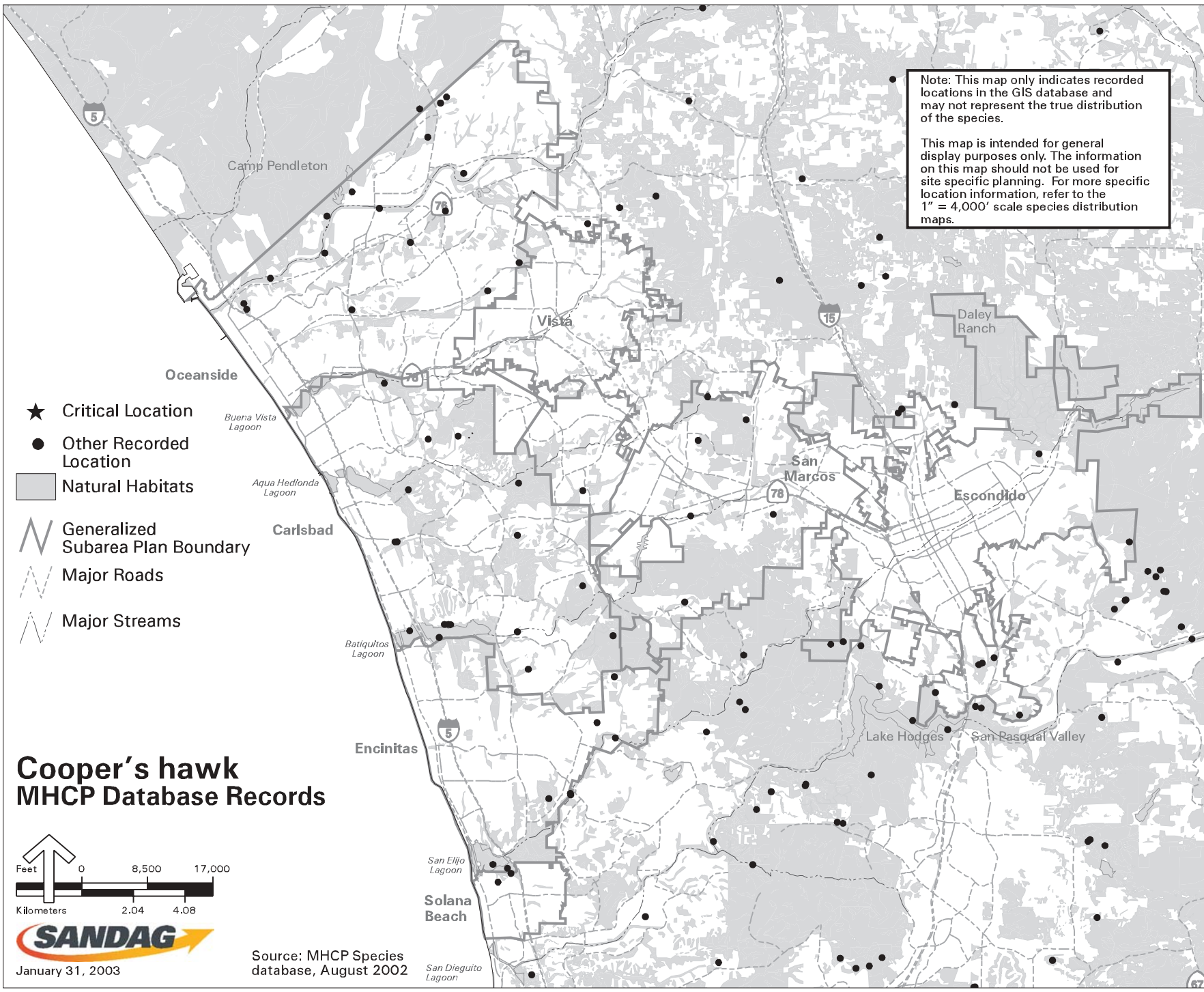
Conservation and Take Levels. Maximum conservation of the riparian ecological community (100%) and the high level of conservation of the oak woodland ecological community (79%) (Section 3.2) will substantially benefit this species. Overall, about 90% of suitable habitat is expected to be conserved, including about 81% of critical areas. The FPA also includes 34 of 57 point localities (60%) (Table 4-43), with many of the points outside the FPA representing observations of Cooper's hawks flying over developed areas between suitable habitats.

Preserve Configuration Issues. The MHCP preserve will not affect the ability of this species to disperse relative to existing conditions. This is a migratory species with the ability to cover large distances of unsuitable habitat. About 91% of suitable habitats within the BCLA will be conserved, including about 81% of the oak woodlands in Escondido and San Marcos (critical areas). These oak woodlands are generally contained within large blocks of native habitats, which enhance the connectivity of the preserve for this species. The maximum level of conservation for riparian habitat further increases preserve connectivity. Any management actions implemented with the MHCP that would decrease the current fragmentation of this habitat and increase habitat area and connectivity would benefit the species and contribute to population recovery.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to maintain and possibly enhance population viability of the Cooper's hawk through increased management and monitoring. The MHCP preserve and policies will maintain consistency with other management goals for the species. The MHCP will increase regional coordination and funding for research, monitoring, and management, which may improve current management of Cooper's hawk habitat and species stability.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



★ Critical Location

● Other Recorded Location

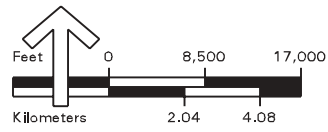
■ Natural Habitats

— Generalized Subarea Plan Boundary

--- Major Roads

--- Major Streams

Cooper's hawk MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Dieguito Lagoon

Table 4-43

**SUMMARY OF CONSERVATION FOR
COOPER'S HAWK**

City	Habitat Acres Conserved ¹		Location Points Conserved ²	Critical Locations Conserved
	Net Acres (%)	BCLA Acres (%)		
Carlsbad	125 (96%)	123 (96%)	7 (45%)	None known
Encinitas	51 (100%)	51 (100%)	4 (50%)	None known
Escondido	923 (86%)	700 (86%)	9 (94%)	81% of oak woodlands are conserved
Oceanside	245 (100%)	208 (100%)	12 (71%)	None known
San Marcos	101 (95%)	57 (93%)	2 (40%)	81% of oak woodlands are conserved
Solana Beach	None present	None present	0 (0%)	None present
Vista	180 (91%)	66 (10%)	1 (100%)	None known
MHCP Total ³	1,626 (90%)	1,205 (91%)	34 of 57 (60%)	Critical locations in oak woodlands are 81% conserved

¹ Habitat includes riparian forest, riparian woodlands, and all oak woodland vegetation communities.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Special Considerations. Suitable habitat must be maintained in large contiguous patches due to the large territory and home range of this species.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Conduct telemetry study to determine key habitat use requirements and allow for management of human disturbance factors.

Osprey*Pandion haliaetus***USFWS: None****CDFG: Species of Special Concern****MHCP: Obligate Wetlands Species****Conservation Goals**

Ensure the persistence of the osprey in the plan area and contribute to regional species viability by enhancing habitat quality.

Conservation Strategy

Include within the open space preserve system sufficient occupied and potential habitat, including coastal lagoons and inland reservoirs, to contribute to the regional viability of wintering and breeding osprey. Implement species-specific management actions, as necessary to increase habitat quality and population size. Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Covered.

Rationale. The MHCP will adequately conserve this species by conserving 100% of known locations, critical locations, and foraging habitats in the study area.

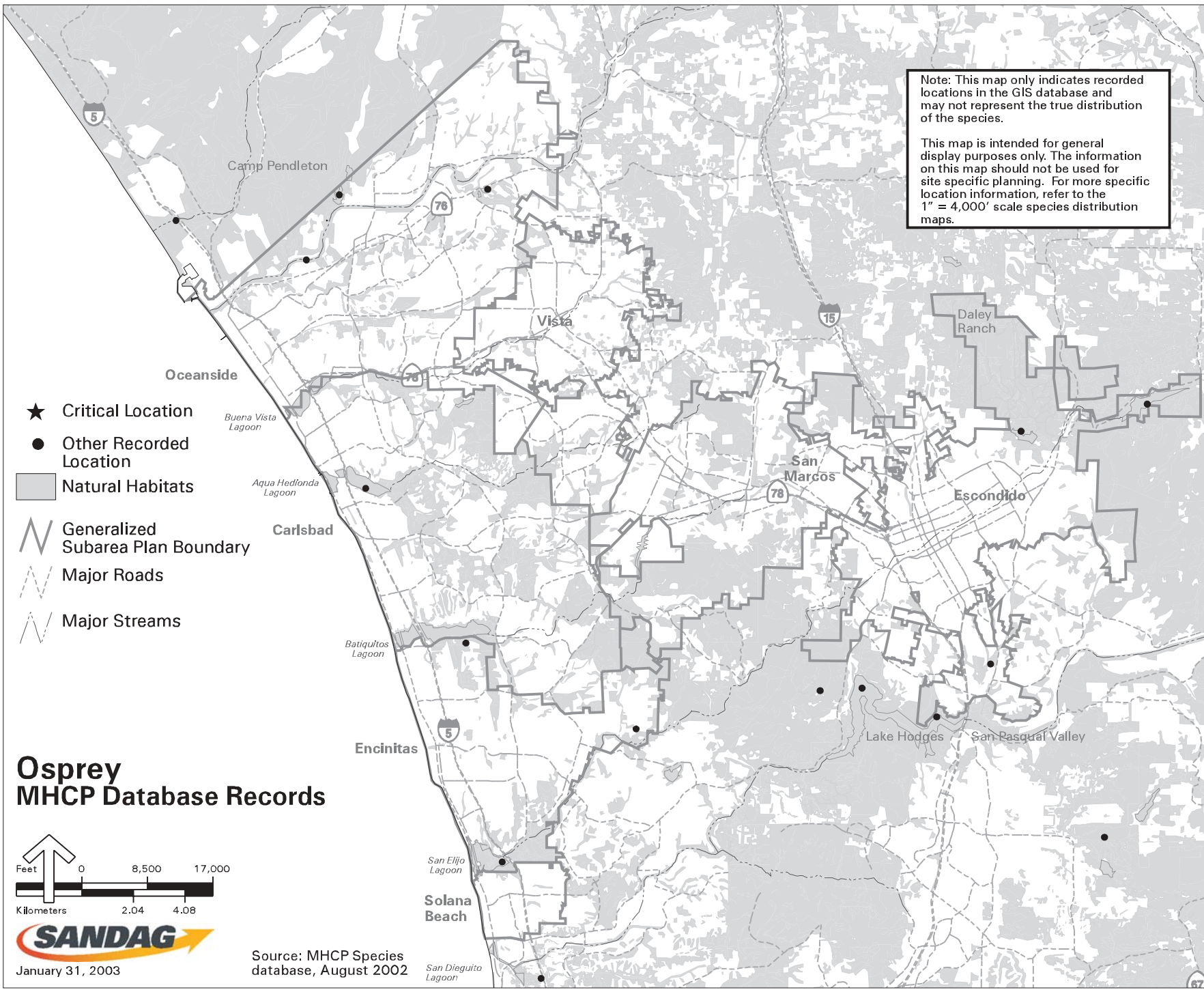
Conditions. Not applicable.

Background

Distribution, Abundance, and Trends. Ospreys are a widely distributed species in North America, but are an uncommon wintering species and are relatively rare during the breeding season in San Diego County. Within the MHCP area (see MHCP Database Records Map), ospreys have been recorded at Agua Hedionda Lagoon, Lake Hodges, San Vicente Reservoir, and San Diego Bay (T. Oberbauer personal communication). A single (P. Unitt personal communication) or pair (M. Klein personal communication) of ospreys have recently been sighted using Dixon Reservoir in Escondido, and P. Unitt (personal communication) expects Ospreys may nest at Lake Wohlford in the near future. Osprey foraging habitat includes coastal estuaries and large lakes and reservoirs that support forage fish populations. Ospreys nest near these habitats in large dead-topped trees, snags, cliffs, and man-made structures that can support their nesting platform. There are no major populations in the MHCP but all coastal lagoons and estuaries are considered critical foraging areas.

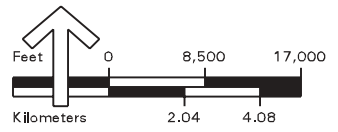
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- Generalized Subarea Plan Boundary
- Major Roads
- Major Streams

Osprey MHCP Database Records



Source: MHCP Species database, August 2002

Threats and Limiting Factors. Ospreys are vulnerable to human disturbance at their nest sites and adverse impacts to potential foraging habitat.

Special Considerations. None identified.

Conservation Analysis

Conservation and Take Levels. Due to maximum conservation of the lagoon and marsh ecological community (Section 3.2), the expected level of take of this species or its habitat is very low. All (1,399 acres) of the potential foraging habitat and 90% (9 of 10) of the known location points in the study area will be conserved (Table 4.44). It is difficult to quantify the amount of suitable nesting habitat because features such as large trees, snags, and suitable structures are not mapped in the database. Because the osprey nests very close to large water bodies suitable for foraging, it is possible that most suitable nesting habitat will be within the buffer zone of lakes, lagoons, estuaries, and riparian areas. Most of these areas are expected to be conserved along with the associated wetland habitats.

Preserve Configuration Issues. The MHCP will not adversely affect connectivity of osprey habitat, or the ability of osprey to disperse between patches of suitable habitat, relative to existing conditions. The habitat of the osprey is naturally patchily distributed, with coastal lagoons and inland lakes separated by upland habitats. Upland habitats between the four lagoons have already been mostly removed by development; however, because this species is a long-distance migrant, development is not a substantial barrier to dispersal.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to maintain and possibly enhance the population viability of osprey through increased habitat management. The MHCP will increase regional coordination and funding for research, monitoring, and management, which may improve current management of osprey habitats and species stability.

Special Considerations. Osprey require clear water with abundant fish populations for foraging. Conservation and management of wetland habitats in and upstream from the coastal wetlands and estuaries will help maintain water quality in osprey habitat. The additional assurances and protection to wetlands water quality will contribute to further recovery of the osprey. Sufficient roosting and nesting habitat must be conserved within the vicinity of foraging habitat. Human disturbance of nest sites should be minimized.

Table 4-44**SUMMARY OF CONSERVATION FOR
OSPREY**

City	Habitat Acres Conserved¹	Location Points Conserved²	Critical Locations Conserved
Carlsbad	825 (100%)	1 (100%)	Agua Hediona and Batiquitos Lagoons conserved at 100%
Encinitas	167 (100%)	2 (67%)	San Elijo and Batiquitos Lagoons conserved at 100%
Escondido	239 (100%)	3 (100%)	None known
Oceanside	163 (100%)	3(100%)	San Luis Rey River mouth and Buena Vista Lagoon conserved at 100%
San Marcos	1 (100%)	None known	None known
Solana Beach	1 (100%)	None known	None known
Vista	2 (100%)	None known	None known
MHCP Total³	1,399 (100%)	9 of 10 (90%)	Critical locations in coastal lagoons and estuaries are 100% conserved

¹ Habitat includes estuarine and freshwater vegetation communities.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Modify power poles near lagoons to preclude electrocution of raptors.

Golden Eagle

Aquila chrysaetos

USFWS: Bald Eagle Protection Act

CDFG: Species of Special Concern, Fully Protected

Conservation Goals

Ensure the persistence of the golden eagle in the plan area and contribute to regional species viability. Enhance foraging and wintering habitat quality, protect existing nest sites with appropriate buffers, and support conservation efforts outside the study area.

Conservation Strategy

Conserve existing foraging habitat, potential nesting locations, and critical locations for golden eagles in the grassland and scrub habitats in the vicinity of known nesting locations. Protect known historic nesting areas with sufficient buffers against human intrusion to ensure their continued use by eagles in the future. Include within the open space preserve system sufficient foraging habitat to maintain existing golden eagle breeding territories in or near the MHCP area. Implement species-specific management actions, as necessary to increase habitat quality and reduce disturbance to nesting eagles. Facilitate coordination of local, state, and federal conservation and management actions for this species and maintain consistency with the Bald Eagle Protection Act, which also protects this species.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions. No take of individuals or nests, including by harassment, is allowed for this species.

Rationale. The MHCP may adequately conserve this species by conserving a few large blocks of habitat that may be used by foraging golden eagles and the one known nesting location in the study area (Del Dios area of southern Escondido). However, habitat fragmentation will degrade nesting and foraging habitat somewhat relative to existing conditions within the study area. Provided that the Escondido subarea plan can guarantee sufficient buffers and minimization of disturbance around known nesting sites in the Del Dios area, the plan may help ensure species persistence in this area.

Conditions. No take (including by harassment) of individuals or active nests is allowed for this state Fully Protected species, regardless of coverage status. A subarea plan may receive take authorization for habitats used by this species if it applies the following species-specific conditions:

1. Maintain a 4,000-foot disturbance avoidance radius around any nest locations, including currently used locations and any historically active nest locations that could be used again in the future, as determined by species experts. Absolute buffers of less than 4,000 feet (but not less than 3,000 feet) may be allowed if

- topography effectively blocks the line of sight between the nest location and any proposed human development, and provided that the situation prevents any disturbance (including noise, artificial light, recreational access, etc.) from being perceivable by eagles at the nest site, as determined by species experts with experience monitoring golden eagle nesting pairs in San Diego County (e.g., golden eagle researchers at the Wildlife Research Institute [WRI]).
2. Reserve lands within 4,000 feet of nesting locations (including current and historically active locations), or within habitat areas identified as “primary foraging areas” by golden eagle experts (e.g., WRI) must be managed to restrict any activities that could disturb eagles during their normal nesting, loafing, foraging or other activities (including hiking, mountain biking, or off-road vehicle use). Existing roads that allow access within 4,000 feet of active nests will be closed to the public, including a dirt road in the Del Dios area that passes near the currently occupied nest site.
 3. No poisoning of ground squirrels or other wildlife, or other use of pesticides, will be allowed within primary foraging areas or within 4,000 feet of known occupied or historic nests within occupied territories.

Background

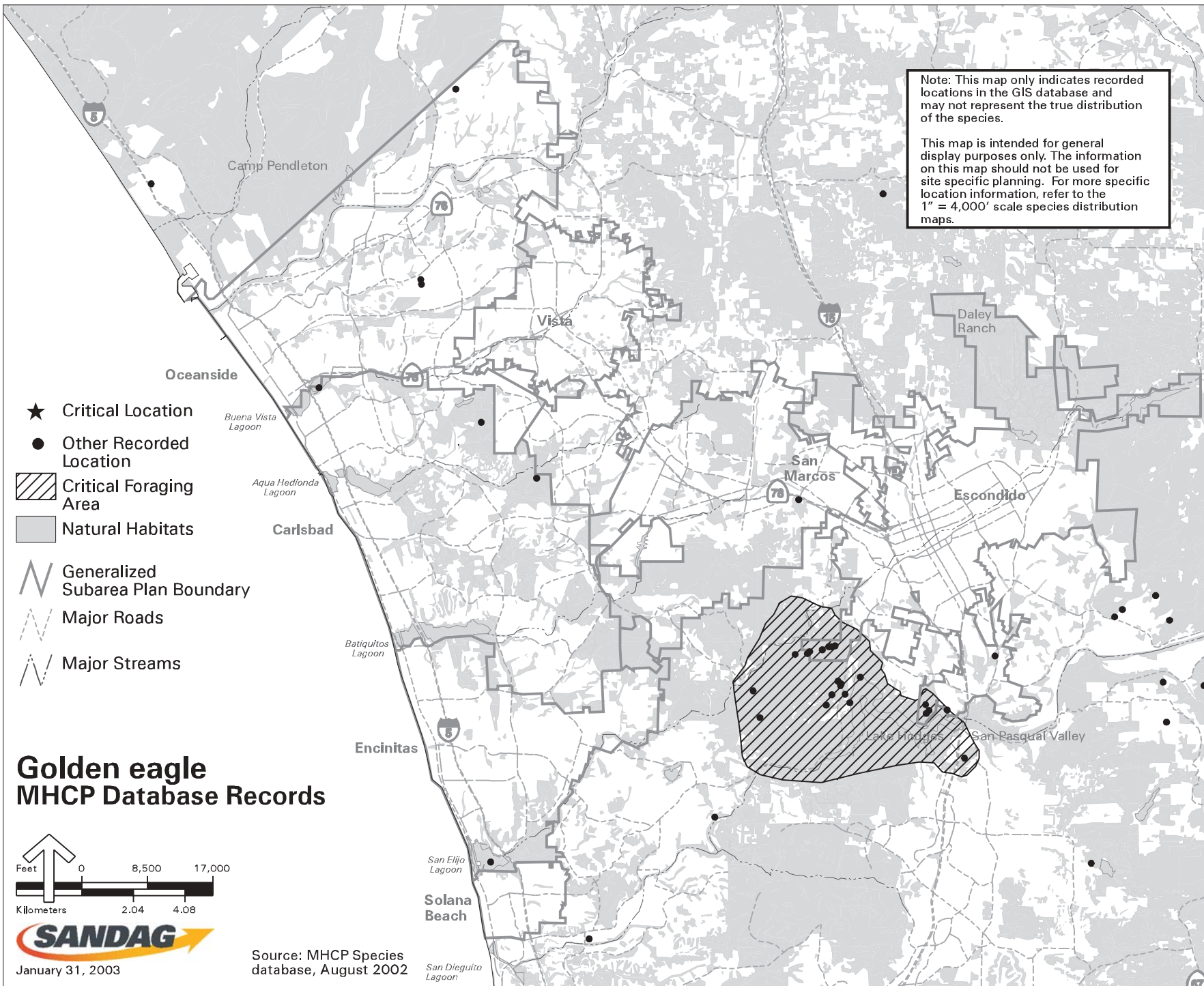
Distribution, Abundance, and Trends. Golden eagles are widely distributed throughout western North America in open habitats away from human development. The golden eagle population in San Diego County is one of the best-studied populations in North America, with nesting pairs monitored and documented nearly continuously since 1895. This population has declined by 53% in recent decades (a loss of 45 nesting pairs) due to human encroachment and habitat destruction (Bittner in litt. 2002).

Although eagle observations are scattered throughout the MHCP study area (see MHCP Database Records Map), sightings are becoming more rare within the MHCP in recent years due to habitat loss and fragmentation. Currently, the MHCP supports only one nesting pair—the only pair west of I-15 in San Diego County, excluding Camp Pendleton (Bittner in litt. 2002). Other active nesting pairs in the vicinity of the MHCP are found on Camp Pendleton, at Gregory Mountain, and near the eastern San Pasqual Valley (Scott 1985).

Golden eagle foraging habitat includes extensive areas of open sage scrub, grasslands, and recently burned chaparral. Suitable foraging habitat within the MHCP area includes habitats adjacent to Camp Pendleton, east Carlsbad and Encinitas, north and south San Marcos, and especially north and south Escondido. Primary foraging areas and core areas near active nest sites, which may be inside or outside the MHCP boundary, are considered critical locations, especially the Del Dios/Lake Hodges/San Pasqual Valley area of south Escondido.

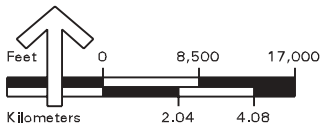
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

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- ★ Critical Location
- Other Recorded Location
- ▨ Critical Foraging Area
- Natural Habitats
- Generalized Subarea Plan Boundary
- Major Roads
- Major Streams

Golden eagle MHCP Database Records



Source: MHCP Species database, August 2002

San Diego Lagoon

Threats and Limiting Factors. Human disturbance at active nest sites, loss of foraging habitat, shooting, lead poisoning, and electrocution on power poles (Snow 1973; Scott 1985; Johnsgard 1990) are known factors impacting golden eagle populations. Nest abandonment due to disturbance by hikers or other recreationists is one of the primary threats to extant nesting pairs.

Special Considerations. Golden eagles nest on cliffs and in large trees capable of supporting a large nesting platform in open areas. They are long-lived, and pairs have high fidelity to previously used nest sites. They typically have 3-4 alternative nest sites within their territory, among which they may rotate between years, especially if one becomes unsuitable due to disturbance or other factors. Eagles will readily abandon nesting areas as human uses encroach, and have been observed to fly off when humans approach from as far away as 0.5 miles (Bittner, in litt., 2002). Eagles require extensive foraging areas within their territories of 20-30 square miles. Within these larger areas, pairs generally maintain one or more large, primary or core foraging areas near the nest site. Housing or other human developments on ridgetops, within view of nesting sites, may cause nest abandonment.

Conservation Analysis

Conservation and Take Levels. No take of individuals or nests, including by harassment, is allowed for this species. Overall, the MHCP will conserve approximately 51% of potential foraging habitats (coastal sage scrub and grassland habitats; Table 4-45). Much of the take will occur in smaller habitat fragments that are no longer suitable for golden eagle foraging. The FPA includes 8 of 15 point localities (50%), but this is not a good measure of conservation and take because some of these represent historic observations of individuals over areas that are no longer capable of supporting nesting or foraging eagles (e.g., over central Oceanside). It is difficult to quantify the amount of suitable nesting habitat, because features such as large trees, snags, and cliffs are not mapped in the database. However, the one extant nesting area, and most of that pair's core foraging area, will be conserved in the Del Dios area of Escondido.

Preserve Configuration Issues. Golden eagles can fly long distances between foraging areas, so landscape connectivity may be less important on a fine scale than for many other species. However, they do require large, contiguous core habitat areas that are free of internal fragmentation and edge effects, and require undisturbed areas within about 4,000 feet of nest sites (over 1,150 contiguous acres). The MHCP will protect a substantial amount of foraging habitat in a few large and unfragmented areas used by pairs nesting in or near the MHCP. Overall, about 62% of potential habitat within the BCLA will be conserved. Potential foraging areas in north Oceanside and south San Marcos are only partially conserved by the FPA. However, the critical nesting and core foraging area in the Del Dios portion of Escondido is substantially conserved and is contiguous with more extensive nesting and foraging areas in the unincorporated county

Table 4-45

**SUMMARY OF CONSERVATION FOR
GOLDEN EAGLE**

City	Habitat Acres Conserved ¹		Location Points Conserved ²	Critical Locations Conserved
	Net Acres (%)	BCLA Acres (%)		
Carlsbad	1,960 (55%)	1,876 (57%)	2 (67%)	Grasslands and scrub habitats in central and southeast Carlsbad are partially conserved
Encinitas	740 (64%)	673 (66%)	1 (100%)	Scrub habitat in east Encinitas is substantially conserved
Escondido	1,977 (68%)	1,846 (83%)	8 (89%)	Scrub habitat in north and east Escondido is substantially conserved; nesting and primary foraging habitat in south Escondido is substantially conserved.
Oceanside	1,262 (41%)	1,131 (54%)	0 (0%)	Grasslands and scrub habitat adjacent to Camp Pendleton is partially conserved
San Marcos	1,155 (43%)	1,084 (54%)	0 (0%)	Scrub habitat in north and southwest San Marcos are partially conserved
Solana Beach	6 (53%)	6 (79%)	None known	None known
Vista	167 (18%)	134 (48%)	None known	None known
MHCP Total ³	7,267 (51%)	6,750 (62%)	8 of 15 (50%)	Some of the foraging habitat in critical locations is substantially conserved

¹ Foraging habitat includes coastal sage scrub, coastal sage scrub/chaparral mix, and grassland vegetation communities. Nesting habitat includes rocky cliffs, which are not quantified.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

around Lake Hodges and the San Pasqual Valley. Conservation of the unincorporated core gnatcatcher area may also contribute to retention of this pair of eagles in the region by helping to buffer this nesting territory from encroachment from the west and protecting potential foraging habitat.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to allow for continued persistence of the one pair of golden eagles in the plan area by protecting the one extant nesting area and substantial portions of foraging habitat in the vicinity, provided that the core foraging area is sufficiently managed to prevent trespass and disturbance to the nesting pair. The MHCP will increase regional coordination and funding for monitoring and management, which may improve current management and species stability.

Special Considerations. Human disturbance within 4,000 feet of nest sites should be minimized in perpetuity, including disturbance from passive recreational uses.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Determine foraging habitat requirements of golden eagles adjacent to the MHCP area through a radio-telemetry study.
2. Modify power poles to preclude electrocution of raptors.

American Peregrine Falcon

Falco peregrinus anatum

USFWS: Formerly Endangered, Delisted in August 1999

CDFG: Endangered, Fully Protected

Conservation Goals

Ensure continued use of foraging habitat and allow for future potential nesting use within the plan area. Contribute to regional viability and recovery of the species.

Conservation Strategy

Include within the preserve sufficient foraging habitat, especially in coastal wetlands, and potential breeding habitat to support breeding and wintering pairs of peregrine falcon. Avoid human disturbance at nest sites in the event any become established in the plan area in the future. Facilitate coordination of local, state, and federal conservation and management actions for this species, including coordination with the American peregrine falcon species recovery plan.

Coverage Determination and Permit Conditions

Coverage Determination. Covered. No take of individuals or nests, including by harassment, is allowed for this state Fully Protected species.

Rationale. The MHCP will adequately conserve this species by conserving 100% of wetland habitats used for foraging, including critical foraging areas associated with the coastal lagoons, and by managing preserve areas consistent with species' needs. The species is not known to nest in the study area, but no take of individuals or nests (including by harassment) would be allowed if any were established in the future.

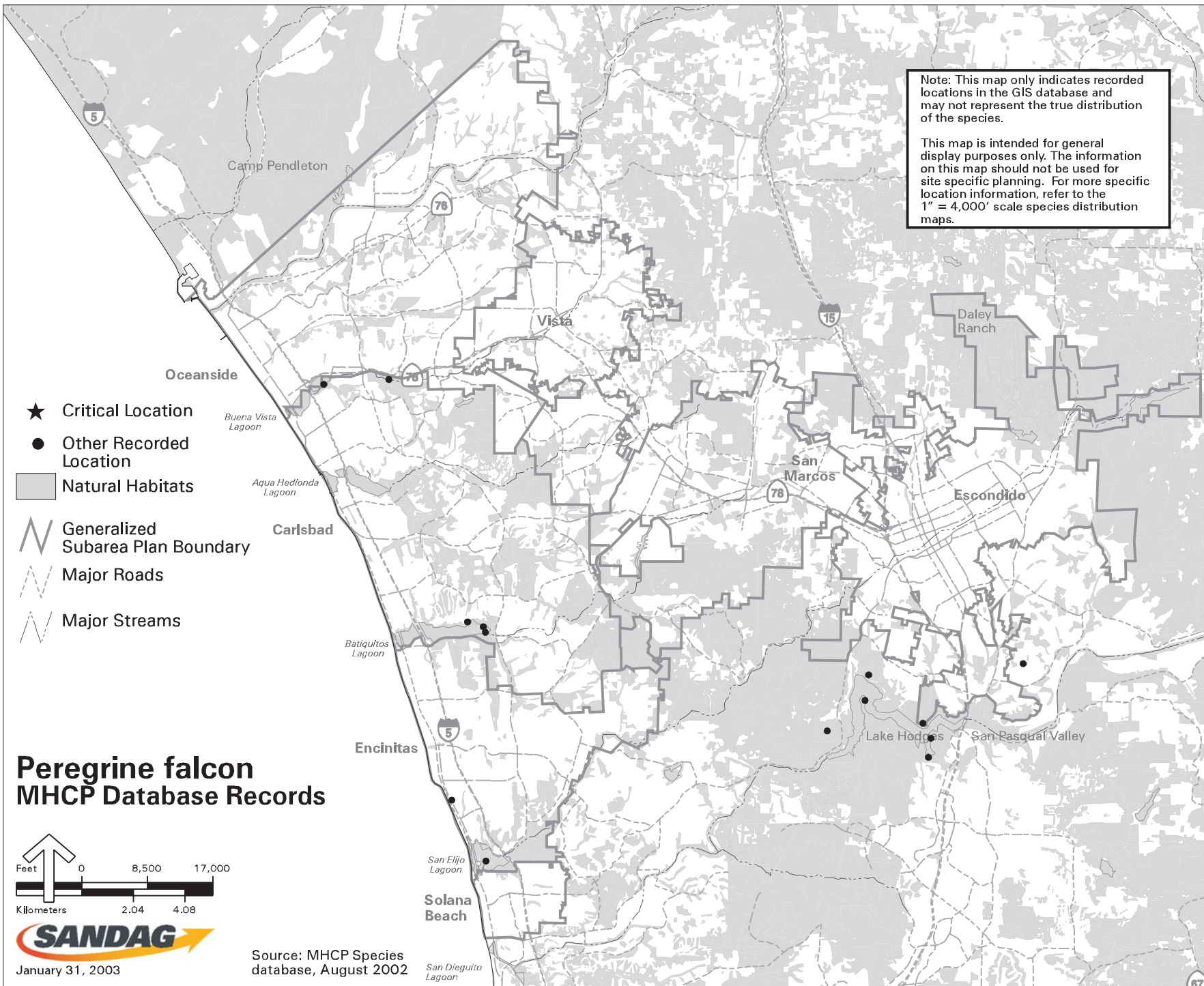
Conditions. No take of individuals or active nests is permitted for this fully protected species. Any nesting pairs discovered or established in the future must be fully protected against harassment during the breeding season.

Background

Distribution, Abundance, and Trends. This falcon is in the process of recovering much of its former breeding range in North America and has recovered sufficiently that the species was removed from the endangered species list in August of 1999 (USFWS 1999c). Three breeding pairs have bred around San Diego Bay since about 1989 (Pavelka 1991; Unitt personal communication). Peregrine falcons occur along coastal areas and at reservoirs in the county during winter. Falcons have been detected foraging in and adjacent to the MHCP area, including Camp Pendleton, Batiquitos Lagoon, Lake Hodges, and San Pasqual Valley (see MHCP Database Records Map), but have not been known to nest there (Unitt personal communication). Peregrine falcon foraging habitat includes coastal wetland areas, extensive riparian areas, and lakes that support large

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

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flocks of waterbirds (ducks, shorebirds) or pigeons. There are no major populations in the MHCP; however, all coastal wetlands and lagoons are considered critical foraging locations within the study area.

Threats and Limiting Factors. Bioaccumulation of pesticides resulted in egg-shell thinning and significant population declines in this species during the middle of this century. Reduction or banning of the harmful pesticides has significantly reduced this threat, and the peregrine falcon is continuing to recover from the effects of pesticide contamination (Johnsgard 1990; Finch 1992; Wootton and Bell 1992). Disturbance of nest sites by humans continues to be a threat to this species, and collisions with utility wires may also be a problem.

Special Considerations. Peregrines traditionally nest on cliff faces but have adapted to also nest on tall building ledges, towers, and similar tall structures. Nest sites need minimal human disturbance. Peregrine falcons are susceptible to the effects of bioaccumulation of toxins due to their high trophic position. Bioaccumulation of DDE was a primary cause of major population declines.

Conservation Analysis

Conservation and Take Levels. No take of individuals or nests, including by harassment, is allowed for this state Fully Protected species. Due to maximum conservation of the lagoon and marsh ecological community and the riparian community (Section 3.2), the expected level of take of habitat potentially used by this species is very low. All of the potential foraging habitat and 6 of 8 location points in the study area are in areas to be conserved (Table 4-46), although only 81% (3,400 acres) are within the FPA and will be actively managed.

Preserve Configuration Issues. All suitable foraging and wintering habitat for the peregrine falcon is 100% conserved and adequately connected relative to the dispersal capability of this species.

Effects on Population Viability and Species Recovery. The preserve design will conserve all existing habitat and will increase species viability and continued recovery through increased management and conservation attention.

Special Considerations. Because peregrines are susceptible to bioaccumulation of toxins, toxicity testing should be initiated if significant population declines are detected in the regional population.

Table 4-46

**SUMMARY OF CONSERVATION FOR
AMERICAN PEREGRINE FALCON**

City	Habitat Acres Conserved¹	Location Points Conserved²	Critical Foraging Locations Conserved
Carlsbad	1,579 (100%)	4 (75%)	Agua Hediona and Batiquitos Lagoons conserved at 100%
Encinitas	811 (100%)	1 (50%)	San Elijo and Batiquitos Lagoons conserved at 100%
Escondido	438 (100%)	1 (100%)	None present
Oceanside	1,284 (100%)	None known	San Luis Rey River mouth and Buena Vista Lagoon are 100% conserved
San Marcos	196 (100%)	None present	None present
Solana Beach	11 (100%)	None known	None known
Vista	256 (100%)	None present	None present
MHCP Total³	4,574 (100%)	6 of 8 (72%)	Critical habitat in coastal lagoons 100% conserved

¹ Habitat includes all estuarine, marsh, and riparian vegetation communities.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Modify utility wires to make them more visible to flying falcons.
2. Evaluate the potential to enhance or create potential nesting sites for peregrine falcons.

Light-footed Clapper Rail

Rallus longirostris levipes

USFWS: Endangered

CDFG: Endangered, Fully Protected

MHCP: Obligate Wetland Species

Conservation Goals

Ensure species persistence within the plan area, contribute to species recovery, and maintain potential for natural recolonization or reintroduction into currently unoccupied habitat.

Conservation Strategy

Conserve all remaining breeding and wintering habitat by increasing protection and reducing threats. Conserve all major populations and critical locations of light-footed clapper rail and additional salt marsh habitat and freshwater marsh habitat upstream in Encinitas, Carlsbad, and Oceanside. Conserve and enhance existing unoccupied habitat to maintain potential for natural recolonization or reintroduction. Implement species-specific management actions, as necessary to increase habitat quality and population size. Facilitate coordination of local, state, and federal conservation and management actions for this species, including coordination with the USFWS light-footed clapper rail endangered species recovery plan.

Coverage Determination and Permit Conditions

Coverage Determination. Covered. No take of individuals or nests, including by harassment, is allowed for this state Fully Protected species.

Rationale. The MHCP will adequately conserve this species by conserving all potential habitat and critical locations and 95% of location points, and by managing preserve areas consistent with species' needs.

Conditions. No take of individuals, roosts, or nests is permitted for this fully protected species.

1. As part of the project review process (e.g., CEQA) for individual projects within the MHCP area, a qualified biologist possessing a Section 10(a)1(A) research permit for this species must survey all areas containing suitable habitat for this species using approved survey protocols. Any take of habitat must be mitigated in part by creating or enhancing light-footed clapper rail habitat and/or establishing new populations in reserve areas. Possible restoration and enhancement actions include revegetation of cordgrass and pickleweed vegetation, and providing nesting platforms in potential nesting habitat.

Background

Distribution, Abundance, and Trends. The light-footed clapper rail is restricted to coastal salt marshes in southern California, where it uses patches of cordgrass and pickleweed for foraging, nest building, and cover. Clapper rails forage in higher marsh vegetation and along tidal creeks and at the interface between vegetation and adjacent mudflats (CDFG 1997). Rails commonly use freshwater marsh upstream from salt marsh during fall and winter.

Breeding pairs of the light-footed clapper rail have been found at 22 marshes throughout its range since 1980. More recently, however, this number has declined, with clapper rails found in only 11 marshes in 1991. In 1990, the U.S. population of light-footed clapper rails was estimated at 190 pairs (USFWS 1986). Breeding densities in southern California range from 0.04 to 0.8 pair per acre (Tomlinson and Todd 1973; Jorgensen 1975).

Within the MHCP study area, major populations of clapper rails occur in San Elijo, Batiquitos, Agua Hedionda, and Buena Vista lagoons (see MHCP Database Records Map). Due to the species' rarity, all major population areas are considered critical locations for conservation. Freshwater marsh vegetation upstream from major population areas is also critical if used by wintering rails.

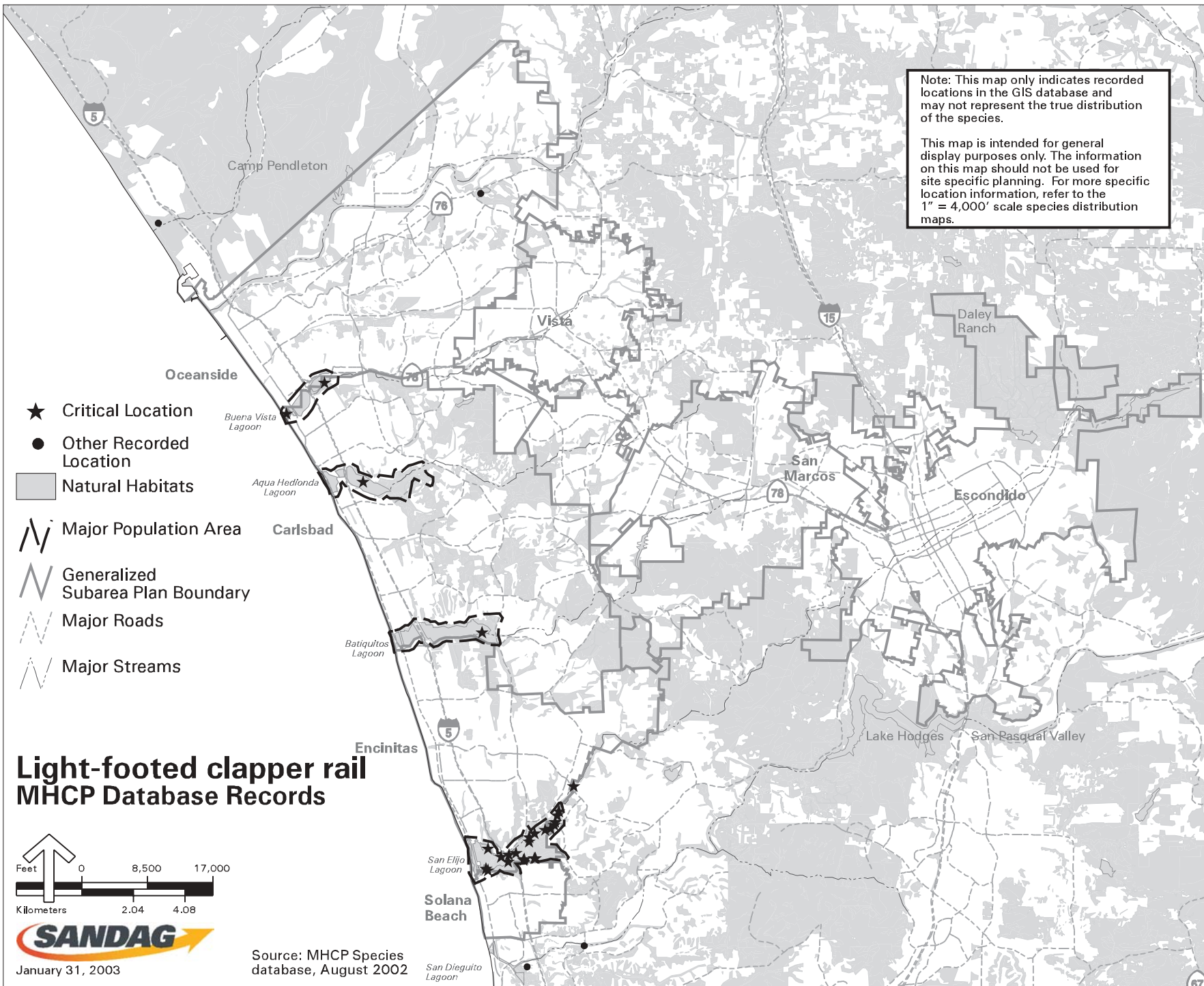
Threats and Limiting Factors. Threats to this species include cumulative habitat loss and degradation, genetic isolation of populations, depredation by introduced predators and artificially enhanced populations of native predators, and human disturbance of habitat (Jorgenson 1975; USFWS 1986; Zembal 1992).

Available habitat appears to be the major limiting factor for this species. Recent recolonizations of lagoons in the study area (SDNHM 1999) are therefore encouraging and suggest that if unoccupied habitat is protected and additional habitat is restored, recovery of the species in the study area is possible.

Special Considerations. Unnaturally large populations of small mammalian predators, such as skunks and foxes, and domestic cats and dogs can adversely affect rail populations via nest predation. It is therefore essential to maintain populations of larger mammalian predators, such as coyotes, in the lagoon and marsh community to prevent overpopulation of smaller predators. The Batiquitos Lagoon restoration project reopened the lagoon to full tidal influence, which is expected to enhance clapper rail habitat and populations over time. The light-footed clapper rail is already closely managed and monitored by state and federal wildlife agencies pursuant to the species recovery plan.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



★ Critical Location

● Other Recorded Location

■ Natural Habitats

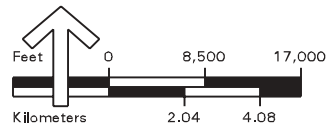
▭ Major Population Area

▭ Generalized Subarea Plan Boundary

— Major Roads

— Major Streams

Light-footed clapper rail MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Elijo Lagoon
Solana Beach
San Dieguito Lagoon

Camp Pendleton

Oceanside

Buena Vista Lagoon

Aqua Hedfonda Lagoon

Carlsbad

Batiquitos Lagoon

Encinitas

Vista

San Marcos

Escondido

Lake Hodges
San Pasqual Valley

Daley Ranch

5

78

78

15

78

5

67

Conservation Analysis

Conservation and Take Levels. No take of individuals or nests, including by harassment, is allowed for this species. Due to maximum conservation of the lagoon and marsh ecological community (Section 3.2), the expected level of take of habitat potentially used by this species is very low. All potential breeding habitat, critical locations, major populations, and 95% of known location points in the study area are in areas to be conserved, and the majority will be actively managed as part of the preserve (Table 4-47).

Preserve Configuration Issues. The MHCP will not adversely affect connectivity of clapper rail habitat, or the ability of clapper rails to disperse between patches of suitable habitat, relative to existing conditions. The habitat of the light-footed clapper rail is naturally patchily distributed, with coastal salt marsh habitat separated by upland habitats across which rails may have formerly dispersed. Upland habitats between the four lagoons have already been mostly removed by development. Nevertheless, limited dispersal between lagoons may still occur as demonstrated by the natural recolonization of San Elijo Lagoon in 1981 (Unitt 1984). The MHCP preserve design facilitates continued access by coyotes and other larger predators to lagoon systems, thereby helping maintain ecological balance and avoiding large population increases of smaller predators (e.g., skunks and foxes) that may prey on clapper rail nests. Rails can move upstream along riparian corridors from breeding habitat to freshwater marsh habitat during winter. Most of the freshwater marsh habitat (83%) is in the FPA and will also be actively managed.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to maintain and possibly enhance population viability of the species and therefore contribute to species recovery. The MHCP preserve and policies are consistent with current recovery planning and management goals for the species. The MHCP will increase regional coordination and funding for monitoring and management, which may improve current management of salt marsh habitats and species stability.

Special Considerations. Conservation and management of wetlands habitats in and upstream from freshwater marsh and lagoon communities will help maintain water quality in clapper rail habitat. Water quality affected by runoff from upland areas into wetland habitats should be monitored and controlled.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Table 4-47

**SUMMARY OF CONSERVATION FOR
LIGHT-FOOTED CLAPPER RAIL**

City	Habitat Acres Conserved¹	Location Points Conserved²	Major Populations Conserved	Critical Locations Conserved
Carlsbad	147 (100%)	3 (100%)	Agua Hediona and Batiquitos Lagoons conserved at 100%	Agua Hediona and Batiquitos Lagoons conserved at 100%
Encinitas	119 (100%)	17 (100%)	San Elijo and Batiquitos Lagoons conserved at 100%	San Elijo and Batiquitos Lagoons conserved at 100%
Escondido	NA	NA	None present	None present
Oceanside	None in database	0 (0%)	Buena Vista Lagoon conserved at 100%	Buena Vista Lagoon conserved at 100%
San Marcos	None present	None present	None present	None present
Solana Beach	6 (100%)	None known	None known	No critical locations known
Vista	None present	None present	None present	None present
MHCP Total³	272 (100%)	20 of 21 (95%)	All Major Populations Conserved	Critical breeding habitat in coastal lagoons 100% conserved, and no net loss policy is expected to maintain upstream wintering habitat

¹ Habitat includes southern coastal salt marsh vegetation communities.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Create or enhance suitable light-footed clapper rail habitat, and establish new populations in the study area. Evaluate areas of disturbed coastal marsh habitat for potential enhancement or revegetation with cordgrass and pickleweed. Provide nesting platforms if warranted based on research and monitoring.
2. If necessary, reintroduce light-footed clapper rails into suitable areas of historic occurrence or into other appropriate unoccupied habitat, such as enhanced or newly created coastal salt marsh.

Western Snowy Plover*Charadrius alexandrinus nivosus***USFWS: Threatened****CDFG: Species of Special Concern****MHCP: Obligate Wetland Species****Conservation Goals**

Ensure species persistence within the plan area and contribute to species recovery. Increase breeding population size in the plan area via active management.

Conservation Strategy

Conserve existing major populations and critical locations of western snowy plover and additional breeding and wintering habitats in the San Luis Rey River mouth and Agua Hedionda, Batiquitos, and San Elijo lagoons. Implement species-specific management actions, as necessary to reduce threats to the species, increase habitat quantity and quality, and increase population size. Facilitate coordination of local, state, and federal conservation and management actions for this species, including coordination with the USFWS western snowy plover recovery plan.

Coverage Determination and Permit Conditions

Coverage Determination. Covered.

Rationale. The MHCP will adequately conserve this species by conserving all potential habitat and critical locations, and by managing preserve areas consistent with species' needs.

Conditions. No take of individuals or nests is permitted for this species. The following additional conditions apply:

1. Management will restrict activities within the preserve that could adversely plover populations, including human disturbance, off-road vehicular activity, and predation of adults and nests by domestic animals (e.g., dogs and cats) and introduced predators (e.g., red fox) or artificially enhanced populations of natural predators (e.g., gulls, raccoons, ravens, and skunks).
2. Human activity will be restricted by fencing off nesting areas during the breeding season (April 1 through August 31). Signs restricting access are usually not effective without fencing.
3. Create suitable snowy plover habitat to compensate for take by projects. Evaluate areas of disturbed salt flats, mudflats, beach and estuarine habitats for potential snowy plover breeding habitat enhancement and protection. Cover created breeding habitats with shells or similar coarse materials to suppress weed growth

and offer nest camouflage and scatter patches of sticks, small rocks, dried kelp or similar debris in small amounts (15% cover) as hiding cover, as directed by results of monitoring and research (Powell and Collier 2000).

Background

Distribution, Abundance, and Trends. The breeding and winter distribution of the western snowy plover in California is along coastal sandy beaches, dunes, estuarine habitat, and at interior lakes and salt flats such as Mono Lake. It is a common migrant and winter visitor and localized breeding resident in San Diego County (Unitt 1984). Breeding localities within the MHCP area include the San Luis Rey River mouth and Agua Hedionda, Batiquitos, and San Elijo lagoons (see MHCP Database Records Map). Major populations within the MHCP study area occur at the San Luis Rey River mouth and the lagoon and estuarine habitats in Encinitas, Carlsbad, and Oceanside, all of which are considered critical locations (Unitt 1984; Powell and Collier 2000).

Threats and Limiting Factors. Major threats to this species include human disturbance, loss and degradation of foraging and nesting habitats, and predation by introduced animals and artificially enhanced populations of native predators (Remsen 1978; Page et al. 1983; Powell 1998; Powell and Collier 2000). Much of the former breeding habitat on sandy beaches has been made unsuitable by intensive human recreation and beach grooming activities.

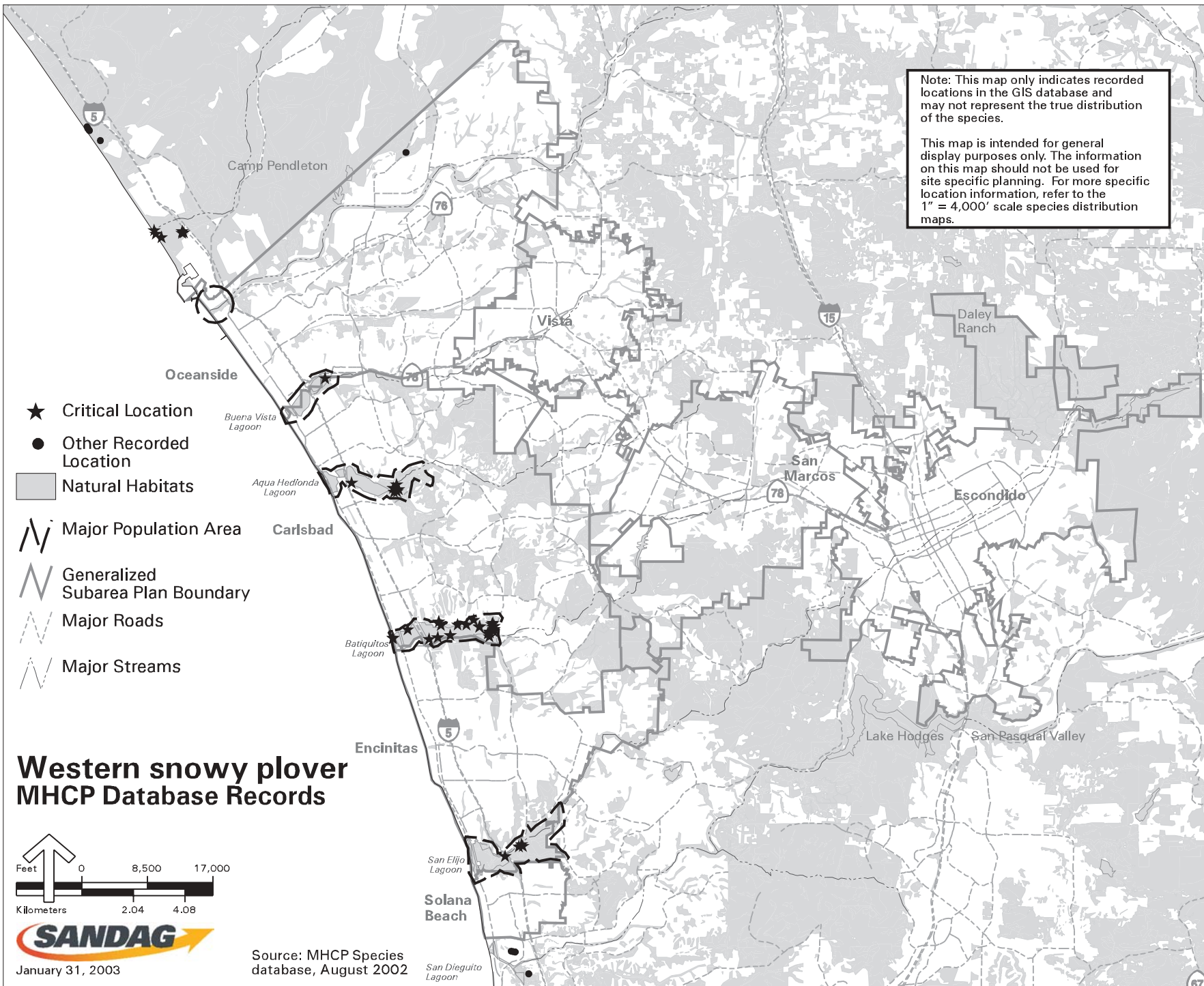
Special Considerations. The western snowy plover historically bred in ephemeral habitats created by the natural deposition and migration of beach sands and similar substrates. It responds rapidly to newly created nesting habitat that is protected or fenced from predators and humans. However, reproductive success on newly created habitats, such as the dredge spoil islands created in Batiquitos Lagoon, may rapidly decline after a first-year peak due to increased predation (including from domestic cats and dogs, and ravens, crows, and other avian predators), weed growth, and other factors. Consequently, created habitats may rapidly become population sinks (Powell and Collier 2000). Active management to provide cover materials, suppress weed growth, and control predation are essential (Powell and Collier 2000).

Conservation Analysis

Conservation and Take Levels. The expected level of take of potential habitat for this species is very low. The FPA will have little effect on conservation of breeding habitat, which is currently very limited in the study area. While only 18% (9 acres) of beach habitat is included in the FPA, little of the beach habitat in the study area is currently suitable for nesting due to heavy recreational use. Less than 10 acres of beach or saltflat breeding habitat occur on the edges of estuaries away from the immediate coast where recreational impacts are minimal. In addition, several small islands created as breeding habitat for terns and shorebirds occur in the FPA in Batiquitos Lagoon. These islands initially supported an increasing abundance of successfully breeding snowy plovers (Powell et al. 1996), but this trend reversed over the next several years, apparently due to

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★ Critical Location

● Other Recorded Location

■ Natural Habitats

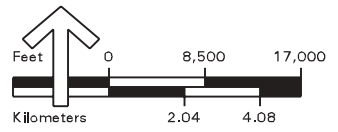
▭ Major Population Area

▭ Generalized Subarea Plan Boundary

▭ Major Roads

▭ Major Streams

Western snowy plover MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Diego Lagoon

increasing predation (Powell and Collier 2000). All of the estuarine and salt flat habitat will be 100% conserved, most of which is within the FPA, and will be actively managed as part of the preserve. All major populations and critical locations are conserved, along with 82% (28 of 34) of the location points in the study area.

Preserve Configuration Issues. The MHCP will not adversely affect connectivity of snowy plover habitat, or the ability of snowy plovers to disperse between patches of suitable habitat, relative to existing conditions. The habitat of the snowy plover is naturally patchily distributed, with coastal salt marsh habitat separated by upland habitats. Upland habitats between the four lagoons have already been mostly removed by development; however, because this species is a long-distance migrant, development is not a substantial barrier to dispersal. The MHCP preserve design facilitates continued access by coyotes and other larger predators to lagoon systems, thereby helping maintain ecological balance and avoiding large population increases of smaller predators (e.g., skunks and foxes) that may prey on snowy plover nests.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to maintain and possibly enhance the population viability of snowy plovers through increased habitat management and is expected to contribute to species recovery. The MHCP will increase regional coordination and funding for monitoring and management, which may improve current management of salt marsh habitats and species stability.

Special Considerations. Recreational uses must be controlled in active plover nesting areas to avoid trampling or other disturbance near nests. Signs alone are generally ineffective in controlling access, so strong fencing is required to prohibit human access to active nesting areas.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Consider conducting genetic and demographic studies of the conserved plover population.

Long-billed Curlew

Numenius americanus

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: Species of Special Concern

MHCP: Obligate Wetlands Species

Conservation Goals

Allow for continued wintering use by the long-billed curlew in the plan area. Contribute to regional viability and species recovery by enhancing habitat quality in the plan area.

Conservation Strategy

Conserve existing potential curlew wintering habitats (i.e., mudflats and salt marshes) in the San Luis Rey River mouth and Agua Hedionda, Batiquitos, and San Elijo lagoons as well as in suitable coastal slope uplands (i.e., grasslands and fallow agricultural fields). Conserve remaining wintering habitat by increasing protection and reducing threats. Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, due to insufficient information.

Rationale. It is impossible to determine adequacy of conservation for this species based on existing information. It is an uncommon winter visitor within lagoons and grasslands. Although lagoons are 100% conserved, grasslands are only 32% conserved. Overall, only about 36% of potential habitat will be conserved in the study area.

Conditions. Not applicable.

Background

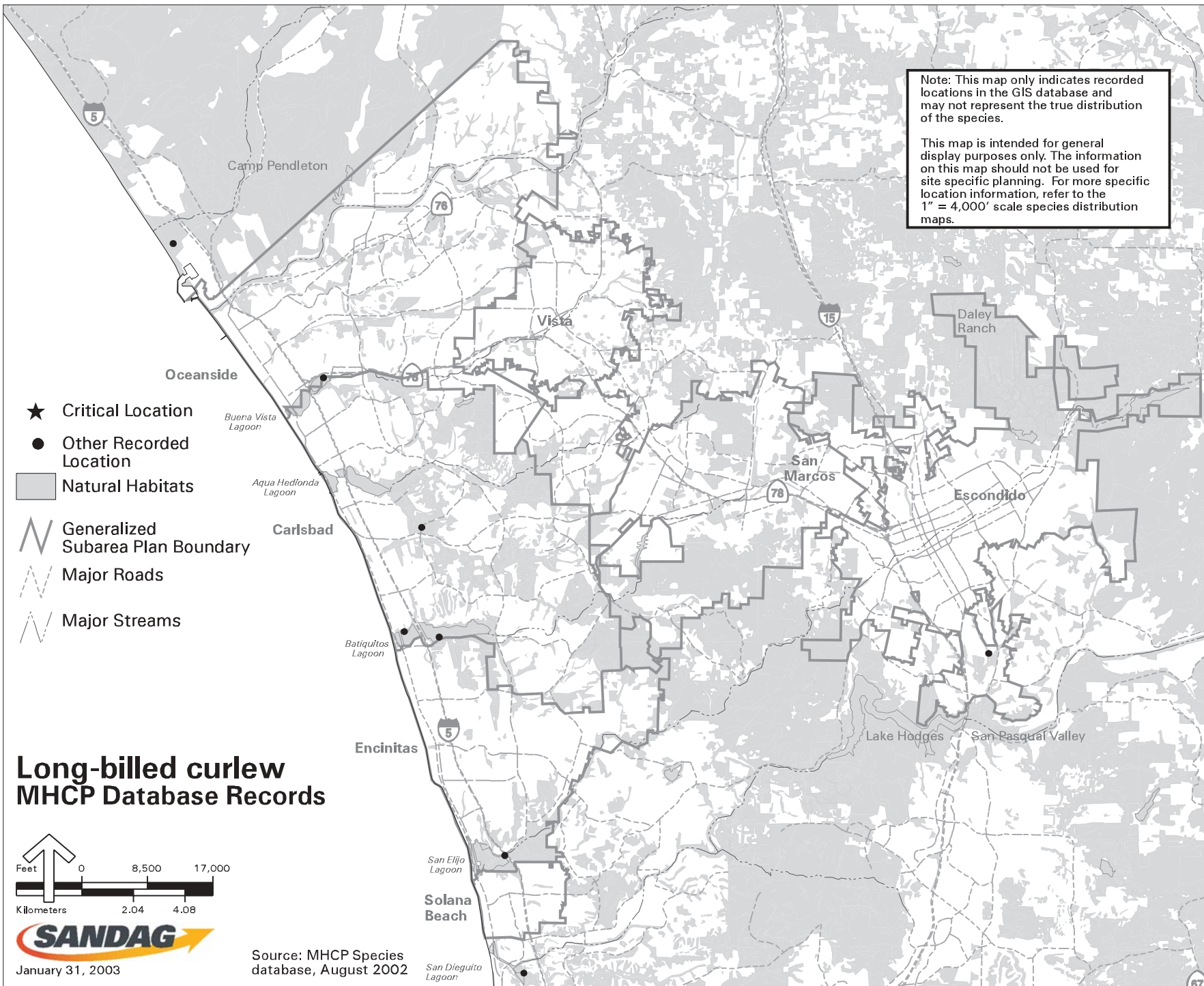
Distribution, Abundance, and Trends. This curlew is an uncommon migrant and winter visitor to San Diego County. There are no breeding records for the county. No regular use areas are known for the MHCP area (Unitt 1984). Long-billed curlew habitat includes tidal mudflats, coastal strand, salt marshes, fallow agricultural fields, and grasslands along the coast. There are no major populations or critical locations for this species in the MHCP area, although scattered wintering observations have been recorded near coastal lagoons, south Escondido, and central Carlsbad (see MHCP Database Records Map).

Threats and Limiting Factors. The long-billed curlew has declined principally due to large-scale loss of grasslands and wetlands (Terres 1980).

Special Considerations. None identified.

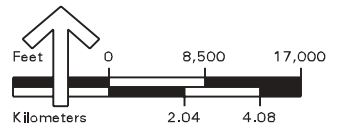
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

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- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- Generalized Subarea Plan Boundary
- Major Roads
- Major Streams

Long-billed curlew MHCP Database Records



Source: MHCP Species database, August 2002

Conservation Analysis

Conservation and Take Levels. Overall, only about 36% of potentially suitable habitat will be conserved (Table 4-48). Although maximum conservation of the lagoon and marsh ecological community (Section 3.2) may benefit this species, only approximately 32% of grassland foraging habitat will be conserved (Table 4-48). Three of 5 observation points (80%) in the study are in areas to be conserved.

Preserve Configuration Issues. The MHCP will not adversely affect connectivity of curlew wintering habitat within the salt marsh and mudflat areas relative to existing conditions. Much of the grassland foraging habitat, however, will be substantially reduced in size and connectivity, with only about 47% of grasslands within the BCLA being conserved.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to have little effect on this occasional winter visitor. It should allow for continued occasional wintering use of the plan area, although this will likely be somewhat reduced due to the substantial loss of grassland foraging habitat. The MHCP will increase regional coordination and funding for monitoring and management, which may improve current management of salt marsh habitats.

Special Considerations. None identified.

Adaptive Management Program

Not applicable.

Table 4-48

**SUMMARY OF CONSERVATION FOR
LONG-BILLED CURLEW**

City	Habitat Acres Conserved ¹		Location Points Conserved ²
	Net Acres (%)	BCLA Acres (%)	
Carlsbad	637 (44%)	623 (47%)	3 (75%)
Encinitas	232 (71%)	223 (78%)	None known
Escondido	401 (67%)	393 (88%)	0 (0%)
Oceanside	574 (33%)	532 (45%)	None known
San Marcos	91 (13%)	50 (26%)	None known
Solana Beach	6 (100%)	6 (100%)	None known
Vista	27 (4%)	16 (13%)	None known
MHCP Total ³	1,967 (36%)	1,843 (52%)	3 of 5 (60%)

¹ Habitat includes southern coastal salt marsh, salt pan/mudflats, and grassland vegetation communities.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Elegant Tern

Sterna elegans

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: Species of Special Concern

Conservation Goals

Ensure continued persistence in the plan area and contribute to species recovery. Support the continued northward expansion of the breeding population to include the plan area.

Conservation Strategy

Include within the preserve the majority of potential elegant tern breeding, foraging, and wintering habitat. Protect, enhance, and manage existing habitat. Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Covered.

Rationale. The MHCP will adequately conserve this species by conserving over 96% of suitable habitat and 86% (6 of 7) known locations in the study area, including 100% of lagoon and estuarine habitats, and by managing preserve areas consistent with species' needs.

Conditions. The following conditions apply:

1. Management will restrict activities within the preserve that could prevent the establishment of additional elegant tern colonies at conserved coastal wetlands. Adverse activities include human disturbance; off-road vehicle and pedestrian activity; changes in nesting substrates and vegetative structure at suitable nesting sites; and presence of domestic animals, introduced predators (e.g., red fox), or artificially enhanced populations of natural predators (e.g., gulls, raccoons, and skunks).
2. Mitigation for any take of occupied breeding habitat must include enhancement of conserved habitat to induce the initiation of new breeding colonies. This may include modification of nesting substrates, vegetation clearing in limited areas deemed appropriate for tern nesting, and placement of tern decoys to attract prospecting terns. If a colony is established, the site will be fenced and signs erected to prohibit public access.

Background

Distribution, Abundance, and Trends. The elegant tern is an abundant summer resident in San Diego County. Elegant terns first bred north of Baja California, Mexico, in 1959

on the dikes of the Western Salt Works in south San Diego Bay. This site is the only known colony in San Diego County, which has steadily grown in size since its discovery. No breeding colonies are known in the MHCP area. A colony has recently formed at the Bolsa Chica wetlands in Orange County. Habitat of the elegant tern within the MHCP includes estuarine and intertidal zones of beaches and mudflats for foraging, and beaches, mudflats, and lagoon shoreline for roosting habitat. There are no known major populations or critical areas within the study area; however, lagoons and beaches within the MHCP area do provide important wintering habitats (see MHCP Database Records Map).

Threats and Limiting Factors. Elegant terns are vulnerable to human disturbance and introduced predators (e.g., red fox) or artificially enhanced populations of natural predators (e.g., gulls, raccoons, and skunks) due to their colonial habits (Remsen 1978).

Special Considerations. Roost sites require minimal human disturbance. Additional protection or creation of breeding habitat may facilitate new breeding colony formation.

Conservation Analysis

Conservation and Take Levels. Due to maximum conservation of the lagoon and marsh ecological community (Section 3.2), the expected level of take of this species or its habitat is very low. The foraging habitat in the estuarine areas is 100% conserved. Although only 18% (9 of 48 acres) of beach habitat will be conserved, most sandy beach in the study area is not suitable for nesting due to high recreational use. Six of 7 point localities (86%) are in areas to be conserved (Table 4-49).

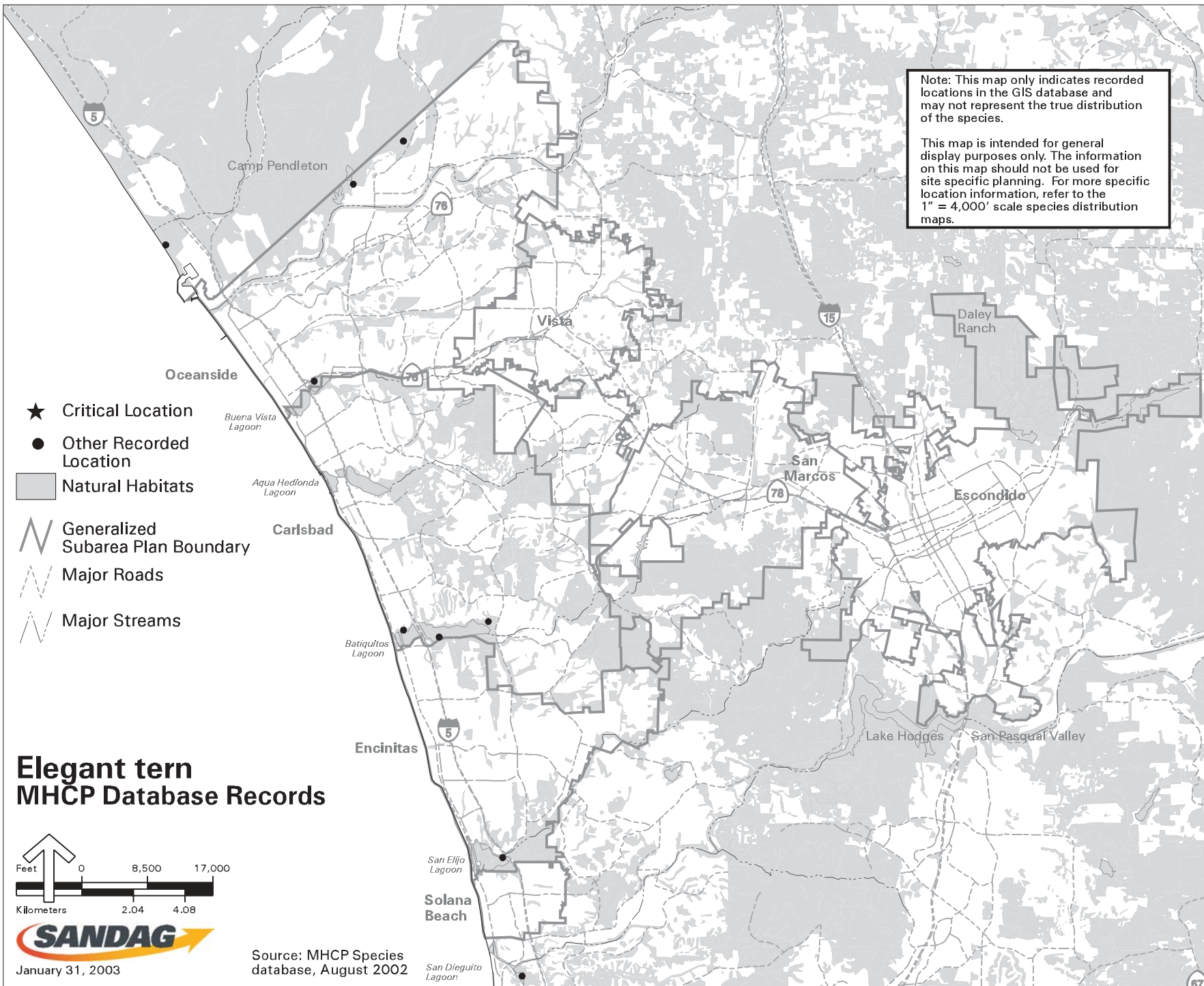
Preserve Configuration Issues. The MHCP preserve will not affect the ability of this species to disperse relative to existing conditions. This highly mobile and migratory species readily covers substantial distances daily when moving between nesting and foraging locations. The abundance and quality of potential breeding and foraging habitat is more important than preserve connectivity through native habitats for this species.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to maintain and possibly enhance population viability of the species and therefore contribute to species recovery. The MHCP preserve and policies are consistent with current management goals for species. The MHCP will increase regional coordination and funding for monitoring and management, which may improve current management of elegant tern foraging and potential breeding habitats and species stability.

Special Considerations. Colonization of suitable breeding habitat could be encouraged by the use of elegant tern decoys. Human disturbance in all potential breeding habitat should be minimized to increase likelihood of recolonization.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

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- ★ Critical Location
- Other Recorded Location

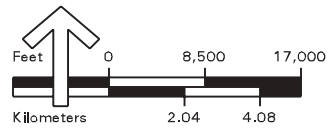
■ Natural Habitats

— Generalized Subarea Plan Boundary

--- Major Roads

--- Major Streams

Elegant tern MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Dieguito Lagoon

Table 4-49

**SUMMARY OF CONSERVATION FOR
ELEGANT TERN**

City	Habitat Acres Conserved¹	Location Points Conserved²
Carlsbad	768 (100%)	3 (100%)
Encinitas	169 (100%)	1 (100%)
Escondido	None present	None present
Oceanside	32 (45%)	2 (67%)
San Marcos	None present	None present
Solana Beach	1 (60%)	None present
Vista	None present	None present
MHCP Total³	970 (96%)	6 of 7 (86%)

¹ Habitat includes estuarine, beach, salt pan, and mudflats vegetation communities.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. None identified.

California Least Tern*Sterna antillarum browni***USFWS: Endangered****CDFG: Endangered, Fully Protected****Conservation Goals**

Ensure continued persistence and possible expansion of breeding populations within the plan area.

Conservation Strategy

Conserve all remaining breeding and foraging habitat by increasing protection and reducing threats. Enhance habitat quality and create new areas for the establishment of breeding colonies. Include habitat for nesting that will not be inundated by high tides. Implement species-specific management actions, as necessary to increase habitat quality and population size. Facilitate coordination of local, state, and federal conservation and management actions for this species, including coordination with the USFWS California least tern endangered species recovery plan.

Coverage Determination and Permit Conditions

Coverage Determination. Covered. No take of individuals or nests, including by harassment, is allowed for this state Fully Protected species.

Rationale. The MHCP will adequately conserve this species by conserving about 96% of suitable habitat and 96% of observation points, including 100% of critical lagoon habitats and major populations, and by managing preserve areas consistent with species' needs.

Conditions. No take of individuals or active nests are allowed for this species. Management must control human access to minimize potential trampling or harassment in breeding areas.

1. Management will restrict human access in active nesting areas during the breeding season (April 1 through September 15) by fencing and signage. Management will also control other threats to the species, including off-road vehicle activity; changes in nesting substrates and vegetative structure at nesting sites; inundation of colonies by high tides or freshwater; and predation of adults and nests by domestic animals (e.g., dogs and cats), introduced predators (e.g., red fox), or artificially enhanced populations of natural predators (e.g., gulls, raccoons, and skunks).
2. Mitigation for any impacts to occupied habitat must include enhancement of habitat to induce the initiation of new breeding colonies. This may include fencing, modification of nesting substrate, vegetation clearing in limited areas deemed appropriate for tern nesting, placement of tern decoys to attract

prospecting terns, and creation of islands of vegetation or tile shelters to provide cover for chicks.

Background

Distribution, Abundance, and Trends. The least tern is a colonially breeding species distributed along the coast from San Francisco Bay to Baja California, Mexico. San Diego County supports nearly half of California's breeding least terns. In the MHCP area, terns forage in the lagoons (see MHCP Database Records Map), and Batiquitos Lagoon supports breeding least terns (Fancher 1992; Powell and Collier 2000). They also nested at San Elijo Lagoon in 1989 (P. Baird personal communication). Least tern habitat includes coastal beaches and saltflats for colonial breeding, and intertidal and estuarine waters for foraging. Rapid loss of habitat during the later half of this century has resulted in substantial declines in this species throughout San Diego County.

Within the MHCP study area, critical habitat areas used for foraging occur at the San Luis Rey River mouth, and in lagoon and estuarine habitats in Encinitas, Carlsbad, and Oceanside. Batiquitos Lagoon supports breeding least terns, and suitable breeding habitat exists at the San Luis Rey River mouth but is not currently occupied. The foraging habitat at the mouth of the San Luis Rey River may be important to support the major population that breeds north of the study area on the Santa Margarita River delta on Camp Pendleton.

Threats and Limiting Factors. All established nesting sites in San Diego County have received protection and are monitored each year. The California least tern is endangered due to historical loss of suitable nesting and foraging habitat. This species is also vulnerable to predation by introduced predators and artificially enhanced populations of native predators, and to human disturbance.

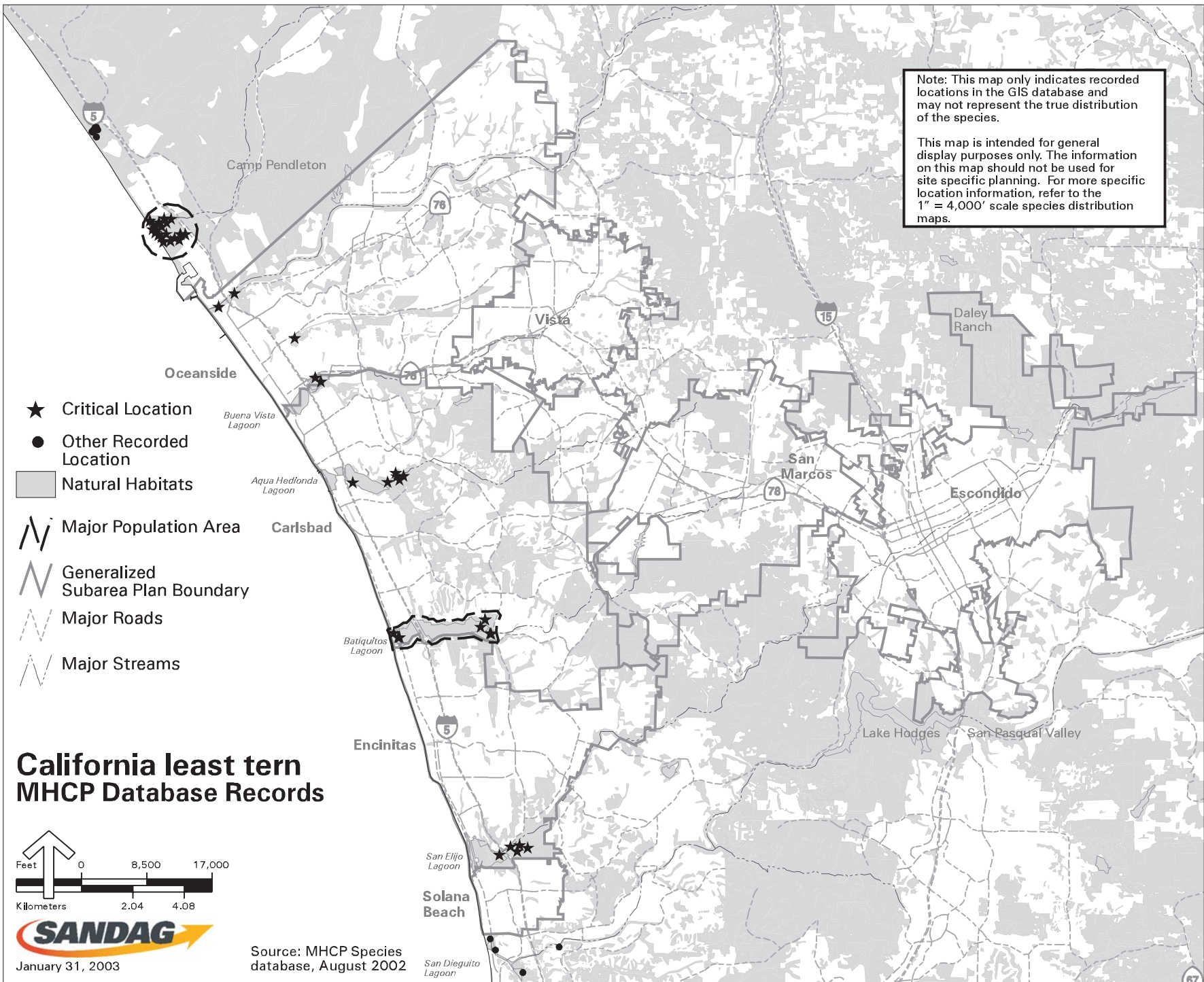
Special Considerations. This species responds well to created nesting habitat that is protected by fencing from predators and human disturbance. Seemingly suitable breeding habitat may go unused if human disturbance or high nest predation has impacted previous breeding attempts (Unitt 1984; Powell 1998)

Unnaturally large populations of small mammalian predators, such as skunks and foxes, can adversely affect nesting terns via nest predation. It is therefore essential to maintain populations of larger mammalian predators, such as coyotes, in the lagoon and marsh community to prevent overpopulation of smaller predators.

The California least tern is already closely managed and monitored by state and federal wildlife agencies pursuant to the species recovery plan (USFWS 1980, 1985).

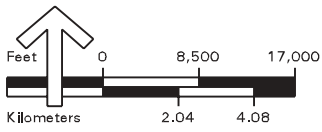
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- ▭ Major Population Area
- - - Generalized Subarea Plan Boundary
- Major Roads
- - - Major Streams

California least tern MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

Conservation Analysis

Conservation and Take Levels. No take of individuals or nests, including by harassment, is allowed for this species. Due to maximum conservation of the lagoon and marsh ecological community (Section 3.2), the expected level of take of habitat potentially used by this species is very low. Foraging habitat in the estuarine areas is 100% conserved. While only 18% (9 acres) of beach habitat is included in the FPA, little beach habitat is currently suitable for breeding due to heavy recreational use. All of the critical potential least tern breeding habitat will be protected by the MHCP and other least tern conservation plans (e.g., California least tern recovery plan, USFWS 1980, 1985). All critical areas and 23 of 24 point localities are in areas to be conserved (Table 4-50).

Preserve Configuration Issues. The MHCP preserve will not affect the ability of this species to disperse relative to existing conditions. This highly mobile and migratory species readily covers substantial distances daily when moving between nesting and foraging locations. The abundance and quality of breeding and foraging habitat is more important than preserve connectivity through native habitats for this species. Preserve management will need to minimize and manage edge effects such as human disturbance and predation by domestic pets in breeding habitat.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to maintain and possibly enhance population viability of the species and therefore contribute to species recovery. The MHCP preserve and policies are consistent with current recovery planning and management goals for the species. The MHCP will increase regional coordination and funding for monitoring and management, which may improve current management of California least tern foraging and breeding habitats and species stability.

Special Considerations. Colonization of the suitable breeding habitat at the mouth of the San Luis Rey River could be encouraged by the use of least tern decoys. Human disturbance in all potential breeding habitat should be minimized to increase likelihood of recolonization.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. None identified.

Table 4-50

**SUMMARY OF CONSERVATION FOR
CALIFORNIA LEAST TERN**

City	Habitat Acres Conserved¹	Location Points Conserved²	Major Populations Conserved	Critical Locations Conserved
Carlsbad	768 (100%)	15 (100%)	Breeding habitat at Batiquitos Lagoon conserved at 100%	Agua Hedionda and Batiquitos Lagoons conserved at 100%
Encinitas	169 (100%)	5 (100%)	None known	San Elijo and Batiquitos Lagoons conserved at 100%
Escondido	None present	None present	None present	None present
Oceanside	32 (45%)	3 (75%)	Breeding habitat at the San Luis Rey River mouth is 100% conserved	Breeding habitat at the San Luis Rey River mouth is 100% conserved
San Marcos	None present	None present	None present	None present
Solana Beach	1 (60%)	None known	None known	None known
Vista	None present	None present	None known	None known
MHCP Total ³	970 (96%)	23 of 24 (96%)	All Major Populations Conserved	Critical breeding and foraging habitat in coastal lagoons 100% conserved

¹ Habitat includes estuarine, beach, salt pan, and mudflats vegetation communities. Less than 10 acres of the conserved habitat is suitable potential breeding habitat.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Burrowing Owl

Speotyto cunicularia hypugaea

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: Species of Special Concern

Conservation Goals

Ensure persistence of this species within the plan area. Contribute to species recovery and regional population viability by enhancing habitat quality in the plan area.

Conservation Strategy

Conserve existing breeding and foraging habitat and potential breeding locations and critical locations for burrowing owls in the grasslands, pastures, and agricultural edge habitats within the MHCP. Include within the open space preserve system any occupied burrowing owl breeding and associated foraging habitat and potential habitat in critical locations. Implement species-specific management actions, as necessary to increase habitat quality and population size. In the case of unavoidable impacts to nesting areas, translocate individuals if necessary to artificial burrow sites within preserve areas. Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, due to insufficient conservation.

Rationale. Current levels of conservation expected under the current MHCP FPA and guidelines do not meet the conservation goals for this species. Few large grassland areas or agricultural areas will be conserved for foraging. Only about 32% of the extant grasslands in the study area are expected to be conserved, and the plan does not protect agricultural lands from development. Remaining potential habitat areas will generally be small and subject to strong edge effects. Few locations in the study area seem suitable to translocate individuals into in the event of unavoidable impacts to nesting areas.

Conditions. Not applicable.

Background

Distribution, Abundance, and Trends. The burrowing owl is widespread throughout open, arid lands of western North America, but the species is in serious decline throughout most of its range, including within San Diego County. It was formerly a common resident of California coastal areas and valleys that support open grasslands and scrub habitats. Locations at which burrowing owls have at least historically been observed breeding in San Diego County include San Marcos, Camp Pendleton, Palomar Airport, central and southeast Carlsbad (Carlsbad golf course locations), Batiquitos and San Elijo lagoons, Mission Bay, Lower Otay Lake, North Island Naval Air Station, Otay

Mesa, and Tijuana River Valley. However, recent surveys within the MSCP area have found fewer breeding pairs at essentially all known breeding locations there, and results of surveys for the San Diego Bird Atlas documented no recent breeding burrowing owls within the MHCP area. The resident population is augmented by migratory individuals from the north during winter. Potential habitat is still present in San Marcos, central and southeast Carlsbad, Batiquitos and San Elijo lagoons, north Oceanside adjacent to Camp Pendleton, and Escondido (P. Bloom personal communication; H. Wier personal communication). Burrowing owl habitat includes grasslands, pastures, and the edges of agricultural fields. Owls use California ground squirrel (*Spermophilus beecheyi*) burrows for cover and nesting. There are no major populations within the MHCP study area due to the small size of habitat blocks that remain; however, areas of potential habitat in San Marcos, southeast Carlsbad, Batiquitos and San Elijo lagoons, north Oceanside adjacent to Camp Pendleton, and Escondido were considered Critical under the MHCP Biological Goals Standards and Guidelines. Scattered observations in these areas (see MHCP Database Records Map) are thought to represent non-breeding individuals.

Threats and Limiting Factors. Burrowing owl populations are declining due to habitat loss, incidental poisoning, destruction of their burrows by ground squirrel control programs, collisions with autos, human disturbance, and introduction of nonnative predators and artificial enhancement of certain native predator populations (Remsen 1978; Unitt 1984; Bloom personal communication; Collins 1979; Zarn 1974). Recent observations suggest the loss of a substantial number of documented colonies and a reduction in the number of individuals at the remaining colonies (P. Bloom personal communication; C. Winchell personal communication).

Special Considerations. Burrowing owls respond to creation of nesting burrows within at least 6.5 acres of suitable foraging habitat (CDFG 1995). Nest sites need minimal human disturbance.

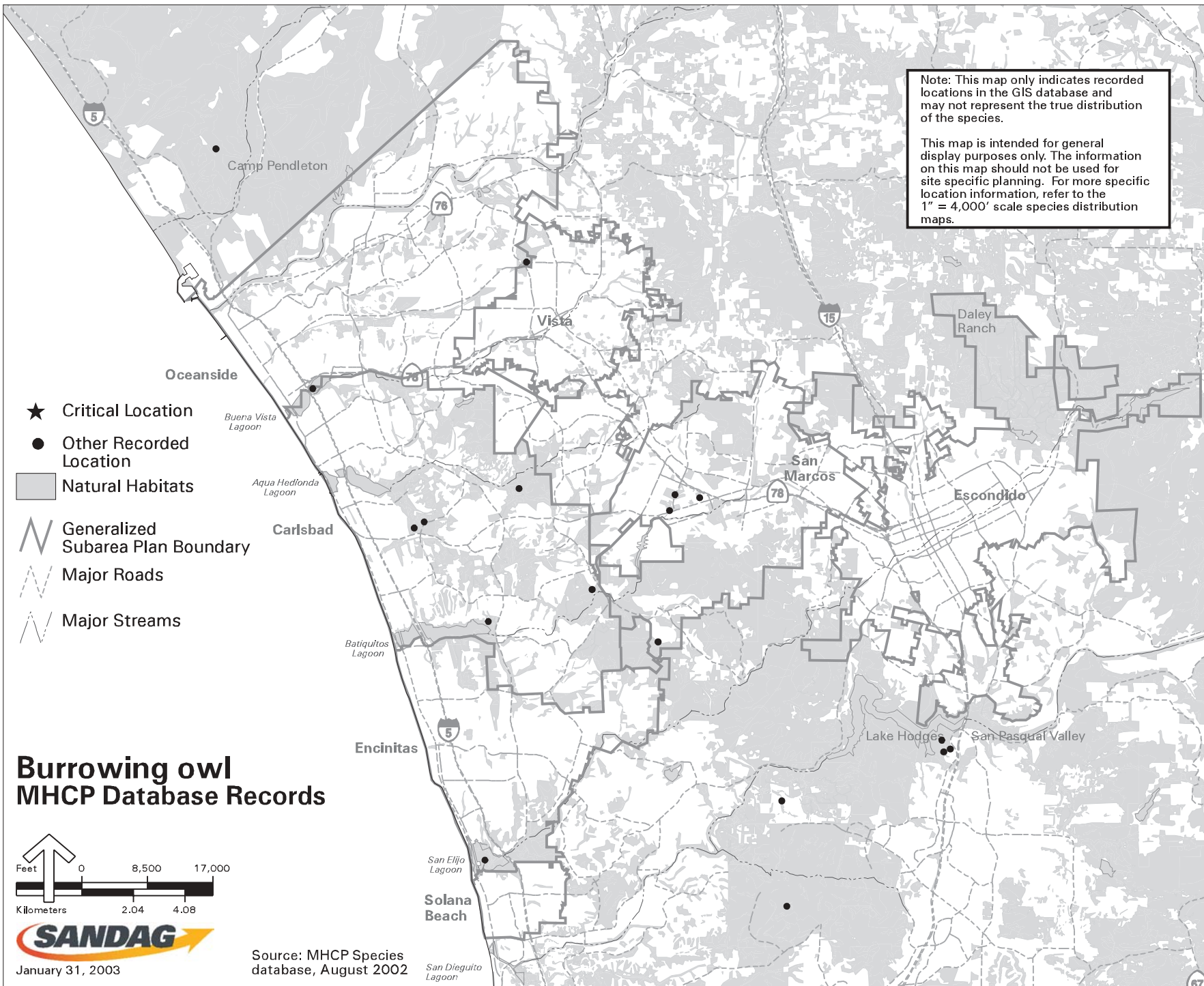
Conservation Analysis

Conservation and Take Levels. The marginal level of conservation of the grassland ecological community (32%) (Section 3.2) will not substantially benefit this species (Table 4-51). Agricultural habitats were not a target for MHCP conservation and are not appreciably conserved. However, take of this species is expected to be low, due to its rarity in the study area and the existing level of fragmentation of its favored habitats. Six of 10 location points are within the FPA.

Preserve Configuration Issues. The MHCP will not protect the majority of grassland habitat and does not directly target any agricultural edge habitat. Although the total acreage of grasslands that are not protected is substantial, some grasslands included in the preserve retain relatively good connectivity (e.g., adjacent to Camp Pendleton). The FPA does provide substantial conservation of habitat in a few critical areas of Carlsbad, Encinitas, Escondido, and Oceanside.

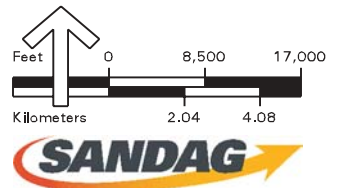
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- Generalized Subarea Plan Boundary
- - - Major Roads
- - - Major Streams

Burrowing owl MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Diegouito Lagoon

Table 4-51

**SUMMARY OF CONSERVATION FOR
BURROWING OWL**

City	Habitat Acres Conserved ¹		Location Points Conserved ²	Critical Locations Conserved
	Net Acres (%)	BCLA Acres (%)		
Carlsbad	490 (38%)	478 (40%)	4 (80%)	Grasslands in eastern Batiquitos Lagoon and southeast Carlsbad are partially conserved
Encinitas	109 (53%)	101 (61%)	1 (100%)	Grasslands in eastern San Elijo Lagoon are substantially conserved
Escondido	401 (67%)	393 (88%)	None known	Grasslands in north and south Escondido are substantially conserved
Oceanside	570 (33%)	527 (44%)	0 (0%)	Grasslands adjacent to Camp Pendleton are substantially conserved
San Marcos	91 (13%)	50 (26%)	1 (33%)	Grasslands in San Marcos are poorly conserved
Solana Beach	None present	None present	None present	None present
Vista	27 (4%)	16 (13%)	None known	None known
MHCP Total ³	1,687 (32%)	1,565 (47%)	6 of 10 (60%)	Some of the foraging habitat in critical locations is substantially conserved

¹ Habitat includes grassland vegetation communities. Agricultural edge habitat was not quantified in this analysis.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

The preserve includes only 1,563 acres (47%) of the potential burrowing owl habitat contained by the BCLA (Table 4-51). FPA conservation of the BCLA provides a useful measure for comparing the proposed preserve to a biologically preferred preserve design, given the existing degree of fragmentation in the plan area. Consequently, although about 32% of total potential habitat will be preserved, approximately 4% of the most important potential habitat will be conserved. Additional acres included in the FPA but not in the BCLA generally are isolated, small, or degraded fragments of habitat that may be of lesser biological value.

Effects on Population Viability and Species Recovery. Implementation of the MHCP might allow for continued persistence of the burrowing owl in the plan area; however, the level of conservation is not expected to contribute substantially to regional population viability or species recovery. The number of owls supported by the preserve is expected to be lower than the number currently supported under existing conditions due to the substantial loss of grassland habitat. Nevertheless, the existing capacity of the study area to support burrowing owls is low, and the number of individuals to be affected by plan implementation should be very low. Translocating individuals from fragmented areas subject to impacts, to larger preserve areas with more suitable habitat, may provide minor benefits to local populations.

Special Considerations. Large blocks of foraging habitat must be conserved within the vicinity of nesting habitat. Human disturbance of nest sites should be minimized and ground squirrel control programs should be monitored to ensure impacts to burrowing owls is minimized.

Adaptive Management Program

Not applicable.

Southwestern Willow Flycatcher

Empidonax traillii extimus

USFWS: Endangered

CDFG: Endangered

MHCP: Obligate Wetlands Species

Conservation Goals

Ensure persistence within the plan area and contribute to species recovery and regional population viability. Enhance habitat quality and quantity, and increase population sizes in the plan area.

Conservation Strategy

Conserve all major populations and critical locations of southwestern willow flycatcher on the San Luis Rey River and Pilgrim Creek in Oceanside. Conserve all mature riparian forest and woodland habitat and additional willow-dominated riparian habitats. Provide appropriate upland buffers for all known populations and around potential habitat (minimum of 50 feet and up to 100 feet wide where available). Initiate cowbird trapping when warranted based on monitoring results. Facilitate coordination of local, state, and federal conservation and management actions for this species, including coordination with the species recovery plan.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions. However, coverage could be revoked in the future depending on resolution of the San Luis Rey River Flood Control Project.

Rationale. The MHCP may adequately conserve this species by conserving 100% of riparian habitat, species locations, and critical locations in the study area, and by managing the preserve system consistent with species' needs. Take of habitat within the few remaining areas of suitable riparian forest in the study area is expected to be very limited. Some potential habitat for this species is within the reach of the San Luis Rey River being planned for flood control by the Army Corps of Engineers, which is not a signatory to the MHCP. The MCHP cannot guarantee long-term conservation within this reach, where flood control actions may eliminate current or future potential habitat for the southwestern willow flycatcher.

Conditions. The following conditions must also be met by the MHCP to adequately conserve this species:

1. As part of the project review process (e.g., CEQA) for individual projects within the MHCP area, a qualified biologist possessing a Section 10(a)1(A) research permit for this species must survey all areas containing suitable habitat (riparian woodlands and forests) using approved survey protocols. Surveys shall be

- conducted when impacts could occur as a result of indirect impacts by placement of the project in or adjacent to potential habitat or through creation of suitable conditions for brown-headed cowbirds (e.g., agricultural fields, livestock presence, woodland parks, roadsides). Surveys shall occur prior to any proposed impact regardless of location inside or outside of the FPA.
2. Nesting southwestern willow flycatchers shall be treated consistent with the Critical Population Policy (Appendix D) and impacts totally avoided. Although southwestern willow flycatcher is not an MHCP Narrow Endemic, wintering localities and confirmed vagrants shall be treated consistent with the Narrow Endemic Species Policy (Appendix D), including the following: (a) maximum avoidance of impacts, to the degree feasible while maintaining reasonable use of the property; (b) for unavoidable impacts, species-specific mitigation designed to minimize adverse effects to species viability and to contribute to species recovery; and (c) no more than 5% gross cumulative loss of suitable habitat inside the FPA or 20% gross cumulative loss outside the FPA.
 3. Occupied habitat within the FPA shall be managed to restrict activities that could degrade willow flycatcher habitat, including livestock grazing, human disturbance, clearing or alteration of riparian vegetation, brown-headed cowbird parasitism, and insufficient water levels leading to loss of riparian habitat and surface water. Area-specific management directives shall include measures to provide appropriate successional habitat, cowbird control, and specific measures to protect against detrimental edge effects, and will remove invasive exotic species (e.g., *Arundo donax*). Human access to flycatcher-occupied habitat will be restricted during the breeding season (May 1-September 15) except for qualified researchers or land managers performing essential preserve management, monitoring, or research functions.
 4. Projects having direct or indirect impacts to the southwestern willow flycatcher shall adhere to the following measures to avoid or reduce impacts:
 - a) The removal of native vegetation and habitat shall be avoided and minimized to the maximum extent practicable. Determination of adequate avoidance and minimization of impacts shall be consistent with Sections 3.6 and 3.7 of the MHCP plan. Deviations from these guidelines shall require written concurrence of the USFWS and CDFG. For temporary impacts, the work site shall be returned to preexisting contours and revegetated with appropriate native species. All revegetation for temporary and permanent impacts shall occur at the ratios specified in Section 4.3 of the MHCP plan, with a minimum 3:1 ratio for creation of occupied or potential willow flycatcher habitat. Revegetation specifications shall ensure creation and restoration of riparian woodland vegetation to a quality that eventually is expected to support nesting southwestern willow flycatchers, in the opinion of experts on this species, recognizing that it may take decades to achieve this state. All revegetation plans shall be prepared and implemented consistent with Appendix C (Revegetation Guidelines) and shall require written

- concurrence of the USFWS and CDFG. If written objections are not provided by the wildlife agencies within 30 days of receipt of written request for concurrence by the local jurisdiction, then the deviation may proceed as approved by the local agency. The wildlife agencies shall provide written comments specifying wildlife agency concerns.
- b) Projects shall be carried out consistent with Appendix B (Standard Best Management Practices).
- c) Projects shall to the maximum extent practicable avoid impacts during the breeding season of the flycatcher (May 1 to September 15). Projects that cannot be conducted without placing equipment or personnel in or adjacent to sensitive habitats shall be timed to ensure that habitat is removed prior to the initiation of the breeding season.
- d) Construction noise levels at the riparian canopy edge shall be kept below 60 dBA L_{eq} (measured as equivalent sound level) from 5 a.m. to 11 a.m. during the peak nesting period of May 1 to September 15. For the balance of the day/season, the noise levels shall not exceed 60 decibels, averaged over a 1-hour period on an A-weighted decibel (dBA) (i.e., 1 hour L_{eq} /dBA). Noise levels shall be monitored, and monitoring reports shall be provided to the jurisdictional city, the USFWS, and the CDFG. Noise levels in excess of this threshold shall require written concurrence from the USFWS and CDFG within 30 days of receipt of request for written concurrence from the local jurisdiction and may require additional minimization/mitigation measures.
- e) Brown-headed cowbirds and other exotic species that prey upon the flycatcher shall be removed from the site. For new developments adjacent to preserve areas that create conditions attractive to brown-headed cowbirds, jurisdictions shall require monitoring and control of cowbirds.
- f) Biological buffers of at least 100 feet shall be maintained adjacent to occupied flycatcher habitat, measured from the outer edge of riparian vegetation. Within this 100-foot buffer, no new development shall be allowed, and the area shall be managed for natural biological values as part of the preserve system. Buffers less than 100 feet shall require written concurrence of the USFWS and CDFG within 30 days of receipt of request for written concurrence from the local jurisdiction.
5. Suitable unoccupied habitat preserved within the FPA shall be managed to maintain or mimic effects of natural fluvial processes (e.g., periodic substrate scouring and deposition).
6. Natural riparian connections with upstream riparian habitat shall be maintained to ensure linkage to suitable occupied and unoccupied habitat within the County MSCP and City of San Diego MSCP Subarea Plans.

Background

Distribution, Abundance, and Trends. The southwestern willow flycatcher is restricted to a few major river drainages in the southwestern United States. Southwestern willow flycatchers have reappeared sporadically in disjunct riparian systems in southwestern California and the lower Colorado River area. Current numbers remain significantly reduced from historical levels. Southern California's largest local population is on the south fork of the Kern River in Kern County, where numbers have slowly increased since the 1980s. Within the MHCP study area, small breeding concentrations of willow flycatchers persist along the San Luis Rey River and Pilgrim Creek in Oceanside (Unitt 1987) with scattered (probably non-breeding) observations in other riparian areas (see MHCP Database Records Map). This species is restricted to willow-dominated riparian habitats, especially areas with abundant large trees, frequently in close proximity to surface water present during June (Sanders and Fleet 1989; USFWS 1995a).

Within the MHCP area, critical locations include breeding habitats along the San Luis Rey River near and upstream from Guajome Lake and on Pilgrim Creek near Foss Lake.

Threats and Limiting Factors. The southwestern willow flycatcher has declined primarily due to loss, alteration, and degradation of riparian habitats, and brown-headed cowbird nest parasitism (Taylor and Littlefield 1986; Unitt 1987; USFWS 2001).

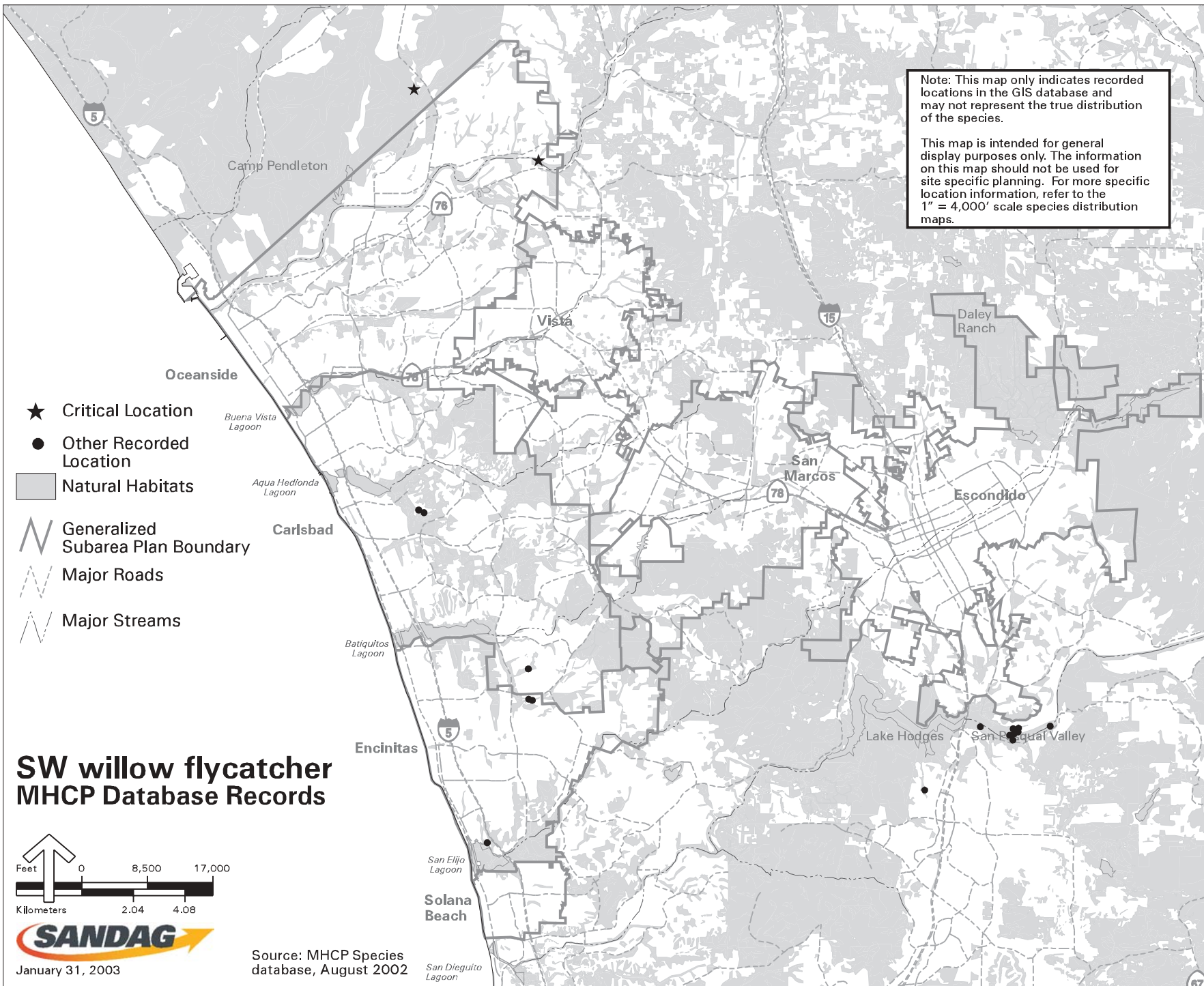
Special Considerations. Nesting sites are often near slow-moving streams, standing water, or seeps. Habitat most often used is mature, closed canopy riparian forest. Reduction or elimination of cowbirds through trapping in willow flycatcher nesting habitat may substantially benefit this species.

Conservation Analysis

Conservation and Take Levels. Due to maximum conservation of the riparian ecological community (Section 3.2), the expected level of take of this species or its habitat is very low. All riparian forest, woodland, and scrub habitat (2,664 acres), including all areas of willow-dominated riparian habitat, is expected to be 100% conserved. All major populations, critical areas, and point localities (6 of 6) will also be conserved (Table 4-52). However, some potential habitat for this species is within the reach of the San Luis Rey River being planned for flood control by the Army Corps of Engineers. The MHCP cannot guarantee long-term conservation within this reach, where flood control actions may eliminate current or future potential habitat for the southwestern willow flycatcher. Nevertheless, for purposes of this analysis, the habitat is considered conserved by MHCP and Oceanside Subarea Plan policies. The ACOE is currently designing the flood control project in consultation with USFWS and City of Oceanside. If the ultimate design results in substantial impacts to occupied southwestern willow flycatcher habitat, or to habitat otherwise considered critical to species viability in the MHCP, the species would no longer be considered adequately conserved by the MHCP or the Oceanside Subarea Plan, and any authorizations for its take granted based on this current analysis would be void.

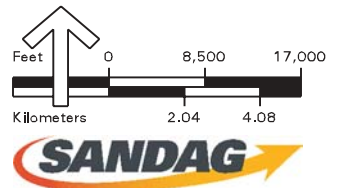
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- Generalized Subarea Plan Boundary
- Major Roads
- Major Streams

SW willow flycatcher MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

Table 4-52

**SUMMARY OF CONSERVATION FOR
SOUTHWESTERN WILLOW FLYCATCHER**

City	Habitat Acres Conserved¹	Location Points Conserved²	Major Populations Conserved	Critical Locations Conserved
Carlsbad	439 (100%)	2 (100%)	None known	None known
Encinitas	226 (100%)	3 (100%)	None known	None known
Escondido	401 (100%)	None known	None known	None known
Oceanside ³	1,085 (100%)	1 (100%)	San Luis Rey River near Guajome Lake and Pilgrim Creek near Foss Lake	San Luis Rey River near Guajome Lake and Pilgrim Creek near Foss Lake
San Marcos	109 (100%)	None known	None known	None known
Solana Beach	1 (100%)	None known	None known	None known
Vista	154 (100%)	None known	None known	None known
MHCP Total ⁴	2,414 (100%)	6 of 6 (100%)	All Major Populations conserved	All Critical Locations conserved

¹ Habitat includes riparian scrub and riparian forest vegetation communities. Willow-dominated riparian habitat is an unknown subset of these habitats that can't be quantified based on the available detail of the vegetation communities database.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Assumes maximum conservation of habitat value in the San Luis Rey River Flood Control Project area. Substantial impacts of the flood control project would require a revised analysis and may require changes to permit conditions.

⁴ Numbers may not total due to rounding.

Preserve Configuration Issues. The MHCP preserve will not affect the ability of this species to disperse relative to existing conditions. This is a migratory species with the ability to cover large distances of unsuitable habitat. During the breeding season, however, this species is primarily confined to riparian woodland and riparian willow habitats. Riparian species are especially vulnerable to edge effects due to the linear nature of riparian habitat (high edge-to-core area ratio). Therefore, substantial upland buffers should be provided wherever possible.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to maintain and possibly enhance population viability of the willow flycatcher and therefore contribute to species recovery. The MHCP preserve and policies will maintain consistency with other recovery planning and management goals for species. The MHCP will increase regional coordination and funding for monitoring and management, which may improve current management of willow flycatcher breeding habitat and species stability. However, implementation of the San Luis Rey River Flood Control Project by the ACOE, which is not a signatory to the MHCP or subarea plans, could invalidate this analysis and have significant adverse impacts to willow flycatcher population viability and recovery outside control of this plan.

Special Considerations. Due to the limited distribution of willow flycatcher habitat in the study area, habitat is vulnerable to stochastic events such as fire or flooding, which could degrade habitat. Management should maintain a diversity of age structures, and especially abundant mature trees for this species.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Conduct studies of local habitat use and preferences by willow flycatcher.
2. Conduct studies of demography and dispersal, and identify sensitive stages of life history/annual cycle.

Least Bell's Vireo*Vireo bellii pusillus***USFWS: Endangered****CDFG: Endangered****MHCP: Obligate Wetlands Species****Conservation Goals**

Ensure species persistence in the plan area and contribute to species recovery. Improve habitat quality and increase species abundance to contribute to regional population viability.

Conservation Strategy

Conserve existing major populations and critical locations of least Bell's vireo and additional willow-mulefat-dominated riparian habitats on the San Luis Rey River and Pilgrim Creek in Oceanside. Enhance potential habitat within the preserve through increased protection and restoration. Provide appropriate upland buffers for all known major populations and potential habitat (minimum of 50 feet and up to 100 feet wide where available). Control cowbirds when necessary to minimize nest parasitism. Facilitate coordination of local, state, and federal conservation and management actions for this species, including coordination with the USFWS least Bell's vireo endangered species recovery plan.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions. However, coverage could be revoked depending on resolution of the San Luis Rey River Flood Control Project.

Rationale. The MHCP is expected to adequately conserve this species by conserving 100% of riparian habitat (under the MHCP no net loss policy for wetland vegetation), 85% of known species locations, and 93% of species locations within the BCLA. However, the MHCP cities cannot guarantee that these conservation levels will actually be achieved in the long term, because much of the highest quality habitat, including much of the one large critical population area for this species, are within a reach of the San Luis Rey River that is being planned for flood control by the Army Corps of Engineers, which is not a signatory to the MHCP. Under current plans, the flood control project would adversely affect a large proportion of the habitat, species population, and critical location, although no ultimate design has yet been decided upon.

Conditions. The following conditions must be met by the MHCP to adequately conserve this species:

1. As part of the project review process (e.g., CEQA) for individual projects within the MHCP area, a qualified biologist possessing a Section 10(a)1(A) research

- permit for this species must survey all areas containing potentially suitable habitat (riparian vegetation communities) using approved survey protocols. Surveys shall occur prior to any proposed impact regardless of location inside or outside of the FPA. Surveys shall be conducted when impacts could occur as a result of indirect impacts by placement of the project in or adjacent to suitable habitat or through creation of suitable conditions for brown-headed cowbirds (e.g., agricultural fields, livestock presence, woodland parks, and roadsides).
2. Any take, both inside and outside of the FPA, shall be consistent with the conditions outlined herein. Projects that impact least Bell's vireo populations outside the FPA shall be required to ensure sufficient management to maintain these populations.
 3. Occupied habitat within the FPA shall be managed to restrict activities that could degrade least Bell's vireo habitat, including livestock grazing, human disturbance, clearing or alteration of riparian vegetation, brown-headed cowbird parasitism, and insufficient water levels leading to loss of riparian habitat and surface water. Area-specific management directives shall include measures to provide appropriate successional habitat, cowbird control, and specific measures to protect against detrimental edge effects, and will remove invasive exotic species (e.g., *Arundo donax*). Initiate cowbird trapping when cowbird parasitism rates exceed 10% or as recommended by monitoring results. Restrict human access to vireo-occupied habitat during the breeding season (March 15 to September 15) except for qualified researchers or land managers performing essential preserve management, monitoring, or research functions.
 4. Projects having direct or indirect impacts to the least Bell's vireo within the MHCP planning area shall adhere to the following measures to avoid or reduce impacts:
 - a) The removal of native vegetation and habitat shall be avoided and minimized to the maximum extent practicable. Determination of adequate avoidance and minimization of impacts shall be consistent with Sections 3.6 and 3.7 of the MHCP plan. Deviations from these guidelines shall require written concurrence of the USFWS and CDFG. For temporary impacts, the work site shall be returned to preexisting contours and revegetated with appropriate native species. All revegetation for temporary and permanent impacts shall occur at the ratios specified in Section 4.3 of the MHCP plan, with a minimum 3:1 ratio for recreation of occupied or potential vireo habitat. Revegetation specifications shall ensure creation and restoration of riparian woodland vegetation to vireo quality. All revegetation plans shall be prepared and implemented consistent with Appendix C (Revegetation Guidelines) and shall require written concurrence of the USFWS and CDFG. If written objections are not provided by the wildlife agencies within 30 days of receipt of written request for concurrence by the local jurisdiction, then the deviation may proceed as approved by the local agency. The

- wildlife agencies shall provide written comments specifying wildlife agency concerns.
- b) Projects shall be carried out consistent with Appendix B (Standard Best Management Practices).
 - c) Projects shall to the maximum extent practicable avoid impacts during the breeding season of the least Bell's vireo (generally March 15 - September 15). Projects that cannot be conducted without placing equipment or personnel in or adjacent to sensitive habitats shall be timed to ensure that habitat is removed prior to the initiation of the breeding season (generally before March 15).
 - d) Construction noise levels at the riparian canopy edge shall be kept below 60 dBA L_{eq} (Measured as Equivalent Sound Level) from 5 a.m. to 11 a.m. during the peak nesting period of March 15 to July 15. For the balance of the day/season, the noise levels shall not exceed 60 decibels, averaged over a 1-hour period on an A-weighted decibel (dBA) (i.e., 1 hour L_{eq} /dBA). Noise levels shall be monitored and monitoring reports shall be provided to the jurisdictional city, the USFWS, and the CDFG. Noise levels in excess of this threshold shall require written concurrence from the USFWS and CDFG and may require additional minimization/mitigation measures.
 - e) Brown-headed cowbirds and other exotic species detrimental to least Bell's vireo shall be removed from the site. For new developments adjacent to preserve areas that create conditions attractive to brown-headed cowbirds, jurisdictions shall require monitoring and control of cowbirds.
 - f) Biological buffers of at least 100 feet shall be maintained adjacent to occupied least Bell's vireo habitat, measured from the outer edge of riparian vegetation. Within this 100-foot buffer, no new development shall be allowed, and the area shall be managed for natural biological values as part of the preserve system. Buffers less than 100 feet shall require written concurrence of the USFWS and CDFG within 30 days of receipt of written request for concurrence by the local jurisdiction.
5. Suitable unoccupied habitat preserved within the FPA shall be managed to maintain or mimic effects of natural fluvial processes (e.g., periodic substrate scouring and deposition).
 6. Natural riparian connections with upstream riparian habitat shall be maintained to ensure linkage to suitable occupied and unoccupied habitat within the County MSCP and City of San Diego MSCP Subarea Plans.

Background

Distribution, Abundance, and Trends. The least Bell's vireo is restricted to willow mulefat-dominated riparian woodlands in southern California, with the majority of breeding pairs in San Diego, Santa Barbara, and Riverside counties. Major vireo populations are currently on six rivers in San Diego County: Tijuana, Sweetwater, San Diego, Santa Ysabel Creek, San Luis Rey River/Pilgrim Creek, and Santa Margarita. Of these, only Oceanside's San Luis Rey River/Pilgrim Creek population is within the MHCP area. This population is considered a major population and a critical location. Smaller populations occur on other drainages throughout the plan area (see MHCP Database Records Map). The regional population increased from 300 pairs in 1986 to 1,500 pairs in 1996, primarily due to the management of local cowbird populations (Kus 1997).

Threats and Limiting Factors. The least Bell's vireo is endangered due to loss, degradation, and fragmentation of willow-mulefat-dominated riparian habitat. This species is also vulnerable to brown-headed cowbird parasitism (Kus 1991a; 1991b; 1992a; 1992b).

Special Considerations: Least Bell's vireos tend to prefer semi-open riparian woodlands with dense shrub understory. Reduction or elimination of cowbirds in least Bell's vireo nesting habitat appears to substantially benefit this species. Excessive noise (>62 dBA) during the nesting season may interfere with territorial behaviors and reduce reproductive success (P. Mock personal communication).

Conservation Analysis

Conservation and Take Levels. Due to maximum conservation of the riparian ecological community (Section 3.2), the expected level of take of this species or its habitat is very low. All riparian forest, riparian woodland, and riparian scrub habitat (2,665 acres), including all areas of willow-mulefat-dominated riparian habitat, is 100% conserved. The San Luis Rey River/Pilgrim Creek population and most point localities (154 of 181 or 85%) will be conserved within the FPA (Table 4-53). However, some potential habitat is within the reach of the San Luis Rey River being planned for flood control by the Army Corps of Engineers. The MCHP cannot guarantee long-term conservation within this reach, where flood control actions may eliminate current or future potential habitat for the least Bell's vireo. Nevertheless, for purposes of this analysis, the habitat is considered conserved by MHCP and Oceanside Subarea Plan policies. The ACOE is currently designing the flood control project in consultation with USFWS and City of Oceanside. If the ultimate design results in substantial impacts to occupied vireo habitat, or to habitat otherwise considered critical to species viability in the MHCP, the species would no longer be considered adequately conserved by the MHCP or the Oceanside Subarea Plan, and any authorizations for its take granted based on this current analysis would be void.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.

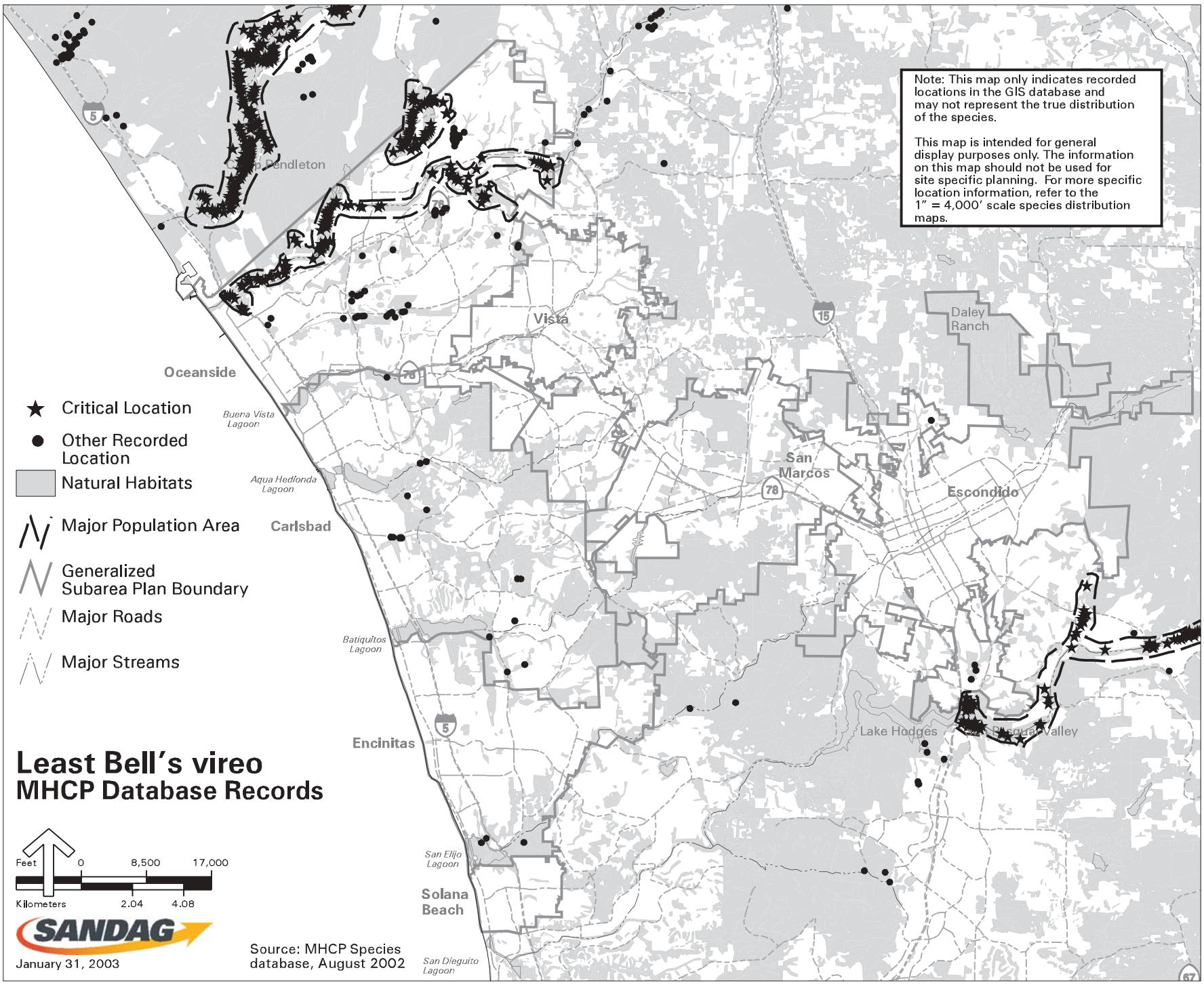


Table 4-53

**SUMMARY OF CONSERVATION FOR
LEAST BELL'S VIREO**

City	Habitat Acres Conserved ¹	Location		
		Points Conserved ²	Major Populations Conserved	Critical Locations Conserved
Carlsbad	459 (100%)	9 of 12 (75%)	None known	None known
Encinitas	274 (100%)	3 of 3 (100%)	None known	None known
Escondido	401 (100%)	2 of 4 (50%)	None known	None known
Oceanside ³	1,088 (100%)	139 of 161 (86%)	San Luis Rey River/Pilgrim Creek	San Luis Rey River/ Pilgrim Creek
San Marcos	186 (100%)	None known	None known	None known
Solana Beach	1 (100%)	None known	None known	None known
Vista	255 (100%)	1 of 1 (100%)	None known	None known
MHCP Total ⁴	2,664 (100%)	154 of 181 (85%)	All Major Populations conserved	All Critical Locations conserved

¹ Habitat includes riparian scrub, riparian woodland, and riparian forest vegetation communities. Willow mulefat-dominated riparian habitat is an unknown subset of these habitats that can't be quantified based on the available detail of the vegetation communities database.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Assumes maximum conservation of habitat value in the San Luis Rey River Flood Control Project area. Substantial impacts of the flood control project would require a revised analysis and may require changes to permit conditions.

⁴ Numbers may not total due to rounding.

Preserve Configuration Issues. The MHCP preserve will not affect the ability of this species to disperse relative to existing conditions. This is a migratory species with the ability to cover large distances of unsuitable habitat. During the breeding season, however, this species is primarily confined to the willow mulefat-dominated riparian habitat. Riparian species are especially vulnerable to edge effects due to the linear nature of riparian habitat (high edge-to-core area ratio). Therefore, substantial upland buffers should be provided wherever possible.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to maintain and possibly enhance population viability of the least Bell's vireo and therefore contribute to species recovery. The MHCP preserve and policies will maintain consistency with other recovery planning and management goals for the species. The MHCP will increase regional coordination and funding for monitoring and management, which may improve current management of vireo breeding habitat and species stability. However, implementation of the San Luis Rey River Flood Control Project by the ACOE, which is not a signatory to the MHCP or subarea plans, could invalidate this analysis and have significant adverse impacts to vireo population viability and recovery outside control of this plan.

Special Considerations. Due to similar habitat requirements, management for least Bell's vireo will also benefit the yellow-breasted chat, southwestern willow flycatcher, and other riparian birds.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. None identified.

Coastal Cactus Wren

Campylorhynchus brunneicapillus cousei

USFWS: Federal Species of Special Concern (former Category 2 Candidate)

CDFG: Species of Special Concern, NCCP Focal Species

MHCP: Narrow Endemic Species

Conservation Goals

Ensure species persistence within the plan area. Maintain connectivity for dispersal between MHCP populations and populations outside the plan area. Contribute to the regional viability and recovery of the species.

Conservation Strategy

Conserve existing major populations and critical locations of coastal cactus wren and all coastal sage scrub habitat with patches of tall cactus. Create or enhance additional habitat to increase regional population size and extent. Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. Assuming strict application of the Narrow Endemic policy and Critical Location policy, the MHCP is expected to adequately conserve this species by conserving at least 95% of current carrying capacity for the species in the critical locations in south Escondido (within hardline reserves and pursuant to the Narrow Endemics Policy outside hardline reserves) and by managing preserve areas consistent with species' needs. The MHCP will conserve about 99% location points in the study area (34 of 34 location points are within the FPA).

Conditions. The following conditions must be met by the MHCP to adequately conserve this species:

1. Ensure conservation of critical cactus wren locations near the San Pasqual Valley consistent with the Narrow Endemic and Critical Location policies, including (a) maximum avoidance of impacts, to the degree feasible while maintaining reasonable use of the property; (b) for unavoidable impacts, implement species-specific mitigation designed to minimize adverse effects to species viability and to contribute to species recovery; and (c) allow no more than 5% gross cumulative loss of cactus wren habitat and population size inside the FPA or 20% gross cumulative loss outside the FPA.
2. Initiate a cactus wren habitat enhancement/creation program in disturbed habitat areas adjacent to conserved coastal cactus wren-occupied habitat. Mitigation for any take within occupied cactus wren habitat must include habitat creation at a

- minimum 2:1 ratio, by planting or transplanting of appropriate native cactus in areas of suitable soils, vegetation, and topography (especially on south and west-facing slopes). Preference should be for expanding existing habitat areas or adding satellite areas in close proximity to existing occupied habitats.
3. Prohibit development or other human disturbance adjacent to occupied habitat and maintain a minimum 300-foot biological buffer around nests to the degree feasible. Prohibit activity within occupied habitat from February 15 through August 15.
 4. Implement a fire management program to minimize and control wildfires that may destroy large cactus within suitable habitat areas. In the event of a fire or other event that kills or reduces vigor of cactus in existing habitats, adaptive management shall include planting or transplanting of large cactus into these or other nearby areas to offset the reduction in habitat value.

Background

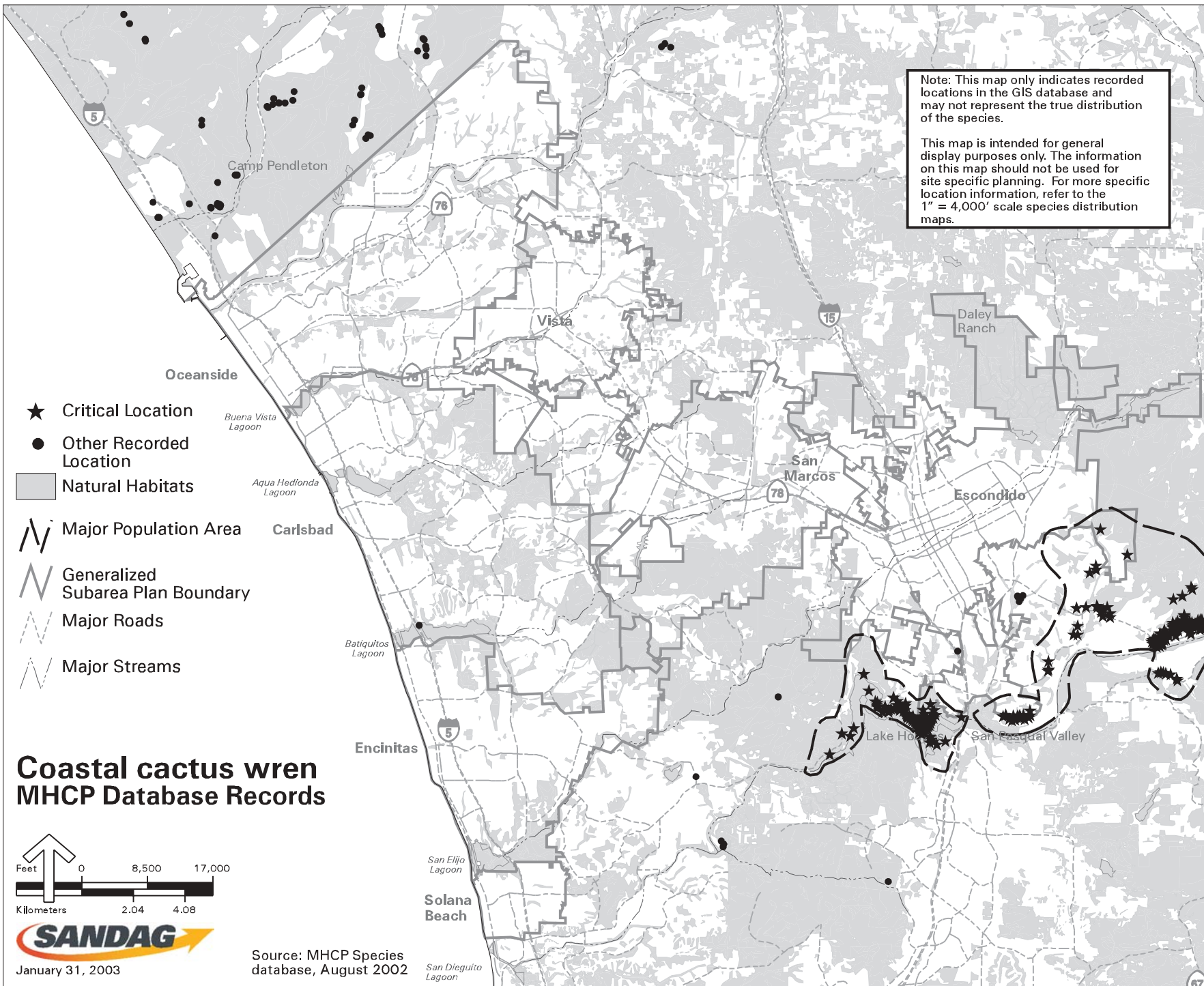
Distribution, Abundance, and Trends. The coastal cactus wren occurs in the coastal plain counties of southern California, with the largest remaining contiguous populations in southern Orange County (Spencer et al. 2001b). This subspecies has a highly disjunct distribution within San Diego County with fragmented populations in five primary areas (Camp Pendleton, Lake Hodges/Wild Animal Park, Santee/Lake Jennings, Sweetwater River, and Otay River/Otay Mesa). The San Diego County population is estimated to be less than 300 pairs (Rea and Weaver 1990; Ogden 1993). Within the MHCP study area, a major population occurs in San Pasqual Valley and extends west along the slopes above Lake Hodges in Escondido (see MHCP Database Records Map). Another isolated observation site, on the north shore of Batiquitos Lagoon, is no longer extant. The coastal cactus wren is a narrow endemic species that relies on patches of tall cactus for nest sites. Suitable habitat is limited in the MHCP area due to the lack of stands of tall cactus within the remaining coastal sage scrub habitat. The area of suitable habitat in Escondido along San Pasqual Valley and Lake Hodges is large enough to support a substantial number of cactus wren pairs. This area is considered a major population and a critical location within the MHCP.

Threats and Limiting Factors. The coastal cactus wren is declining due to loss, degradation, and fragmentation of coastal sage scrub habitat containing cactus (Rea and Weaver 1990; Ogden 1993). Unnaturally frequent fires eliminate cactus and have greatly reduced cactus wren populations on Camp Pendleton and other areas (Rea and Weaver 1990, Harper and Salata 1991, Bontrager et al. 1995).

Special Considerations. This species nests only in tall (≥ 3 feet) cactus patches. Unoccupied suitable habitat may be recolonized in future years; therefore, all suitable habitat within the MHCP should be conserved according to the MHCP narrow endemic policy. Frequent wildfires kill the cactus that this species depend upon, and it may take many decades for suitable habitat to recover naturally.

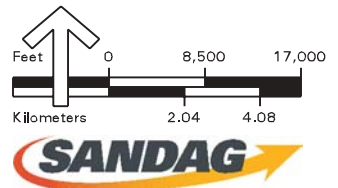
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- ▭ Major Population Area
- ▭ Generalized Subarea Plan Boundary
- ▭ Major Roads
- ▭ Major Streams

Coastal cactus wren MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Dieguito Lagoon

Conservation Analysis

Conservation and Take Levels. The cactus wren is a narrow endemic species that relies on specific localized habitat characteristics (i.e., tall patches of cactus). The MHCP vegetation database does not identify patches of tall cactus, and very little of the coastal sage scrub habitat within the MHCP contains large patches of tall cactus. Therefore, acreages of coastal sage scrub habitat are not an accurate representation of cactus wren habitat within the MHCP and is not quantified here.

The MHCP narrow endemic policy requires that cactus wren localities and suitable habitat are 95% (softline) to 100% (hardline) conserved inside the FPA, and 80% conserved outside the FPA. All 34 point localities are within the FPA. These points correspond with the only major populations and critical habitat locations in the MHCP and occur primarily on south-facing slopes on the north side of the San Pasqual Valley (south Escondido). The habitat in these critical locations is partially within softline areas (at 75% habitat conservation) and partially in hardline areas (at 100% conservation). Therefore, according to the narrow endemic policy, all points and habitat here are assumed to be conserved at 95% to 100% (with an overall estimate of 99%). Achieving this goal will require careful project design on the softline (75%) FPA areas to minimize impacts to occupied habitat.

Preserve Configuration Issues. The MHCP preserve will not reduce the ability of this species to disperse relative to existing conditions. The major population in the San Pasqual Valley and along Lake Hodges is only partially within the MHCP study area. Conservation of the MHCP portion of this population is critical to the viability of the remainder of the population outside the study area. The majority of the population outside the MHCP is conserved within the MSCP preserve. Any management actions implemented within the MHCP that would decrease the current fragmentation of this habitat and increase habitat area and connectivity (i.e., restoration of tall cactus patches) would benefit the species and contribute to population recovery. Abiding by the Narrow Endemic and Critical Location policies within softline FPA areas will require careful project design to minimize impacts and edge effects.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to maintain and possibly enhance population viability of the coastal cactus wren and therefore contribute to species recovery due to maximum conservation of the major and critical locations. The MHCP preserve and policies will maintain consistency with other recovery planning and management goals for the species. The MHCP will increase regional coordination and funding for monitoring and management, which may improve current management of cactus wren habitat and species stability.

Special Considerations. As a result of its small population size and fragmented distribution, the coastal cactus wren is extremely vulnerable to chance events, including environmental stochasticity (e.g., extended periods of drought), demographic stochasticity (e.g., skewed sex ratio and lack of suitable mates), genetic stochasticity (e.g., loss of heterozygosity resulting in increased genetic disorders and decreased

evolutionary adaptability), and catastrophes (e.g., major wildfires). Active adaptive management and close monitoring is required to identify and respond to these potential impacts as quickly as possible. Their dispersal abilities should allow cactus wrens to colonize created habitat areas across other natural habitats but they probably will not colonize across urban areas. It takes many decades for cactus to achieve the size and density required for optimal habitat condition, so wildfire that kills mature cactus can have long-term detrimental effects on local populations.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Relocate cactus wren individuals from populations deemed not viable to the nearest viable population to retain maximum genetic diversity within the conserved regional population.
2. Conduct a management program to “seed” newly created habitat with juvenile cactus wrens of known genetic origin.
3. Monitor the demographics and population genetics of conserved cactus wren populations with the objective of evaluating population viability.
4. Determine the importance of fire or mechanical disturbance to the distribution of *Opuntia* patches.

Coastal California Gnatcatcher

Polioptila californica californica

USFWS: Threatened

CDFG: Species of Special Concern

Conservation Goals

Ensure species persistence within the plan area and contribute to regional metapopulation viability and species recovery by ensuring genetic and demographic connectivity across the plan area.

Conservation Strategy

Conserve and manage sufficient breeding habitat in large, contiguous patches, and sufficient habitat linkages and dispersal stepping stones between breeding areas to ensure species persistence within the plan area and to maintain genetic and demographic connectivity between larger core breeding habitats north and south of the plan area. Restore degraded and disturbed areas to gnatcatcher habitat where necessary to increase size of breeding populations and functionality of linkages.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP will adequately conserve this species via the following minimum estimates of conservation expected under the plan (note that some additional but unquantified conservation is also expected to occur via the project design and approval processes mandated by city subarea plans). These projected minimum conservation estimates are hereby also incorporated as permit conditions for the California gnatcatcher:

1. Conserve at least 5,580 acres (61%) of the extant coastal scrub (including coastal sage scrub, maritime succulent scrub, coastal bluff scrub, and mixed coastal sage scrub/chaparral vegetation communities) within the MHCP plan area.
2. Conserve at least 55% (2,780 acres) of the remaining high-value breeding habitat and 60% (963 acres) of the remaining moderate-value breeding habitat in the MHCP plan area, as determined using the MHCP habitat suitability model.
3. Conserve at least 68% (5,185 acres) of the coastal scrub that lies within the BCLA, and conserve at least 64% of the high-value breeding habitat (2,551 acres) and 78% of the moderate-value breeding habitat (891 acres) that lies within the BCLA.
4. Conserve at least 62% of known gnatcatcher localities (333 of 539 points), including 69% of the locations within the BCLA (295 of 431 points).

5. Restore and enhance at least 338 acres of coastal sage scrub in critical locations to increase breeding habitat and improve functionality of a “stepping-stone” linkage through the MHCP plan area.
6. Conserve 400 to 500 acres of core gnatcatcher breeding habitat in the unincorporated area southeast of the MHCP plan area, but contiguous with and contributing to the stepping-stone corridor across the plan area. The gross acreage conserved may be larger than this to include 400 to 500 acres of gnatcatcher breeding habitat. The core area must be capable of supporting at least 16 to 23 pairs of breeding gnatcatchers during good years, as determined by appropriate habitat evaluations and verified by future monitoring.

Additional Conditions. In addition to the above-listed minimum conservation levels that are ensured within the FPA, all of the following conditions must be met by the MHCP and by individual cities for the California gnatcatcher to be adequately conserved. See city subarea plans for more specific conditions that may apply. Where subarea conditions differ from these MHCP conditions, the subarea plan conditions shall have precedence.

1. Implement an adaptive management program to comprehensively monitor and manage gnatcatcher habitat and populations throughout the preserve system. Increased coordination of monitoring and management may improve knowledge of species’ requirements and habitat quality in the study area.
2. Take of occupied gnatcatcher habitat must be mitigated according to approved MHCP (Volume I, Section 4.3) or subarea plan ratios using one or more of the following measures: (a) conservation of occupied gnatcatcher habitat inside the BCLA or in the unincorporated core area; (b) conservation of linkage areas identified by the MHCP as critical to regional gnatcatcher population connectivity (whether or not such areas are currently occupied by gnatcatchers or vegetated with coastal sage scrub); or (c) restoration of gnatcatcher habitat within critical breeding or linkage areas identified by the MHCP.
3. *Carlsbad*—Abide by all specific conditions and standards listed in the Carlsbad HMP, including core area contributions, restoration obligations, reserve configuration standards, and mitigation obligations. Ensure continued functionality of the gnatcatcher stepping-stone linkage across the city, and especially at its boundaries with adjoining cities.
4. *Encinitas*—Ensure at least 67% conservation of coastal sage scrub within the city’s sphere of influence via conservation standards to apply when properties are proposed for annexation to the city. Standards must ensure that the conserved areas are contiguous and contribute substantially to the gnatcatcher core area and preserve design.
5. *Escondido*—Mitigate take of occupied gnatcatcher habitat by conservation of occupied gnatcatcher habitat elsewhere within the city (e.g., in or adjacent to the

San Pasqual Valley), elsewhere within the MHCP plan area, or within the unincorporated core area.

6. *Oceanside*—Conserve at least 664 acres of existing coastal sage scrub in the city, and restore or enhance at least 164 additional acres of coastal sage scrub. Within the city’s designated Wildlife Corridor Planning Zone, conserve at least 480 acres of biological open space in a configuration that accommodates continued movement by California gnatcatchers between State Route 78 and the San Luis Rey River. Of this 480-acre total, conserve at least 210 acres of existing gnatcatcher breeding habitat (coastal sage scrub), and increase the net amount of viable breeding habitat within the zone by at least 145 acres through restoration of disturbed, developed, or annual grassland habitats to coastal sage scrub in key locations (Note: Acreages conserved and restored within the Wildlife Corridor Planning Zone count towards the 664 total coastal sage scrub and 164 total restoration acreage requirements for the city.) Conserve 120 acres of contiguous biological open space on the western portion of the city-owned El Corazon property, including at least 45 acres west of the San Diego Gas and Electric transmission easement and 75 acres along Garrison Creek on the northern portion of the property, as detailed in the Oceanside Subarea Plan.
7. *San Marcos*—Maintain an average minimum width of 1,000 feet for the linkage across southwest San Marcos (University Commons area) between the unincorporated core area and east Carlsbad. Restore or enhance at least 30 acres of high quality coastal sage scrub (not including restoration requirements for the San Marcos Landfill) in the southwestern portion of the city to increase habitat contiguity for gnatcatcher breeding and dispersal. (Note: The County of San Diego must restore an additional 79.3 acres on the San Marcos Landfill, but this is not considered an obligation of the City of San Marcos or the MHCP.)
8. *Solana Beach*—No specific conditions.
9. *Vista*—Conserve at least 67% of coastal sage scrub within the BCLA.

Background

Distribution, Abundance, and Trends. The coastal California gnatcatcher is restricted to the coastal slopes of southern California, from Los Angeles County south to El Rosario, Baja California, Mexico. It is closely associated with coastal sage scrub vegetation, particularly Diegan coastal sage scrub occurring on gentle slopes within the maritime and coastal climate zones. In San Diego and Orange counties, the California gnatcatcher occurs most commonly in coastal sage scrub vegetation with high proportions of *Artemisia californica* and *Eriogonum fasciculatum* and less commonly in subassociations dominated by *Salvia mellifera* or *Rhus integrifolia* (Atwood 1980, 1990; Mock and Jones 1990; Bontrager 1991; Weaver 1998); however, in some portions of the gnatcatcher’s range (e.g., western Riverside County) this pattern may be less pronounced (Braden In Press). Atwood et al. (2002) found, in a study on Marine Corps Base Camp Pendleton,

that gnatcatcher populations reach their highest nesting densities, and persist best during population crashes, in areas not burned for 20 years or more.

Regional Population Estimates and Trends. Atwood (1990, 1992b) estimated that approximately 1,811 to 2,291 pairs of coastal California gnatcatchers remained in southern California. Of these, 24 to 30 pairs were estimated in Los Angeles County, 224 to 294 pairs in Orange County, 724 to 916 pairs in Riverside County, and 837 to 1,061 pairs in San Diego County. Michael Brandman Associates (MBA 1991) estimated that 1,645 to 1,880 pairs of California gnatcatchers occurred in the United States (20 to 30 pairs in Los Angeles County, 325 to 350 pairs in Orange County, 300 to 400 pairs in Riverside County, and 1,000 to 1,100 pairs in San Diego County).

Based on later information, the USFWS (1993b) estimated that about 2,562 pairs of coastal California gnatcatchers remained in the United States. Of these, 30 pairs were estimated in Los Angeles County, 757 pairs in Orange County, 261 pairs in Riverside County, and 1,514 pairs in San Diego County. Ogden (1993) estimated there were a minimum of 900 pairs of gnatcatchers in the MSCP plan area of southwestern San Diego County. Approximately 2,800 pairs of *P. c. californica* are estimated to occur in the Mexican portion of the subspecies' range (J. Newman personal communication 1992).

It should be noted that the above estimates for gnatcatcher abundance in California (roughly 1,800 to 2,500 pairs, with 1,000 to 1,500 pairs in San Diego County) were made during the early 1990s, following a period of extended drought in southern California. Results of more recent (late 1990s) surveys suggest that gnatcatcher populations may have increased following relaxation of the drought. For example, the MHCP database contained 3 or 4 gnatcatcher location points on or near the Carlsbad Municipal Golf Course property in central Carlsbad based on surveys during drought years; but surveys in 1998 documented 17 locations there (Merkel & Associates 1998).

MHCP Population Estimate. We tentatively estimate the gnatcatcher population within the MHCP study area at 400 to 600 pairs. The MHCP database (May 1999 update) currently includes 539 point locality records in the MHCP cities. This represents a significant increase over the previous number of records included in the Public Review Draft MHCP (378 points), largely due to incorporating new records from the San Diego Bird Atlas project. The Bird Atlas data are less spatially biased than other survey data (e.g., from CEQA reports), which tend to disproportionately cover properties proposed for development. Therefore, the current MHCP database represents a reasonably complete and unbiased overview of species distribution in the study area. However, because the database includes records from multiple years (with newer observations within 200 feet of existing points not counted as additional locations), the number of location points does not necessarily represent population size in any given year and could potentially overestimate abundance in local areas. On the other hand, not all areas have been thoroughly surveyed, so counting points in the database could underestimate population sizes in particular areas. Inspection of the overall distribution of gnatcatcher database points throughout the study area, the density of points in well surveyed areas, and the overall high level of survey coverage in the MHCP cities suggest that roughly

400 occupied gnatcatcher locations represent a reasonable, minimum gross estimate of gnatcatcher pairs in the MHCP plan area in an “average” year, and that about 600 or more pairs could occupy the MHCP plan area in an optimal year (see *MHCP Carrying Capacity Estimate*, below).

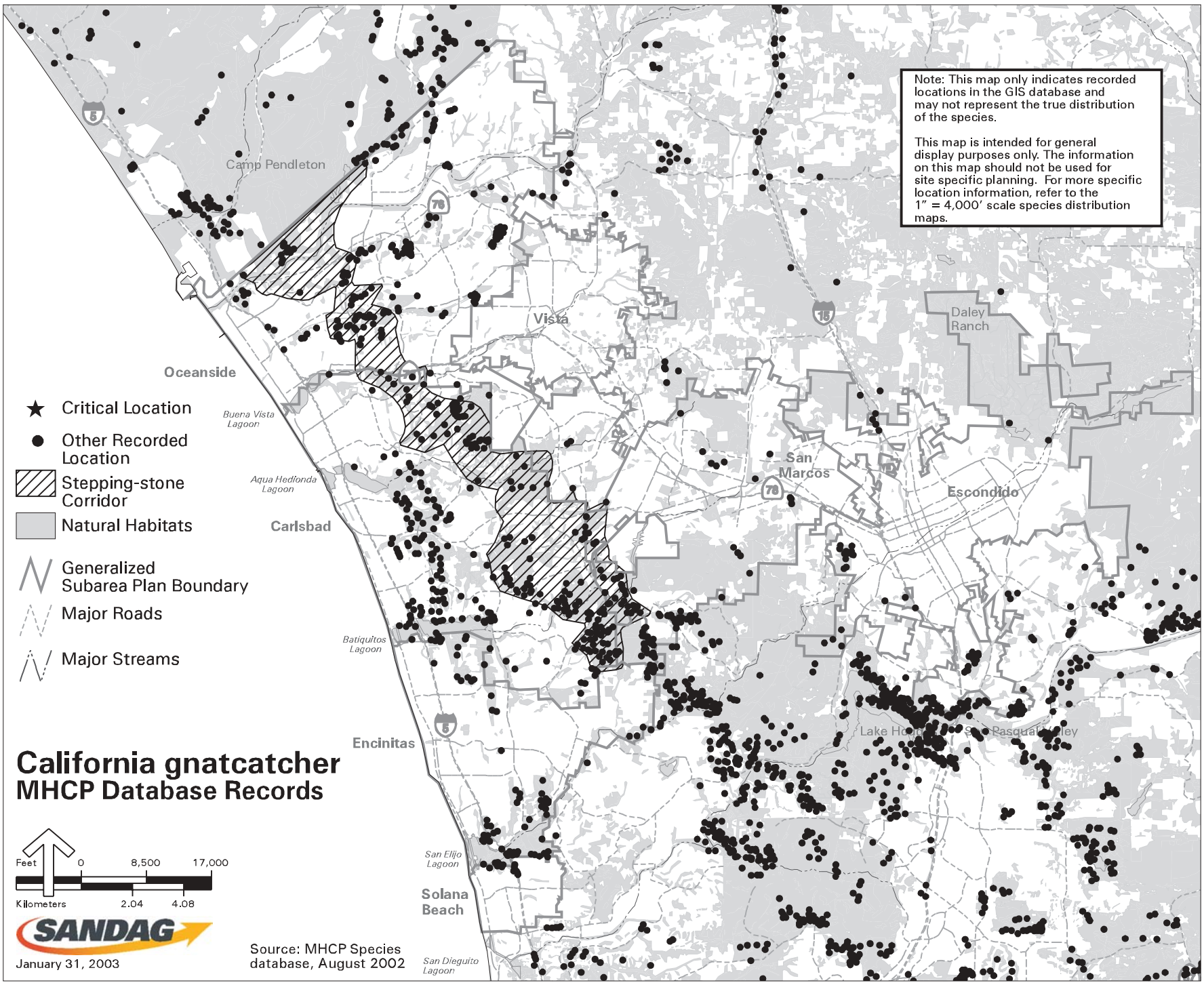
Significant concentrations of gnatcatchers are found throughout Carlsbad, southwest San Marcos, and Oceanside, with lesser concentrations in portions of Escondido, Vista, and Encinitas (see MHCP Database Records Map). Within Carlsbad, major populations are found in the La Costa area in the southeast, the Carlsbad Municipal Golf Course/Macario Canyon area in central Carlsbad, and the Holly Springs/Calavera area in the northeast. A fair number of gnatcatcher locations are also associated with scattered coastal sage scrub patches in the northern portion of Carlsbad near Buena Vista Creek, central Carlsbad between Palomar Airport Road and Batiquitos Lagoon, and the Fieldstone Northwest/Rancho Carillo area of east-central Carlsbad. In Oceanside, concentrations of gnatcatchers are found throughout the northern and central portions of the city, with a surprising density of gnatcatchers occurring on relatively small (less than 50-acre) patches of coastal sage scrub throughout the city. In San Marcos, gnatcatchers are concentrated in the southwestern-most portion of the city (University Commons area), with a scattering of locations elsewhere. Smaller concentrations of gnatcatchers are also found in south Escondido (Bernardo Mountain, San Pasqual Valley, Kit Carson Park, and Quail Hills areas).

Critical population locations include the Calavera Lake/Calavera Highlands area (northeast Carlsbad), the La Costa/University Commons area (southeast Carlsbad/southwest San Marcos), and north Oceanside adjacent to Camp Pendleton. Critical linkage areas include the regional stepping-stone corridor through Oceanside, east Carlsbad, and southwest San Marcos.

MHCP Carrying Capacity Estimate. Gnatcatcher survey coverage is variable within the MHCP study area, which may lead to biased estimates of the level of conservation and take that would result under the plan. In an attempt to correct for this bias, we used a modeling approach to derive an alternative measure based on the concept of population carrying capacity (K). We estimated local K values based on results of the MHCP gnatcatcher habitat evaluation model (Appendix A) and other empirical data. Although tentative, the results provide an additional measure for assessing preserve viability and the level of gnatcatcher conservation and take that avoids the biases due to differing survey intensities. However, these results should be used with caution, for their intended purpose only, which is to provide a relative and supplementary evaluation of the overall level of conservation and take expected under the plan. The results do not provide an absolute prediction of how many gnatcatchers the MHCP can or will support now or in the future.

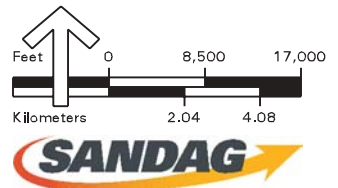
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- ▨ Stepping-stone Corridor
- Natural Habitats
- Generalized Subarea Plan Boundary
- Major Roads
- Major Streams

California gnatcatcher MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

K is generally defined as the maximum density of individuals (or pairs) that an area can sustain through all life stages under optimal environmental conditions—or more simply, the number of individuals that the resources in an area can support (Ricklefs 1979). Because resource levels can vary in complex ways over time and space, K should be viewed as a theoretical number, which may never be reached by a population in nature. This is especially true for a species like the gnatcatcher, which lives in a metapopulation with complex dynamics and influences. Gnatcatcher populations may fluctuate regionally due, for example, to changing weather patterns (Erickson and Miner 1998; Mock 1998). Local populations may also fluctuate asynchronously due to local effects of fires, storms, vegetation succession, predator abundance, and other stochastic or chaotic processes (e.g., see Atwood et al. 1998). Consequently, K may never be reached or empirically measurable for a metapopulation or large region; it can only be estimated using localized sampling extrapolated using theoretical models and assumptions.

Atwood (unpublished manuscript) reviewed a number of approaches for estimating K for the gnatcatcher. We selected a method most appropriate given the available data on gnatcatcher populations in the MHCP study area. We first used the habitat evaluation model results and climate zones to define six categories of gnatcatcher habitat (high, medium, and low quality habitat within the coastal and transitional climate zones, where the coastal climate zone extends approximately 10 miles from the Pacific coast and the transitional climate zone extends inland from the coastal zone to beyond the eastern boundary of the MHCP plan area). We then fitted these six habitat categories with empirically measured gnatcatcher densities that we felt adequately represented minimum local estimates of K. To estimate K, we identified 19 areas of relatively contiguous coastal sage scrub distributed throughout northern San Diego County where thorough (USFWS protocol) gnatcatcher surveys had been conducted in recent years and where the density of gnatcatcher localities appeared saturated (e.g., location points were well and evenly distributed throughout all suitable habitat). To minimize biases due to having one or a few territories constrained to fit tiny fragments of habitat, we only used patches larger than 50 acres or supporting more than 6 pairs for this calculation. We assumed that these well-saturated distributions indicated that all suitable habitat was occupied (i.e., territories were “packed”) and that the densities therefore represented approximate, minimum, local estimates of K.

We then correlated these local density estimates with results of the gnatcatcher habitat evaluation model for predicted high, medium, and low quality habitat in both the coastal and transitional climate zones. Based on these results we assigned each value class with an approximate density value at population saturation (i.e., expected average population density within a habitat class when the population is at K; Table 4-54). High habitat value densities in the coastal zone were the most variable, with roughly one pair of gnatcatchers per every 7.5 to 10 acres of high value habitat. Predicted gnatcatcher densities decrease from the coastal zone to the transitional zone over all habitat-value classes, and densities decrease from high to low value within a zone (Table 4-54). Please note that these are not absolute predictions of K in any habitat, but provide relative measures for comparative purposes only.

Table 4-54

**APPROXIMATED ACRES PER GNATCATCHER PAIR
AT CARRYING CAPACITY IN HABITATS
OF VARYING PREDICTED VALUE¹**

Climate Zone	High-Value Habitat	Moderate-Value Habitat	Low-Value Habitat
Coastal	7.5 to 10	12.5	25 ²
Transitional	20	25	50 ²

¹ Although densities are typically presented as *pairs per acre*, we present the results here as *acres per pair* for ease of comparisons. These density estimates are rounded to the nearest 2.5 acres to reflect the degree of measurement precision justified with these data.

² For estimating carrying capacity (K) for the MHCP study area and for population viability uses, a density of zero was applied in low value habitat, because low-value habitat is not expected to support gnatcatchers through all life stages.

Although gnatcatcher localities are occasionally recorded in low value habitat, and therefore densities are necessarily greater than zero at K, low value habitat is not known to reliably support gnatcatchers through all life stages. Consequently, we assigned a K of zero pairs to low-value habitat when estimating regional K and for use in population viability assessments. In other words, although low value habitat may support some gnatcatchers (approximately one pair per 25 acres in coastal climates and one pair per 50 acres in transitional climates), we assumed that these pairs are not contributing to regional population growth or viability (i.e., they represent “sink” populations) (Pulliam 1988; Pulliam and Danielson 1991).

These results appear to be consistent with K estimates for populations on the Palos Verdes peninsula (7.5 acres per pair) (Atwood et al. 1998) but are higher than densities estimated for Orange County (Akcakaya and Atwood 1997), where coastal K averaged approximately 30 acres per pair and inland K averaged approximately 33 acres per pair. This discrepancy probably results from the extrapolation of the Orange County K over a matrix of variable quality habitat and nonhabitat (i.e., vegetation communities other than coastal scrubs were included in the matrix), which yielded lower densities (J. Atwood personal communication).

Extrapolating the density estimates for “saturated” high value and medium value habitat (from Table 4-54) over all areas of high and medium value habitat in the MHCP plan area, we calculated K for the MHCP area at about 557 to 693 pairs. Note that the current number of location records in the MHCP database (539 records) is approaching this range. Given that the database is becoming relatively complete (with the recent addition of less spatially biased data from the San Diego Bird Atlas), this close correspondence lends confidence to these estimates.

Threats and Limiting Factors. The primary cause of this species’ decline is the cumulative loss and fragmentation of coastal sage scrub vegetation by urban and agricultural development. Early studies suggested that the California gnatcatcher is highly sensitive to the effects of habitat fragmentation and development activity (Atwood 1990; ERCE 1990; Ogden unpublished data). The USFWS has estimated that coastal sage scrub habitat has been reduced by 70 to 90% of its historical extent (USFWS 1991), and little of what remains is protected in natural open space.

Predation is thought to be the primary cause of reproductive failure in land birds (Ricklefs 1969), including the California gnatcatcher (Sockman 1997; Braden et al. 1997a). Gnatcatchers are subject to predation by a wide variety of vertebrate predators (Sockman 1997; Braden et al. 1997a), including human subsidized predators (e.g., house cats, raccoons, ground squirrels, and scrub jays). Gnatcatchers are also subject to nest parasitism by brown-headed cowbirds (USFWS 1991; Ogden 1993; Braden et al. 1997a). Although nest parasitism may adversely affect gnatcatcher nest fates, this effect may be overwhelmed by other causes, especially predation and nest abandonment (Braden et al. 1997a).

Special Considerations. This section discusses some aspects of the gnatcatcher's biology that are pertinent to conservation planning and preserve design for the species. Although based on scientifically derived data, some of the information is inconclusive or statistically untested at this time. Nevertheless, we believe much of the information is relevant to a prudent, conservative approach to designing and evaluating the MHCP preserve. It is also relevant to designing the adaptive management and monitoring program, which should test the assumptions discussed herein.

Much of the information discussed below was used to revise, for use within the MHCP area, a gnatcatcher habitat evaluation model that was first developed for the MSCP (Ogden 1995). The purpose of this model was to identify areas considered most essential to preserve viability for the gnatcatcher within the MHCP area. In the face of uncertainty regarding some of the model assumptions, the guiding philosophy has been in all cases to err on the side of conservation. The details of this model are presented in Appendix A.

Vegetation Preferences. Studies of the gnatcatcher's habitat preferences in San Diego County indicate that California sagebrush (*Artemisia californica*) and flat-topped buckwheat (*Eriogonum fasciculatum*) are the primary plants used by gnatcatchers when foraging for insects (RECON 1987; ERCE 1990; Ogden unpublished data). However, at Rancho San Diego, gnatcatchers foraged on these shrubs in proportion to their availability within the territory, whereas redberry (*Rhamnus crocea*) and broom baccharis (*Baccharis sarothroides*) were preferentially used more often for foraging than would be suggested by random selection of shrubs within the territory (Mock and Bolger 1992). Preferential use of broom baccharis was especially pronounced outside the breeding season. Gnatcatchers will also forage in a variety of other vegetation types, including riparian edges, chaparral, and disturbed areas, particularly outside of the breeding season (Campbell et al. 1998).

Coastal sage scrub that is dominated by black sage (*Salvia mellifera*) appears not to be reliably occupied by breeding gnatcatchers in Orange and San Diego counties. Bontrager (1991) surveyed over 3,000 acres of black sage-dominated coastal sage scrub in Orange County and found no gnatcatchers. Weaver (1998) surveyed 14 black-sage dominated sites in San Diego County (totaling 1,213 acres) and found gnatcatchers in only half of them (totaling 12 pairs). Moreover, the 7 sites that were occupied by gnatcatchers had *Artemisia californica* as a strong codominant to *Salvia mellifera*. Weaver (1998) concluded that areas supporting *Artemisia* as a codominant served as low-density reserves for gnatcatchers within black sage-dominated coastal sage scrub, which was otherwise avoided by gnatcatchers. Atwood (1990) and Mock et al. (1990) also reported a negative correlation between gnatcatcher distribution and black sage-dominated coastal sage scrub. Within the MHCP study area, large areas of coastal sage scrub are dominated by black sage, especially in northeast Carlsbad and north San Marcos. These areas, which otherwise appear suitable as gnatcatcher habitat, have been repeatedly surveyed over multiple years with few gnatcatchers being found (H. Weir, P. Mock, B. Jones, J. Brown, D. King, A. Hayworth, and K. Preston personal communication).

Vegetation subassociations were not originally mapped in the MHCP database. However, we have to the best of our knowledge mapped areas in and near the MHCP study area that are dominated by black sage, based on consultation with other local biologists (H. Weir, P. Mock, A. Hayworth, and D. King). Most of the black sage-dominated coastal sage scrub was previously rated as high value by the habitat evaluation model. Because these areas have been repeatedly surveyed with few or no gnatcatchers being found, we decremented mapped black sage-dominated habitat to low value in the MHCP habitat evaluation model. These areas may be important for wintering, foraging, or dispersal, but are not considered reliable breeding habitat for purposes of evaluating the MHCP preserve design.

Atwood et al. (2002) studied the influence of fire on gnatcatcher population dynamics on Camp Pendleton during 1999-2001. They recorded a significant population crash between 1999 (220 nesting pairs) and 2000 (51 pairs) and 2001 (50 pairs), which was largely unrelated to human influences. In all years, most pairs were in areas mapped as not having burned for at least 20 years, and the population decline was most dramatic in the younger habitat areas. Atwood et al. (2002) concluded that maintenance of “old-growth” coastal sage scrub habitat may be essential to long-term population viability. Because older stands of coastal sage scrub tend to have higher proportions of *Artemisia californica*, and lower proportions of black sage and other species, this may explain some of the patterns in species occurrence relative to vegetation subassociations discussed above. However, Atwood et al. (2002) also noted that, despite lower nesting densities in younger habitat areas, gnatcatchers nesting in such young-successional habitats actually experienced higher nest survival rates and reproductive rates than those in older stands, perhaps due to differences in predator communities. Thus, maintaining a diversity of coastal scrub stand ages and compositions may be important to long-term population viability.

Selection of nest sites by gnatcatchers within a territory seems more dependent on structural aspects of vegetation in the immediate vicinity than on shrub species per se. Ogden (1992) found shrub species selection for the nest site to be directly related to relative availability of different shrub species at Rancho San Diego. Although Braden (In Press) found that shrub selection for nesting substrate was not proportional to shrub species availability, there was no clear pattern of selection and no relationship detected between nest success and the nest shrub species. Braden (In Press) found, rather, that gnatcatchers in Riverside County placed their nests in locations with greater perennial cover, greater perennial height, increased horizontal structural homogeneity, and increased vertical structural homogeneity than random locations within territories. Braden et al. (1997b) also measured increased fitness components (e.g., earlier nesting, higher nest success, greater fledgling production) for nest territories associated with increased grass and forb cover, increased perennial structure, increased horizontal perennial homogeneity, decreased vertical perennial homogeneity, and decreased perennial diversity. Results of detailed, within-territory studies such as those reported by Braden et al. (1997a, 1997b), provide insights for habitat management (e.g., habitat restoration design) and monitoring within the MHCP study area. However, it is difficult to extrapolate these micro-scale studies to the landscape-level preserve design and

evaluation considerations discussed here, given the lack of similar detailed data within the MHCP study area.

Elevational Distribution. At least in the coastal counties of San Diego and Orange, gnatcatchers appear to be largely restricted to coastal sage scrub below about 900 or 1,000 feet elevation. Atwood (1992a) reported that 94% of all gnatcatcher locality records ($n = 306$) for Orange and San Diego counties were below 250 meters (820 feet) in elevation (Atwood 1992a). Based on a much larger sample size ($n = 781$) for the same geographic area, MBA (1991) reported that 91% of all gnatcatcher records occur at or below 250 meters (820 feet) and 99% occur at or below 300 meters (984 feet) in elevation. In the MSCP study area, Ogden (1993) found over 99% of documented gnatcatcher sightings below 292 meters (950 feet). Based on these observations, Atwood (1992a) suggested that, while protection of higher elevation coastal sage scrub in Orange and San Diego counties is important for other biological reasons, it might contribute little to long-term viability of gnatcatcher populations. However, these observations can be criticized as being based on biased survey data, with few surveys performed at higher elevations (Braden 1999). To detect whether gnatcatchers truly select lower elevation coastal sage scrub over higher elevation areas requires unbiased statistical tests, which have not been performed. However, we know of many surveys performed by qualified biologists in high elevation sage scrub habitats, and their collective knowledge supports the conclusion that gnatcatcher populations are not reliably found above about 900 or 1,000 feet in San Diego County (P. Mock, D. King, K. Preston, H. Wier, A. Hayworth, L. Jones, and P. Unitt, personal communications). Furthermore, within the MHCP area, all higher elevation areas (e.g., coastal sage scrub on Daley Ranch in Escondido, in north San Marcos, and the San Elijo Ranch area of south San Marcos) have been repeatedly and intensively surveyed, with very few observations of gnatcatchers. Although the biological basis for these observations is not fully understood or statistically verified, they nevertheless suggest that lower elevation coastal sage scrub may be more important to gnatcatcher conservation within the MHCP area than higher elevation habitats. Note that less than 5% of the coastal sage scrub in the study area is above 950 feet and therefore affected by this variable.

Effects of Slopes. The original gnatcatcher habitat evaluation model used slopes less than 40% as one criterion for ranking gnatcatcher habitat value. Ogden's detailed studies (Mock and Bolger 1992; Ogden 1992a) and other observations (e.g., Bontrager 1991; B. Wagner personal communication) suggest that gnatcatchers avoid nesting on very steep slopes ($> 40\%$). At Rancho San Diego, gnatcatchers exhibited neutral selection for slopes less than 20%, significantly positive selection for slopes of 20% to 40%, and negative selection (avoidance) of slopes greater than 40% in siting their nests (Mock and Bolger 1992). However, habitat on slopes greater than 40% is nevertheless suitable for foraging and dispersal. Approximately 93% of the documented gnatcatcher sightings within the MSCP study area occur where the slope gradient is less than 40%, and 99% of the sightings within the MHCP study area occur where the slope gradient is less than 40%. We therefore did not change this criterion in the MHCP gnatcatcher habitat evaluation model. For purposes of MHCP preserve planning, slopes greater than 40% are

not considered reliable breeding areas, but are considered important to habitat connectivity for gnatcatcher foraging and dispersal.

Territory Size and Minimum Occupiable Patch Size. The territory size requirements of the gnatcatcher appear to vary with habitat quality (Ogden 1993; Preston et al. 1998). Documented home ranges have varied from 2.5 to 45 acres in San Diego County (RECON 1987; ERCE 1990; ERCE unpublished data). Ogden (1993) and Preston et al. (1998) identified a pattern of increasing territory size with increasing distance from the coast and hypothesized that larger inland territories were a result of lower overall habitat quality.

Data from north San Diego County were used to test this hypothesis, which confirmed a similar pattern for the MHCP study area. Using the 19 well-surveyed areas discussed above, we used the inverse of density to estimate territory size (assuming habitat saturation), and fit a regression line to the data (Appendix A, Figure A-2). The regression indicates that territory size increases with distance from coast. This pattern is similar to that identified by Preston et al. (1998) based on territory size estimates from multiple studies covering a broader geographic area. We also separated the data into coastal and transitional climate zones (at approximately 10 miles from the coast in the MHCP area) and compared arithmetic and harmonic means, minimums, and medians for patch size and territory size between zones. Each statistic measured 2 to 3 times larger for the transitional climate zone. For example, minimum territory size appears to be about 5 acres in the coastal zone and 10 acres in the transitional zone.

Territory sizes and other data suggest that, at least within the MHCP study area, the minimum habitat patch size that can consistently support gnatcatchers is significantly smaller than previously thought, especially within more coastal areas. The MSCP gnatcatcher habitat evaluation model excluded patches of less than 10 acres in the coastal area, and less than 25 acres in more inland areas, as unsuitable for gnatcatchers, at least for purposes of prioritizing areas for preserve designation. However, a frequency distribution of occupied patch sizes in the MHCP area shows patches of 5 to 6 acres are very frequently occupied (Appendix A, Figure A-3). Patches less than 1 acre are very infrequently occupied (probably as a portion of a territory within a more extensive habitat matrix), and patches of about 2 to 4 acres are frequently occupied, but not necessarily preferentially selected relative to their overall availability. Patches larger than about 10 acres are generally selected at or above their level of availability in the environment. These results do not necessarily mean that patches of 5 to 6 acres are preferred by gnatcatchers over larger patches, or that gnatcatcher fitness components (e.g., reproductive or survival rates) are higher in these patches than in larger patches. However, the available data suggest that patches of about 5 to 6 acres are capable of supporting breeding gnatcatchers and should not be discounted in assessing habitat quality and potential contributions to preserve design, at least in coastal areas. Observations in many of these small patches in Oceanside indicate that gnatcatcher pairs occupy them reliably year after year. This suggests that at least some of these pairs successfully reproduce, even though mortality rates may exceed reproductive rates there (Spencer 1997). Based on these observations, we modified the gnatcatcher evaluation

model to consider 5-acre patches in the coastal climate zone and 10-acre patches in the transition zone as potentially suitable to support gnatcatchers. This modification better fits the fragmented nature of habitat in the MHCP and supports inclusion of relatively small patches to serve as linkage stepping-stones in the MHCP preserve system. This makes the model more conservative by including more habitat patches for consideration as potential contributions to a viable preserve system.

Dispersal Capabilities and Persistence in Habitat Fragments. Although gnatcatchers are adversely affected by habitat fragmentation, accumulating evidence suggests that gnatcatchers may be more capable of dispersal across suburban environments and more persistent in habitat fragments than previously thought (Atwood 1995; Bailey and Mock 1998; Galvin 1998; Braden unpublished data). Studies of banded individuals in southern San Diego County (Mock and Bolger 1992) and Palos Verdes in Los Angeles County (Atwood et al. 1995) documented median dispersal distances of less than 2 miles with maximum recorded distances of about 5 miles. However, banding studies invariably underestimate dispersal capabilities due to the low probability of band recoveries with increasing distance. Bailey and Mock (1998) inferred from an analysis of detailed distribution maps that juveniles are able to traverse highly man-modified landscapes for as much as 3 miles and may disperse more than 6 miles in some instances through a complex of natural and nonnatural areas (for example from Tecolote Canyon to Point Loma in San Diego). Atwood et al. (1995) found on the Palos Verdes peninsula that 9 of 15 gnatcatchers that dispersed at least one territory diameter from their natal territory passed through man-modified habitats (e.g., residential and golf course). That study also recorded one dispersal event of about 4.1 miles, which included at least 1.5 miles over man-modified habitats (suburban landscaping and a golf course).

Sweetwater Environmental Biologists (B. Jones personal communication) surveyed 53 isolated fragments, varying from 2 to 300 acres of coastal sage scrub, throughout the gnatcatcher's geographic range. They found gnatcatchers in 64% of these patches. Many of the smallest patches supported gnatcatchers, especially in more coastal locations, despite that patches were isolated for an average of 19 years, and some for over 50 years. A review of gnatcatcher survey results in small patches of coastal sage scrub in Oceanside also indicated that gnatcatcher occupancy is very persistent in small patches in coastal areas (Spencer 1997): All patches in Oceanside that had been surveyed more than once (and up to four times) between the late 1980s and 1997 were occupied in every survey year. These results do not mean that small patches are necessarily good places for individual gnatcatchers (they may, in fact, be population "sink" areas, where more birds die than are reproduced). However, the results suggest that small patches may serve an important role in keeping the overall metapopulation of gnatcatchers intact and viable by serving as stepping-stones for genetic and demographic connectivity between other, larger habitat areas. Together, the existing information on persistent use of small habitat patches for breeding, and the dispersal capabilities of gnatcatchers between these patches, reemphasize the conservation value of stepping-stone corridors to connect large patches of gnatcatcher breeding habitat where conserving more continuous habitat connections is no longer possible.

Conservation Analysis

Conservation and Take Levels. Levels of conservation and take for the gnatcatcher were investigated using a variety of measures, including acres of coastal sage vegetation (including both coastal sage scrub and mixed coastal sage scrub/chaparral); numbers of gnatcatcher location points in the MHCP database; acres of high, medium, and low value gnatcatcher habitat (based on the MHCP gnatcatcher habitat evaluation model); and estimated gnatcatcher carrying capacities (based on modeled habitat value, climate zones, and densities extrapolated from well-surveyed areas). In general, each of these measures provides a similar relative estimate of the overall levels of conservation expected under the MHCP plan (Tables 4-54 and 4-55). This convergence of results from various sources provides some confidence in the accuracy of the predictions, although we recognize that these measures are not totally independent of one another.

According to current estimates and assumptions, and as summarized in Table 4-55, the FPA will conserve a minimum of 61% of the extant coastal scrub habitat (5,580 acres), 62% of known location points, and 59% to 60% of estimated carrying capacity within the study area (excluding properties already holding take authorizations). These estimates of conservation probably overestimate the level of take by a small amount, because they assume that all coastal sage scrub habitat outside of the FPA will be taken, whereas some coastal sage scrub and gnatcatchers are likely to remain in undeveloped areas outside the FPA.

Based on the results of the MHCP habitat evaluation model (Table 4-56), the MHCP will conserve about 55% of the remaining high value gnatcatcher habitat (2780 acres), 60% of moderate value habitat (963 acres), and 63% of low value habitat (1,531 acres). Of those areas that are within the BCLA and therefore are considered to contribute most to preserve viability, about 64% of the high value habitat and 78% of the medium value habitat will be conserved.

Table 4-57 summarizes the level of conservation for gnatcatcher habitat, adding in other contributions not fully accounted for by the FPA calculations. Table 4-57 then adds in current estimates of restoration potential in the cities, which would add about 338 acres of restored coastal sage scrub within the FPA. Percent conservation estimates calculated using these restoration acreages assume that restored coastal sage scrub will eventually constitute high quality gnatcatcher breeding habitat. Consequently, each acre restored is counted as an acre conserved. Finally, Table 4-57 adds in expected conservation of gnatcatcher breeding habitat in the unincorporated core area, based on the 400- to 500-acre target established for this contribution. Accounting in this way for the additional gnatcatcher conservation contributions increases the overall expected level of conservation to about 66% or 67%. Overall conservation of habitat may actually be higher based on subarea plan implementation policies.

Preserve Configuration Issues. Although gnatcatcher habitat in the MHCP study area is already highly fragmented and will become more fragmented during plan implementation, the preserve system will conserve major and critical population areas

and linkages, as summarized in Table 4-58. It will improve core areas and linkages in some key areas via habitat restoration and enhancement and will contribute core breeding gnatcatcher habitat in the adjacent unincorporated area.

Because the BCLA was delineated to capture the best remaining habitat areas, including all the largest remaining blocks of habitat and critical linkages between them, it is a relevant model against which to compare the proposed preserve configuration. Within the BCLA, the MHCP will conserve about 68% of all coastal scrub vegetation. The MHCP will also conserve about 64% of the high-value gnatcatcher breeding habitat and 78% of the medium-value breeding habitat that was included within the BCLA (Table 4-56). Finally, about 69% of gnatcatcher location points that lie within the BCLA are expected to be conserved.

Effects on Population Viability and Species Recovery. Despite the relatively high level of take expected within the MHCP plan area (on the order of 38% to 39% of the existing habitat and population in the MHCP plan area may be taken by development), the gnatcatcher is expected to persist within the MHCP plan area. The MHCP should contribute to regional viability of the species by conserving, enhancing, and managing a regionally critical stepping-stone linkage across the MHCP plan area, which is expected to maintain functional connections between core populations north and south of the MHCP plan area. The MHCP will also contribute to conservation of core breeding habitat for the species, by conserving 400 to 500 acres of such habitat adjacent to the stepping-stone corridor. More precise, quantitative estimates of the effects of the MHCP on gnatcatcher metapopulation viability are not possible given our current level of information concerning gnatcatcher biology.

Special Considerations. The large number of small habitat fragments included in the preserve system, and associated high level of edge effects, will require intensive management to control adverse effects and maintain habitat value. Management should strive to maintain a diversity of coastal sage scrub stand ages within the reserve, but with a preference for maintaining stands older than 20-years post disturbance as nesting habitat. High frequency fires, which are expected in urban reserves, will tend to convert coastal sage scrub to less desirable forms of sage scrub, or even to non-native grasslands, which are not suitable for nesting. Predation from nonnative vertebrates may be high, as might nest parasitism from cowbirds. Although cowbird trapping may reduce adverse effects of nest parasitism on gnatcatchers, it is unclear whether this will have beneficial effects on local gnatcatcher populations. Braden et al. (1997a) found in Riverside County that, while nest parasitism decreased significantly after cowbird trapping, nest predation and abandonment unrelated to parasitism overwhelmed the effect, and nest success decreased significantly from the no-trapping to trapping periods. It appears that gains in nest success from decreased nest parasitism during cowbird trapping periods may have been negated by increased nest abandonment before cowbirds were active. Similar studies should be performed as part of the MHCP adaptive management and monitoring program.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Conduct bird banding and possibly telemetry studies to investigate reproduction, dispersal, and survivorship in the study area, and especially to determine the effectiveness of the stepping-stone corridor.

Table 4-55

**CONSERVATION OF COASTAL SAGE SCRUB HABITAT,
GNATCATCHER LOCATION POINTS, AND ESTIMATED
CARRYING CAPACITY IN THE MHCP PLAN AREA**

City	Habitat Acres Conserve d ¹		Location Points Conserved ²	Carrying Capacity (lower – upper) ⁴
	Net Acres (%)	BCLA Acres (%)		
Carlsbad	1,470 (65%)	1,398 (67%)	117 (67%)	108-139 (66%)
Encinitas	631 (67%)	572 (67%)	58 (76%)	55-72 (59%)
Escondido	1,576 (68%)	1,454 (82%)	47 (67%)	68 (92%)
Oceanside	692 (51%)	603 (67%)	77 (50%)	54-68 (43-44%)
San Marcos	1,065 (53%)	1,034 (57%)	30 (54%)	34-45 (45%)
Solana Beach	6 (53%)	6 (79%)	4 (80%)	1 (69-72%)
Vista	140 (55%)	118 (72%)	1 (25%)	12-16 (52-53%)
MHCP Total ³	5,580 (61%)	5,185 (68%)	333 (62%)	332-410 (59-60%)

¹ Habitat includes southern coastal bluff scrub, maritime succulent scrub, coastal sage scrub, and coastal sage scrub/chaparral mix vegetation communities.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

⁴ Carrying Capacity estimated based on empirically fitted densities at 19 sites in high, medium, and low value habitat in the coastal and transitional climate zones. Lower to upper range is based on variability in densities estimated for high value coastal habitat (7.5 to 10 acres per pair).

Table 4-56

**CONSERVATION OF PREDICTED GNATCATCHER
HABITAT VALUE CLASSES¹**

City	High		Medium		Low		Total	
	Within Plan Area	Within BCLA	Within Plan Area	Within BCLA	Within Plan Area	Within BCLA	Within Plan Area	Within BCLA
	acres (%)	acres (%)	acres (%)	acres (%)	acres (%)	acres (%)	acres (%)	acres (%)
Carlsbad	947 (68%)	908 (70%)	163 (62%)	144 (71%)	309 (54%)	309 (54%)	1,419 (62%)	1,362 (66%)
Encinitas	510 (58%)	470 (60%)	53 (73%)	47 (77%)	0 (0%)	0 (0%)	563 (60%)	516 (61%)
Escondido	456 (50%)	401 (72%)	571 (79%)	540 (90%)	503 (80%)	481 (84%)	1,530 (67%)	1,421 (82%)
Oceanside	421 (46%)	357 (61%)	148 (36%)	144 (57%)	4 (16%)	4 (34%)	573 (42%)	505 (59%)
San Marcos	329 (43%)	307 (48%)	16 (35%)	13 (76%)	711 (60%)	712 (62%)	1,056 (53%)	1,031 (57%)
Solana Beach	6 (84%)	6 (90%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	6 (64%)	6 (82%)
Vista	110 (58%)	103 (76%)	13 (24%)	3 (27%)	5 (73%)	5 (90%)	127 (51%)	110 (73%)
MHCP Total	2,780 (55%)	2,551 (64%)	963 (60%)	891 (78%)	1,531 (63%)	1,510 (66%)	5,274 (58%)	4,952 (67%)

¹ Habitat value classes defined using the revised MHCP gnatcatcher habitat evaluation model.

Table 4-57

**CONSERVATION OF COASTAL SCRUB HABITAT
INCLUDING RESTORATION AND
UNINCORPORATED CORE AREA CONTRIBUTIONS**

City	Coastal Scrub in MHCP ¹	Coastal Scrub Conservation in FPA ²		Expected Habitat Restoration ³		Additional Habitat Contribution in the Unincorporated Core ⁴	
	Acres	Acres	%	Acres	% ⁵	Acres	%
Carlsbad	2,298	1,499	65%	104	70%	--	--
Encinitas	943	631	67%	0	67%	--	--
Escondido	2,304	1,576	68%	0	68%	--	--
Oceanside	1,348	692	51%	164	64%	--	--
San Marcos ⁶	1,990	1,065	53%	70	57%	--	--
Solana Beach	13	6	46%	0	46%	--	--
Vista	255	140	55%	0	55%	--	--
Total, Low Estimate	9,152	5,609	61%	338	65%	400	66%
Total, High Estimate						500	67%

Note: Numbers may not sum to totals as shown, and percentages may not calculate as shown, due to rounding.

- ¹ Includes coastal sage scrub, southern coastal bluff scrub, maritime succulent scrub, and mixed coastal sage scrub/chaparral vegetation, but does not distinguish habitat quality.
- ² Net conservation in the FPA based on Final October 2002 FPA maps.
- ³ Adds assumed restoration of coastal sage scrub in key locations identified by consultants and the cities within the FPA.
- ⁴ Adds 400 (low estimate) to 500 (high estimate) acres of coastal sage scrub conservation in the unincorporated core area, including conservation contributions from already permitted projects, offsite mitigation obligations, or wildlife agency acquisition contributions. These contributions are not yet apportioned by city.
- ⁵ Assumes 1:1 credit for conversion of annual grasslands or disturbed land to coastal sage scrub within the FPA. Assumes that restored coastal sage scrub eventually will constitute moderate- to high-value coastal sage scrub habitat.
- ⁶ Restoration estimate in San Marcos includes 30 acres on private lands within the southwestern portion of the city plus 40 acres on the San Marcos Landfill that are not the obligation of the city or MHCP. The County of San Diego is obligated to restore 79.3 acres of coastal sage scrub on the landfill. This analysis assumes that approximately 50% of this (about 40 acres) will ultimately meet the biological criteria for gnatcatcher breeding habitat once restored by the County.

Table 4-58

**CONSERVATION OF MAJOR AND CRITICAL
GNATCATCHER LOCATIONS**

City	Major Populations Conserved	Critical Locations Conserved	Regional Linkages Conserved
Carlsbad	Major populations in north, central, and southeast Carlsbad will be substantially conserved, with the exception of areas already permitted for take. Major populations in central Carlsbad (e.g., Carlsbad Municipal Golf Course/Macario Canyon) will be partially conserved and will become more fragmented.	Much of the Calavera Lake/Calavera Highlands location will be conserved. The critical location in the La Costa area is largely on properties already permitted for take.	Linkages through central and east Carlsbad will be substantially conserved. Some linkages may be further constrained or edge affected by development. Habitat restoration and enhancement will improve or create other linkages, and habitat management should help control adverse edge effects.
Encinitas	None known.	None known.	None known.
Escondido	Bernardo Mountain, Kit Carson Park, and San Pasqual Valley populations will be substantially conserved.	None known.	Although no regional linkages cross Escondido, conserved areas in and near San Pasqual Valley will contribute to viability of the regional linkage between north Poway and Lake Hodges, which is largely outside of the MHCP area, and within the MSCP area.
Oceanside	The major population in north Oceanside will be substantially conserved, while the population in central Oceanside will be partially conserved. Habitat restoration will increase the available breeding habitat in contiguous areas of central Oceanside, at least partially offsetting impacts there.	The critical location in north Oceanside adjacent to Camp Pendleton will be substantially conserved.	The critical, regional stepping-stone linkage through central Oceanside will be substantially conserved and enhanced. Some development is likely to further constrain portions of the linkage and increase edge effects. Restoration, enhancement, and management are expected to maintain and possibly improve overall linkage function.

Table 4-58 (Continued)

**CONSERVATION OF MAJOR AND CRITICAL
GNATCATCHER LOCATIONS**

City	Major Populations Conserved	Critical Locations Conserved	Regional Linkages Conserved
San Marcos	The San Marcos portion of the La Costa/University Commons major population will be partially conserved.	The San Marcos portion of the La Costa/University Commons critical population will be partially conserved.	The regional linkage through southwest San Marcos is partially conserved. The regionally critical corridor connecting the unincorporated core gnatcatcher area with the MHCP stepping-stone linkage will be further constrained by development. Some restoration in this vicinity may partially offset these adverse effects.
Solana Beach	None known.	None known.	None known.
Vista	None known.	None known.	None known.
MHCP Total	Most major populations are substantially conserved, except on properties already permitted for take. Some losses will be partially offset by population increases expected via habitat restoration, enhancement, and management.	Some critical locations will be substantially impacted on already permitted properties. Most other critical locations are substantially conserved, except for the San Marcos portion of the La Costa/University Commons area, which will be partially conserved.	Most corridors and linkages are narrow and edge effected. The regionally critical stepping-stone linkage will be further constrained in some areas, but improved in others. Overall, the regional linkage is expected to remain functional, and possibly to be improved by restoration, enhancement, and management.

Western Bluebird*Sialia mexicana*

USFWS: None

CDFG: None

Conservation Goals

Ensure species persistence in the plan area. Contribute to regional viability by protecting and enhancing habitat value.

Conservation Strategy

Conserve existing habitat in the oak woodland-grassland ecotone with an abundance of suitable cavity nest sites within large blocks of open space. Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Covered.

Rationale. The MHCP will adequately conserve this species by conserving at least 79% of suitable habitat (oak woodlands) in the study area, including about 85% of habitat within the BCLA, and managing preserve areas consistent with species' needs.

Conditions. Minimize loss of oak woodland-grassland ecotone habitat and retain dead oak trees or branches that provide nesting cavities in reserve areas. Monitor and control, as necessary, exotic bird species that compete for nesting cavities (e.g., European starling and house sparrow). Monitor nest boxes and install starling excluding devices as needed.

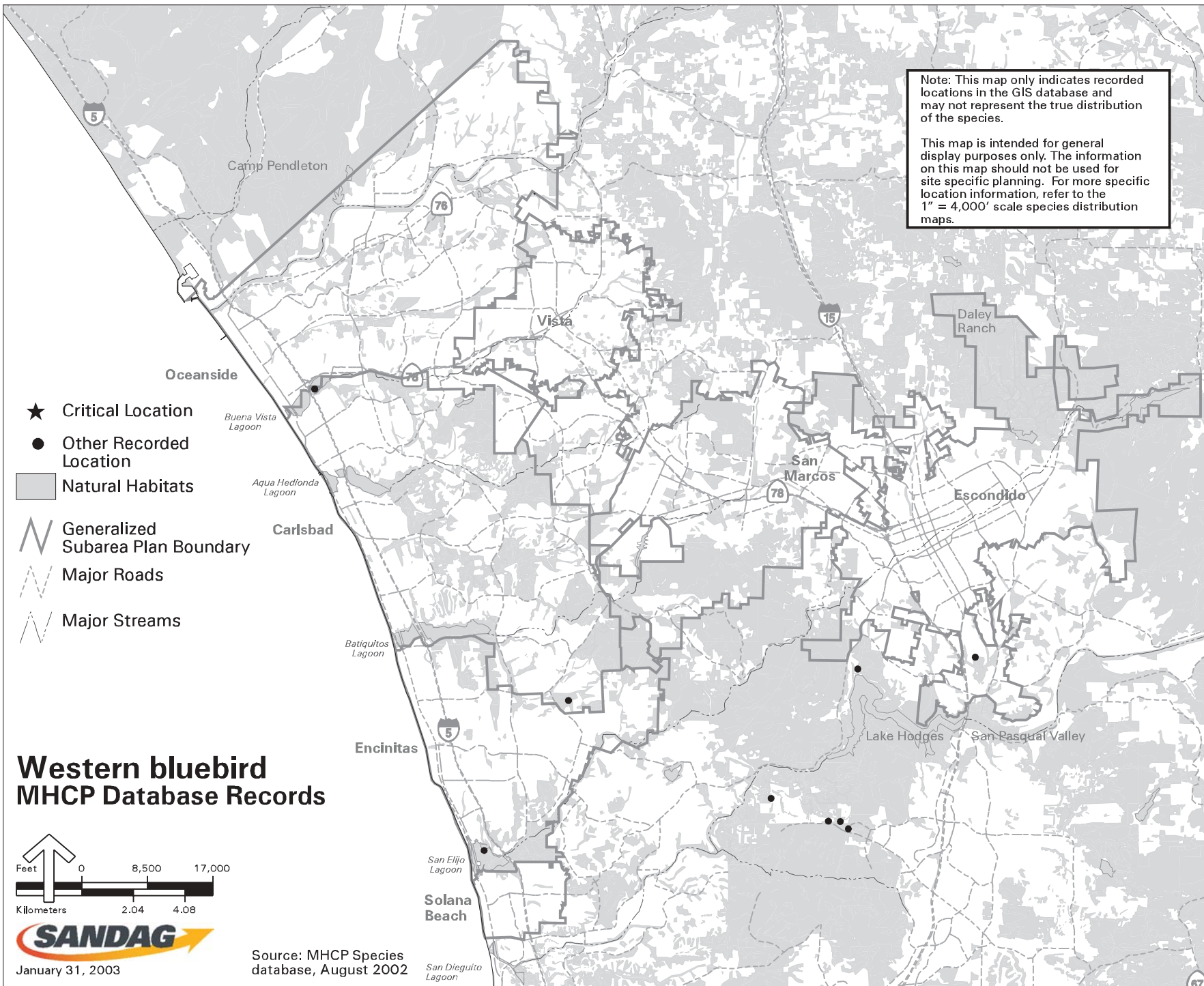
Background

Distribution, Abundance, and Trends. The western bluebird is a common cavity-nesting songbird of oak woodland and pine forests throughout the western United States. It is primarily a wintering species in the MHCP area, except for limited breeding in oak woodlands of Escondido and San Marcos (see MHCP Database Records Map). The western bluebird breeds in oak woodland-grassland ecotone areas, and winters in a wide variety of open habitats at elevations below 4,000 feet. There are no major populations or critical locations in the plan area.

Threats and Limiting Factors. Although still common, the bluebird is a habitat indicator species for two depleted habitats: oak woodland and grasslands in coastal areas of the county. The western bluebird is vulnerable to competition with more aggressive introduced species (e.g., European starling and house sparrow) for scarce nesting cavities (McLaren 1963; Zeleny 1969; Patterson 1979).

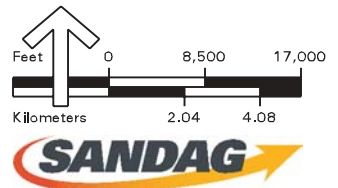
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- Generalized Subarea Plan Boundary
- Major Roads
- Major Streams

Western bluebird MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Dieguito Lagoon

Special Considerations. Bluebirds are highly dependent on mistletoe fruit during winter. Larger blocks of habitat may be necessary to avoid edge effects, including competition for nest cavities by starlings and house sparrows, which tend to be associated with urban and agricultural areas.

Conservation Analysis

Conservation and Take Levels. The substantial level of conservation of the oak woodland ecological community (79%; Section 3.2) will benefit this species. Although the ecotone between oak woodland and grasslands is considered the primary breeding habitat for this species, oak woodlands alone are used to quantify the level of bluebird habitat conservation (Table 4-59). The elimination of grasslands from the habitat quantification is based on the assumption that most oak woodlands in the MHCP occur in a matrix of grasslands and scrub communities and are generally suitable breeding habitat, while most grasslands do not occur within a matrix of oak woodland and are not suitable breeding habitat. There are only 4 species point localities in the MHCP database, 3 of which (75%) are in areas to be conserved.

Preserve Configuration Issues. The MHCP preserve will not affect the ability of this species to disperse relative to existing conditions. About 85% of oak woodlands within the BCLA will be conserved, and the majority of oak woodlands are conserved within large blocks of native habitats (e.g., at Daley Ranch) thereby enhancing habitat connectivity for this species. The maximum level of conservation for riparian habitat further increases preserve connectivity.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to maintain and possibly enhance population viability of the western bluebird through increased management and monitoring and would contribute to species recovery in the plan area. The MHCP preserve and policies will maintain consistency with other recovery planning and management goals for the species. The MHCP will increase regional coordination and funding for monitoring and management, which may improve current management of western bluebird habitat and species stability.

Special Considerations. Substantial buffer zones should be maintained around oak woodland breeding habitat to protect oak woodland-grassland ecotone used by this species. Nonnative nest competitors (e.g., European starlings) should be monitored and controlled if necessary within reserve areas. Bluebird populations respond well to nest box provisioning and benefit from the installation of devices that exclude starlings from nest boxes and natural cavities.

Table 4-59

**SUMMARY OF CONSERVATION FOR
WESTERN BLUEBIRD**

City	Habitat Acres Conserved ¹		Location Points Conserved ² (% of FPA)
	Net Acres (%)	BCLA Acres (%)	
Carlsbad	19 (79%)	19 (79%)	1 (50%)
Encinitas	None present	None present	1 (100%)
Escondido	655 (81%)	628 (85%)	1 (100%)
Oceanside	4 (95%)	None present	None known
San Marcos	22 (81%)	22 (83%)	None known
Solana Beach	None present	None present	None present
Vista	0 (0%)	None present	None known
MHCP Total ³	700 (79%)	669 (85%)	3 of 4 (75%)

¹ Habitat includes all oak woodland vegetation communities.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Coordinate with bluebird conservation organizations (e.g., North American Bluebird Society [NABS]) to initiate a bluebird nest box program.

Yellow-breasted Chat

Icteria virens

USFWS: None

CDFG: Species of Special Concern

MHCP: Obligate Wetlands Species

Conservation Goals

Ensure species persistence in the plan area. Improve habitat quality and increase species abundance to contribute to regional population viability.

Conservation Strategy

Conserve existing major populations and critical locations of yellow-breasted chat and additional riparian habitats on the San Luis Rey River and Pilgrim Creek in Oceanside, the lower Escondido Creek in Encinitas, and in Kit Carson Park in Escondido. Include within the open space preserve system critical locations of yellow-breasted chats and enhance potential habitat. Provide appropriate upland buffers (minimum of 50 feet and up to 100 feet wide where possible) for all major populations and other high quality habitat areas. Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions. However, coverage could be revoked depending on resolution of the San Luis Rey River Flood Control Project.

Rationale. The MHCP is expected to adequately conserve this species by conserving 100% of riparian habitat (under the MHCP no net loss policy for wetland vegetation), 90% of known species locations, and 91% of species locations within the BCLA. However, the MHCP cities cannot guarantee that these conservation levels will actually be achieved in the long term, because much of the highest quality habitat, including much of the critical population area for this species, are within a reach of the San Luis Rey River that is being planned by the Army Corps of Engineers for flood control. Under current plans, the flood control project would adversely affect a large proportion of the habitat, species population, and critical location.

Conditions. A subarea plan may receive take authorization for habitats used by this species if it applies the following species-specific conditions:

1. Manage suitable unoccupied habitat preserved within the FPA to maintain or mimic effects of natural fluvial processes (e.g., periodic substrate scouring and deposition to rejuvenate riparian vegetation).

2. Maintain biological buffers of at least 100 feet adjacent to occupied habitat, measured from the outer edge of riparian vegetation.
3. Reserve areas will be managed to avoid and minimize clearing and alteration of riparian vegetation, invasion of exotic plants and trees into the native riparian system, human disturbance, brown-headed cowbird parasitism, insufficient maintenance of water levels leading to loss of riparian habitat, and predation of adults and nests by domestic animals.
4. As mitigation for project impacts, enhance or restore yellow-breasted chat habitat consistent with management of other sensitive riparian bird species. Enhancement may include providing sufficient water flow to ensure sustained willow growth, restriction of human activities within the habitat during the breeding season, removal of invasive plant species, and predator/cowbird control.
5. Protect upland buffers around riparian habitat. Buffer areas should be a minimum of 50 feet and up to 100 feet wide.

Background

Distribution, Abundance, and Trends. The yellow-breasted chat is an uncommon but locally abundant summer resident of riparian woodland/scrub of coastal plain and foothills of California. Within the MHCP area, documented yellow-breasted chat locations include San Luis Rey River, central Oceanside, lower Escondido Creek in Encinitas, and Kit Carson Park in Escondido (see MHCP Database Records Map). Most riparian woodland habitat within the MHCP area is expected to support this species. The yellow-breasted chat is considered an indicator species for potential least Bell's vireo habitat. The San Luis Rey River and Pilgrim Creek are critical locations and also support major populations of this species.

Threats and Limiting Factors. Population declines are associated with the loss of suitable habitat and brown-headed cowbird nest parasitism.

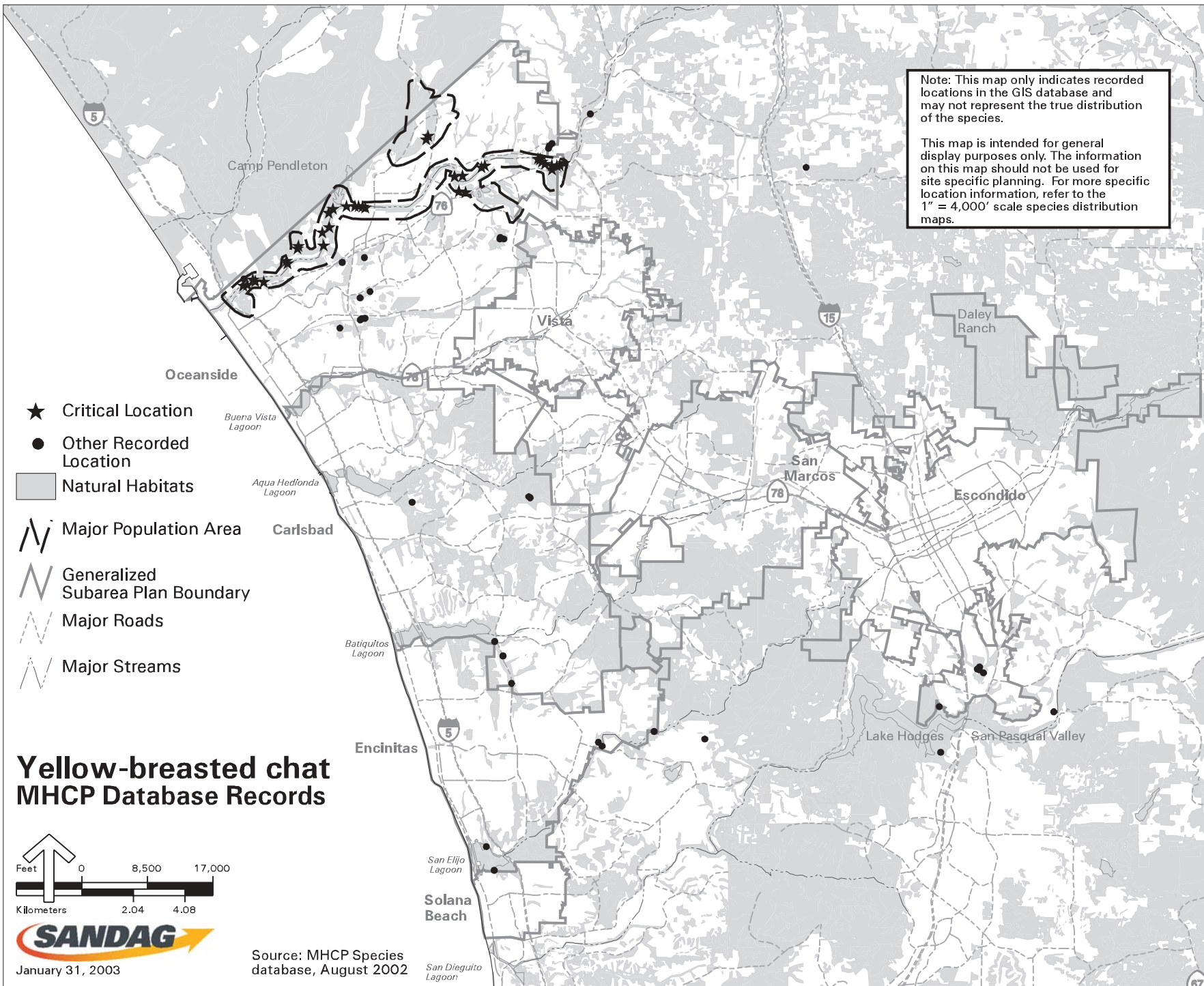
Special Considerations. This species is sensitive to habitat fragmentation and associated increases in cowbird parasitism rates.

Conservation Analysis

Conservation and Take Levels. Due to maximum conservation of the riparian ecological community (Section 3.2), the expected level of take of this species or its habitat is very low. All riparian forest, riparian woodland, and riparian scrub habitat (2,664 acres) is 100% conserved. The San Luis Rey River/Pilgrim Creek population and most point localities (54 of 60, or 90%) will be conserved (Table 4-60). However, some potential habitat for this species is within the reach of the San Luis Rey River being planned for flood control by the Army Corps of Engineers. The MCHP cannot guarantee long-term

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

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★ Critical Location

● Other Recorded Location

■ Natural Habitats

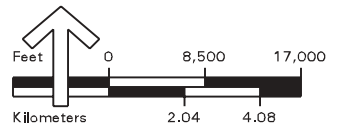
▮ Major Population Area

▮ Generalized Subarea Plan Boundary

▮ Major Roads

▮ Major Streams

Yellow-breasted chat MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Dieguito Lagoon

Table 4-60**SUMMARY OF CONSERVATION FOR
YELLOW-BREASTED CHAT**

City	Habitat Acres Conserved¹	Location Points Conserved²	Major Populations Conserved	Critical Locations Conserved
Carlsbad	459 (100%)	6 (100%)	None known	None known
Encinitas	274 (100%)	5 (100%)	None known	None known
Escondido	401 (100%)	4 (100%)	None known	None known
Oceanside ³	1,088 (100%)	39 (87%)	San Luis Rey River/Pilgrim Creek	San Luis Rey River/Pilgrim Creek
San Marcos	186 (100%)	None known	None known	None known
Solana Beach	1 (100%)	None known	None known	None known
Vista	255 (100%)	None known	None known	None known
MHCP Total⁴	2,664 (100%)	54 of 60 (90%)	All Major Populations conserved	All Critical Locations conserved

¹ Habitat includes riparian scrub, riparian woodland, and riparian forest vegetation communities.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Assumes maximum conservation of habitat value in the San Luis Rey River Flood Control Project area. Substantial impacts of the flood control project would require a revised analysis and may require changes to permit conditions.

⁴ Numbers may not total due to rounding.

conservation within this reach, where flood control actions may eliminate current or future potential habitat for the chat. Nevertheless, for purposes of this analysis, the habitat is considered conserved by MHCP and Oceanside Subarea Plan policies. The ACOE is currently designing the flood control project in consultation with USFWS and City of Oceanside. If the ultimate design results in substantial impacts to occupied yellow-breasted chat habitat, or to habitat otherwise considered critical to species viability in the MHCP, the species would no longer be considered adequately conserved by the MHCP or the Oceanside Subarea Plan, and any authorizations for its take granted based on this current analysis would be void.

Preserve Configuration Issues. The MHCP preserve will not affect the ability of this species to disperse relative to existing conditions. This is a migratory species with the ability to cover large distances of unsuitable habitat. During the breeding season, however, this species is primarily confined to the dense cover of riparian thickets such as willow mulefat-dominated riparian habitat. Riparian species are especially vulnerable to edge effects due to the linear nature of riparian habitat (high edge-to-core area ratio). Therefore, substantial upland buffers should be provided wherever possible. Any management actions (i.e., restoration, enhancement) implemented with the MHCP that would decrease the current fragmentation of this habitat and increase habitat area and connectivity would benefit the species and contribute to population recovery.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to maintain and possibly enhance population viability of the yellow-breasted chat and therefore contribute to species recovery. The MHCP preserve and policies will maintain consistency with other recovery planning and management goals for the species. The MHCP will increase regional coordination and funding for monitoring and management, which may improve current management of yellow-breasted chat breeding habitat and species stability.

Special Considerations. Due to similar habitat requirements, management to benefit yellow-breasted chat should also benefit the least Bell's vireo, southwestern willow flycatcher, and many other riparian birds.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Study demography and dispersal, and identify sensitive stages of the species' life history/annual cycle.
2. Conduct research to clarify/verify habitat requirements.

Southern California Rufous-crowned Sparrow

Aimophila ruficeps canescens

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: Species of Special Concern

Conservation Goals

Ensure species persistence in the plan area and contribute to species recovery. Improve habitat quality, and increase species abundance to contribute to regional population viability.

Conservation Strategy

Conserve existing suitable habitat for southern California rufous-crowned sparrow in the coastal scrub communities of the MHCP. Include within the preserve system large patches of coastal sage scrub. Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Covered.

Rationale. The MHCP will adequately conserve this species by conserving at least 61% of potential habitat (68% within the BCLA) and 67% of known locations (78% within the BCLA), and by managing preserve areas consistent with species' needs. Habitat restoration, conservation of the 400-500-acre unincorporated core area, and other management actions designed for the California gnatcatcher should also benefit the rufous-crowned sparrow.

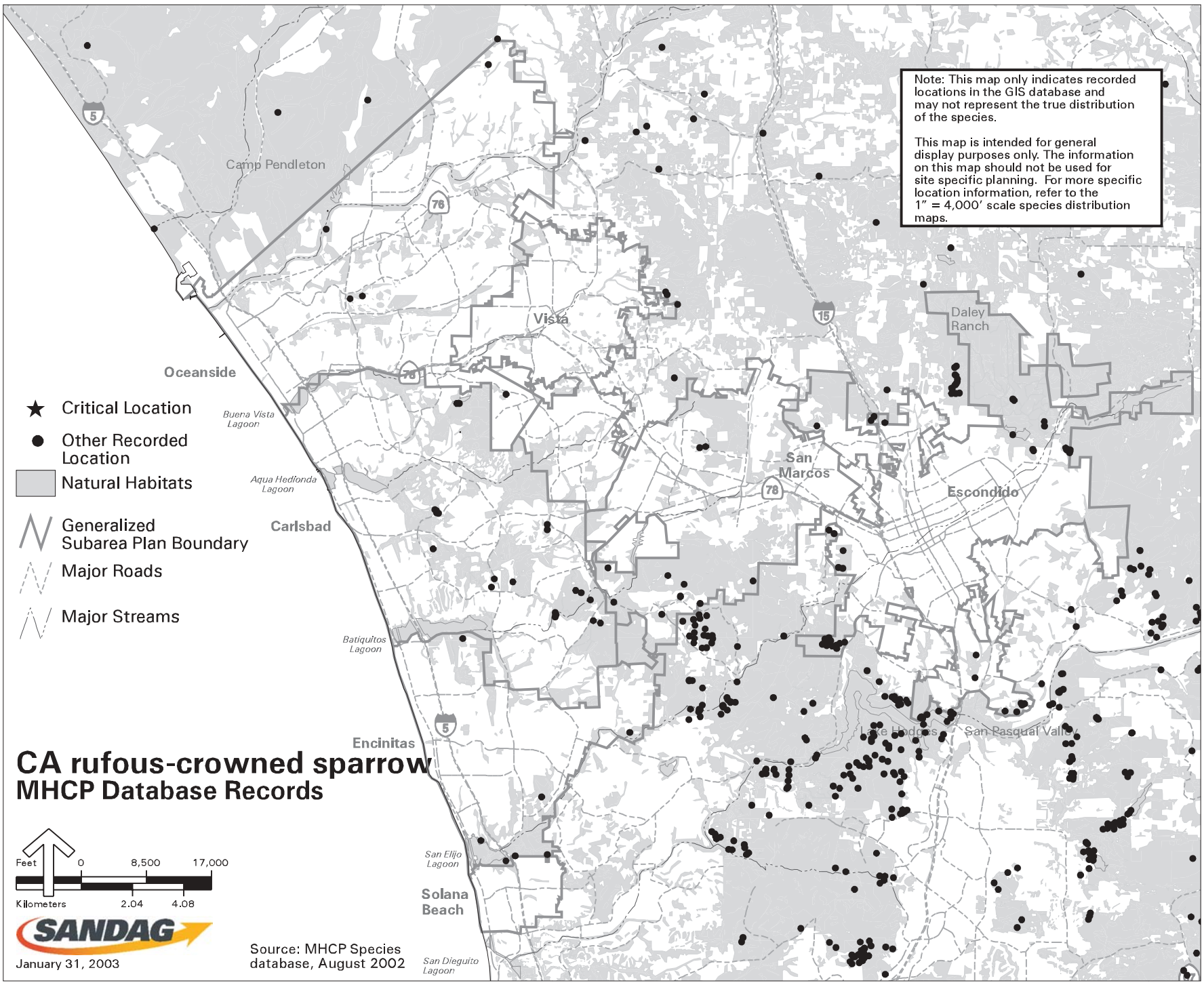
Conditions. Manage reserve areas by controlling factors detrimental to rufous-crowned sparrow habitat, including livestock overgrazing, fire prevention and management methods, presence of brown-headed cowbirds, and unnaturally abundant predators. As a mitigation option for project impacts on rufous-crowned sparrow habitat, restore coastal sage scrub habitats in disturbed areas adjacent to occupied habitat.

Background

Distribution, Abundance, and Trends. The southern California rufous-crowned sparrow is a common resident of scrub habitats of the coastal plain of southern California and Baja California, Mexico. Rufous-crowned sparrows are locally common in open coastal sage scrub in San Diego County, and they occur throughout the MHCP area wherever suitable coastal sage scrub habitat occurs in relatively large blocks (see MHCP Database Records Map). Rufous-crowned sparrow habitat includes open coastal sage scrub, often on slopes that are steep, sparsely vegetated, and rocky or recently burned. There are no major populations or critical locations in the MHCP study area.

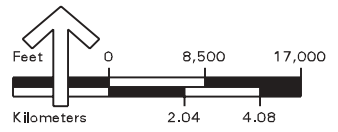
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- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- Generalized Subarea Plan Boundary
- Major Roads
- Major Streams

CA rufous-crowned sparrow MHCP Database Records



Source: MHCP Species database, August 2002

San Dieguito Lagoon

Threats and Limiting Factors. The Southern California rufous-crowned sparrow is vulnerable to loss, degradation, and fragmentation of coastal sage scrub habitat and may be sensitive to edge effects.

Special Considerations. This species apparently exists in patchy landscape, including steep slopes with low shrub volume. It often nests near rocky outcroppings or other openings in the scrub habitat.

Conservation Analysis

Conservation and Take Levels. Moderate conservation (about 61%) of the coastal scrub ecological community (Section 3.2) should benefit this species. The FPA is expected to conserve about 51 of 75 point localities (67%) (Table 4-61).

Preserve Configuration Issues. The ability of the rufous-crowned sparrow to disperse is not substantially reduced relative to existing conditions. The preserve includes 5,185 acres (68%) of the potential rufous-crowned sparrow habitat contained by the BCLA (Table 4-61). The BCLA was delineated to include the most important large blocks of habitat, critical locations, and areas of high biological value. Conservation of the BCLA therefore provides a useful measure for comparing the proposed preserve to a biologically preferred preserve design, given the existing degree of fragmentation in the plan area. Consequently, although about 61% of total potential habitat will be preserved, approximately 68% of the most important potential habitat will be conserved. Development will reduce the size of some coastal sage scrub blocks and thereby increase edge effects. However, restoration and enhancement of coastal sage scrub in the plan area should partially offset these effects. Conservation of an additional 400-500 acres of coastal sage scrub in the unincorporated gnatcatcher core area will also benefit this species.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to maintain population viability of the southern California rufous-crowned sparrow through increased management and monitoring. The MHCP preserve and policies will maintain consistency with other management goals for species. The MHCP will increase regional coordination and funding for monitoring and management, which may improve current management of rufous-crowned sparrow habitat and species stability.

Special Considerations. None identified.

Table 4-61

**SUMMARY OF CONSERVATION FOR
SOUTHERN CALIFORNIA RUFOUS-CROWNED SPARROW**

City	Habitat Acres Conserved ¹		Location Points Conserved ²
	Net Acres (%)	BCLA Acres (%)	
Carlsbad	1,470 (65%)	1,398 (67%)	7 (61%)
Encinitas	631 (67%)	572 (67%)	5 (71%)
Escondido	1,576 (68%)	1,454 (82%)	31 (74%)
Oceanside	692 (51%)	603 (67%)	4 (67%)
San Marcos	1,065 (53%)	1,034 (57%)	4 (42%)
Solana Beach	6 (53%)	6 (79%)	None known
Vista	140 (55%)	118 (72%)	None known
MHCP Total ³	5,580 (61%)	5,185 (68%)	51 of 75 (67%)

¹ Habitat includes coastal sage scrub and coastal sage scrub/chaparral mix vegetation communities.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. None identified.

Belding's Savannah Sparrow*Passerculus sandwichensis beldingi***USFWS: Federal Species of Concern (former Category 2 Candidate)****CDFG: Endangered****MHCP: Obligate Wetland Species****Conservation Goals**

Ensure species persistence within the plan area and contribute to species recovery. Enhance habitat quality, increase species abundance, and contribute to regional population viability.

Conservation Strategy

Conserve existing major populations and critical locations of Belding's Savannah sparrow and additional salt marsh and mudflat habitat in Encinitas, Carlsbad, and Oceanside. Conserve all existing habitat to maintain potential for natural recolonization. Enhance disturbed salt marsh habitat to increase habitat quality and increase population size. Provide appropriate upland buffers for all known populations and potential habitat (minimum of 50 feet and up to 100 feet where possible). Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP will adequately conserve this species by conserving 100% of salt marsh habitat, 74% of recorded location points, and all critical locations, and by managing preserve areas consistent with species' needs. Surveys indicate this species is increasing in most estuaries and lagoons, particularly those managed to restore or maintain full tidal action (Batiquitos and San Elijo).

Conditions. The following conditions must also be met by subarea plans to adequately conserve this species:

1. As part of the project review process (e.g., CEQA) for individual projects within the MHCP area, a qualified biologist possessing a Section 10(a)1(A) research permit for this species must survey all areas containing potentially suitable habitat (salt marsh, mudflats, and coastal strands) using approved survey protocols. Surveys shall occur prior to any proposed impact regardless of location inside or outside of the FPA. Surveys shall be conducted when impacts could occur as a result of direct or indirect impacts by placement of the project in or adjacent to occupied or potentially suitable habitats.
2. Implement wetland mitigation standards that require a minimum 4:1 replacement ratio for unavoidable impacts to occupied habitat for this species, with particular

- emphasis on restoring upper marsh zones preferred by this species. Control recreational use by humans within pickleweed habitats to reduce trampling.
3. Manage occupied areas to control activities that degrade Belding's Savannah sparrow habitat, including human disturbance, filling and diking of salt marsh habitat, predation of adults and nests by introduced feral and domestic animals (e.g., dogs and cats), adverse changes in water level, water quantity and quality, and introduction of pesticides and other contaminants into preserve wetlands.
 4. As mitigation for project impacts, enhance, restore, or create salt marsh habitat within the preserve to allow for the expansion of Belding's Savannah sparrow populations into new locations.
 5. Protect upland buffer areas to minimize edge effects. Buffer areas should be a minimum of 50 feet and up to 100 feet wide where possible.

Background

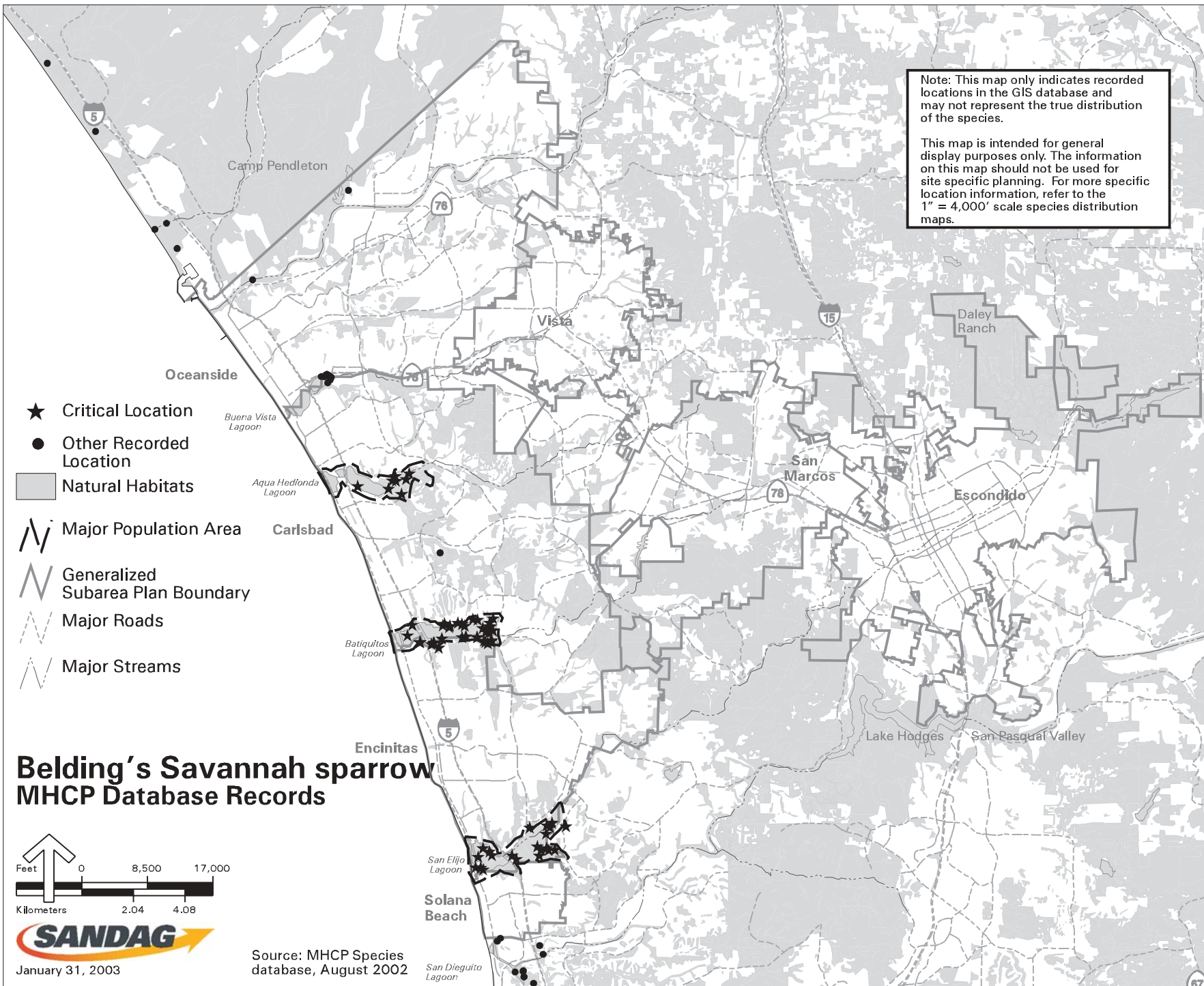
Distribution, Abundance, and Trends. This salt marsh sparrow is distributed along the coastline from Santa Barbara County south to northern Baja California, Mexico. A year-round resident in San Diego County, the Belding's Savannah sparrow lost about 75% of its habitat by the 1970's and was listed as endangered in 1974. The population in California has since gradually increased, from 1084 pairs in 1973 to 1,610 pairs in 1977 to 2,274 pairs in 1986 (Zembal et al. 1987) to 2,902 pairs in 2001 (Zembal and Hoffman 2002). Most salt marshes within the MHCP area support the species, including all 4 lagoons (see MHCP Database Records Map). In 2001, Zembal and Hoffman recorded the following number of nesting pairs in MHCP lagoons: 6 at Buena Vista, 22 at Agua Hedionda, 66 at Batiquitos, and 75 at San Elijo. This is the highest number of breeding pairs in the MHCP since surveys began in 1973.

Belding's Savannah sparrow is restricted to salt marsh, mudflat, and low coastal strand vegetated habitats, especially those densely vegetated with pickleweed (*Salicornia virginica*). Salt marsh habitat within Agua Hedionda, Batiquitos, and San Elijo lagoons (in Encinitas and Carlsbad) are considered major populations and critical areas (Unitt, 1984).

Threats and Limiting Factors. Belding's Savannah sparrow populations historically declined due to destruction, fragmentation, and alteration of salt marsh. This species may also be impacted by human disturbance and predation by introduced domestic and exotic predators (Zembal et al. 1987). Zembal and Hoffman (2002) observed that disturbance by fishermen, vehicles, pet walkers, and other visitors was quite severe around portions of MHCP lagoons and was preventing the species from nesting in some areas. They also noted muted tidal flows at Agua Hedionda and flooding of pickleweed flats with freshwater behind a dike at San Elijo as constraints to those populations. They credited the recent restoration and management of Batiquitos Lagoon toward a full tidal system with nearly doubling the breeding population of Belding's savannah sparrows there.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location

■ Natural Habitats

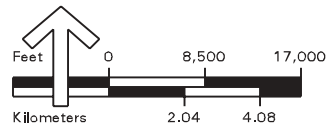
▮ Major Population Area

▮ Generalized Subarea Plan Boundary

▮ Major Roads

▮ Major Streams

Belding's Savannah sparrow MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Dieguito Lagoon

Special Considerations. Recent studies suggest that exchange of individuals between salt marshes is low and is reflected in genetic differences between populations (A. Powell personal communication).

Conservation Analysis

Conservation and Take Levels. Due to maximum conservation of the lagoon and marsh ecological community (Section 3.2), the expected level of take of this species or its habitat is very low. All potential breeding habitat (280 acres) and most known localities (55 of 74, 74%) in the study area will be conserved, and the majority will be actively managed as part of the preserve (Table 4-62).

Preserve Configuration Issues. The MHCP will not adversely affect connectivity of Belding's Savannah sparrow habitat, or the ability of sparrows to disperse between patches of suitable habitat, relative to existing conditions. The habitat of the Savannah sparrow is naturally patchily distributed, with coastal salt marsh habitat and mudflats separated by upland habitats across which sparrows may have formerly dispersed. Upland habitats between the four lagoons have already been mostly removed by development. Limited dispersal between lagoons may still occur, although genetic studies have shown some divergence among populations (A. Powell personal communication). The MHCP preserve design allows continued access by coyotes and other larger predators to lagoon systems, thereby helping maintain ecological balance and avoiding large population increases of smaller predators (e.g., skunks and foxes) that may prey on Savannah sparrow nests. Substantial upland buffer areas around suitable breeding habitat should be protected wherever possible to minimize edge effects and human disturbance. Some existing areas of pickleweed are too narrow and fragmented to support the species at present (e.g., around portions of Buena Vista Lagoon), which could be rectified by restoration and management.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to maintain and possibly enhance population viability of the species and therefore contribute to species recovery. The MHCP preserve and policies are consistent with current recovery planning and management goals for the species. The MHCP will increase regional coordination and funding for monitoring and management, which may improve current management of salt marsh and mudflat habitats and species stability.

Special Considerations. Adequate buffer areas should be maintained around salt marsh and mudflat habitats to minimize disturbances and edge effects. Although this species occurs in greatest numbers and densities in marshes with full tidal flushing, they do not nest abundantly on frequently flooded substrates, preferring pickleweed habitat in upper marsh zones (Zembel and Hoffman 2002). Higher marsh zones are most reduced by human impacts, being easiest to fill and convert to other uses, and receive the greatest human recreational use. Restoration of upper marsh zones, for example by removing berms, dikes, or roads that have cut off tidal influence to these areas, should be a high priority at lagoon reserves.

Table 4-62

**SUMMARY OF CONSERVATION FOR
BELDING'S SAVANNAH SPARROW**

City	Habitat Acres Conserved¹	Location Points Conserved²	Major Populations Conserved	Critical Locations Conserved
Carlsbad	147 (100%)	31 (67%)	Agua Hedionda and Batiquitos Lagoons conserved at 100%	Agua Hedionda and Batiquitos Lagoons conserved at 100%
Encinitas	123 (100%)	20 (91%)	San Elijo and Batiquitos Lagoons conserved at 100%	San Elijo and Batiquitos Lagoons conserved at 100%
Escondido	None present	None present	None present	None present
Oceanside	4 (100%)	4 (67%)	None known	None known
San Marcos	None present	None present	None present	None present
Solana Beach	6 (100%)	None known	None known	None known
Vista	None present	None in database	None known	None known
MHCP Total ³	280 (100%)	55 of 74 (74%)	All Major Populations Conserved	Critical breeding habitat in coastal lagoons is 100% conserved

¹ Habitat includes southern coastal salt marsh and mudflat vegetation communities.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Conduct detailed studies of interpopulation dispersal and genetics of conserved Belding's Savannah sparrow populations.
2. Use translocation methods if deemed necessary.

Large-billed Savannah Sparrow

Passerculus sandwichensis rostratus

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: Species of Special Concern

MHCP: Obligate Wetland Species

Conservation Goals

Enhance habitat quality, allow for natural recolonization, and increase species abundance in the plan area. Contribute to regional population viability and species recovery.

Conservation Strategy

Conserve existing critical locations of large-billed Savannah sparrow wintering habitat in salt marsh and mudflat habitat in Encinitas, Carlsbad, and Oceanside. Conserve all existing habitat to maintain potential for natural recolonization. Include within the preserve system critical wintering locations in the coastal lagoons. Provide appropriate upland buffers for known areas of suitable habitat. Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Covered.

Rationale. The MHCP will adequately conserve this species by conserving 100% of salt marsh habitat and critical locations, and by managing preserve areas consistent with species' needs. There are no location points in the MHCP database.

Conditions. Not applicable, although this species will benefit from management designed for the Belding's savannah sparrow.

Background

Distribution, Abundance, and Trends. This wintering subspecies of Savannah sparrow typically inhabits coastal marshes and beaches and has remained scarce during the 1980s, although small numbers have appeared intermittently along the southern California coast and at the Salton Sea (Unitt 1984). Documented locations for large-billed Savannah sparrow are lacking for the MHCP area (no known localities in database). Large-billed Savannah sparrow is restricted to salt marsh, mudflat, and low coastal strand vegetation during the winter. Although there are no major populations of this species in the study area, the Agua Hedionda, Batiquitos, and San Elijo lagoons are considered critical wintering locations.

Threats and Limiting Factors. The large-billed Savannah sparrow population decline is attributed to breeding habitat alteration in the Gulf of California and lower Colorado River, as well as modification of wintering habitats in California (Unitt 1984).

Special Considerations. This species will likely benefit from management and monitoring actions designed for Belding's savannah sparrow.

Conservation Analysis

Conservation and Take Levels. Due to maximum conservation of the lagoon and marsh ecological community (Section 3.2), the expected level of take of this species or its habitat is very low. All potential wintering habitat (280 acres) in the study area will be conserved, and the majority will be actively managed as part of the preserve (Table 4-63). There are no documented localities for this species in the MHCP; therefore, no take of point localities would occur.

Preserve Configuration Issues. The MHCP will not adversely affect connectivity of large-billed Savannah sparrow habitat, or the ability of sparrows to disperse between patches of suitable habitat, relative to existing conditions. The habitat of the large-billed Savannah sparrow is naturally patchily distributed, with coastal salt marsh habitat and mudflats separated by upland habitats across which sparrows may have formerly dispersed. Upland habitats between the four lagoons have already been mostly removed by development. Substantial upland buffer areas around suitable wintering habitat should be protected wherever possible.

Effects on Population Viability and Species Recovery. If large-billed Savannah sparrows were to recolonize their former wintering habitat within the MHCP, then implementation of the MHCP would help maintain and possibly enhance population viability of the species and therefore contribute to species recovery.

Special Considerations. Adequate buffer areas should be maintained around salt marsh and mudflat habitats to minimize disturbances and edge effects.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. None identified.

Table 4-63

**SUMMARY OF CONSERVATION FOR
LARGE-BILLED SAVANNAH SPARROW**

City	Habitat Acres Conserved¹	Critical Locations Conserved²
Carlsbad	147 (100%)	Agua Hedionda and Batiquitos Lagoons conserved at 100%
Encinitas	123 (100%)	San Elijo and Batiquitos Lagoons conserved at 100%
Escondido	None present	None present
Oceanside	4 (100%)	None known
San Marcos	None present	None present
Solana Beach	6 (100%)	None known
Vista	None present	None known
MHCP Total ³	280 (100%)	Critical breeding habitat in coastal lagoons is 100% conserved

¹ Habitat includes southern coastal salt marsh and mudflat vegetation communities.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Bell's Sage Sparrow

Amphispiza belli belli

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: Species of Special Concern

Conservation Goals

Ensure persistence of Bell's sage sparrow in the plan area. Contribute to regional population viability and species recovery by enhancing habitat quality.

Conservation Strategy

Conserve existing suitable habitat for Bell's sage sparrow in the coastal scrub communities. Include within the preserve system documented populations of Bell's sage sparrow within large blocks of habitat. Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Covered.

Rationale. The MHCP may adequately conserve this species by conserving about 61% of potential habitat, including 68% of habitat within the BCLA and several larger blocks suitable for the species, along with 80% of recorded point locations in the study area. This species is susceptible to adverse effects of habitat fragmentation and will likely decline under MHCP implementation. However, the MHCP will conserve some relatively large blocks of habitat contiguous with larger suitable habitat areas outside the area, and the species is expected to persist in these areas. Conservation of the additional 400-500 acres of coastal sage scrub in the unincorporated core area will also benefit this species.

Conditions. Manage reserve areas to restrict activities that degrade Bell's sage sparrow habitat, including habitat alteration, spraying of pesticides, brown-headed cowbird parasitism, and introduction of predators (e.g., domestic dogs and cats). Restrict human access to areas known to support relatively large concentrations of sage sparrow during the breeding season (February 15 to August 31).

Background

Distribution, Abundance, and Trends. Bell's sage sparrows range from the Cascade Mountains to Baja California, Mexico, but are locally uncommon in coastal sage scrub and open chaparral in San Diego County (Johnson and Marten 1992). Within the MHCP area, documented Bell's sage sparrow locations include north and southeast Carlsbad, east Encinitas, north and south San Marcos, and south Escondido (see MHCP Database Records Map). Bell's sage sparrow habitat includes dense coastal sage scrub and open

chaparral, particularly in large, unfragmented blocks in inland areas. There are no major populations or critical locations in the MHCP study area.

Threats and Limiting Factors. Bell's sage sparrow is vulnerable to loss, degradation, and fragmentation of coastal sage scrub habitat.

Special Considerations. None identified.

Conservation Analysis

Conservation and Take Levels. The moderate level of conservation of the coastal scrub ecological community (Section 3.2) should benefit this species. The FPA p includes 8 of 10 point localities (80%) (Table 4-64).

Preserve Configuration Issues. The ability of the Bell's sage sparrow to disperse is not substantially reduced relative to existing conditions. However, this species seems more sensitive to fragmentation and edge effects than other coastal sage scrub species (J. Lovio and D. Bolger, personal communications) and may not persist in the more fragmented portions of the reserve. The preserve includes 5,185 acres (68%) of the potential Bell's sage sparrow habitat contained by the BCLA (Table 4-64). The BCLA was delineated to include the most important large blocks of habitat, critical locations, and areas of high biological value. Conservation of the BCLA therefore provides a useful measure for comparing the proposed preserve to a biologically preferred preserve design, given the existing degree of fragmentation in the plan area. Consequently, although about 61% of total potential habitat will be preserved, approximately 68% of the most important potential habitat will be conserved. Development will reduce the size of some habitat blocks and thereby increase edge effects. However, restoration and enhancement of coastal sage scrub in the plan area should partially offset these effects.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to maintain and possibly enhance population viability of the Bell's sage sparrow through restoration and increased management and monitoring. Although the species may not persist in more fragmented portions of the reserve, it is expected to remain in larger habitat blocks, such as eastern Carlsbad, southern San Marcos, and north and south Escondido. The MHCP preserve and policies will maintain consistency with other recovery planning and management goals for species. The MHCP will increase regional coordination and funding for monitoring and management, which may improve current management of Bell's sage sparrow habitat and species stability.

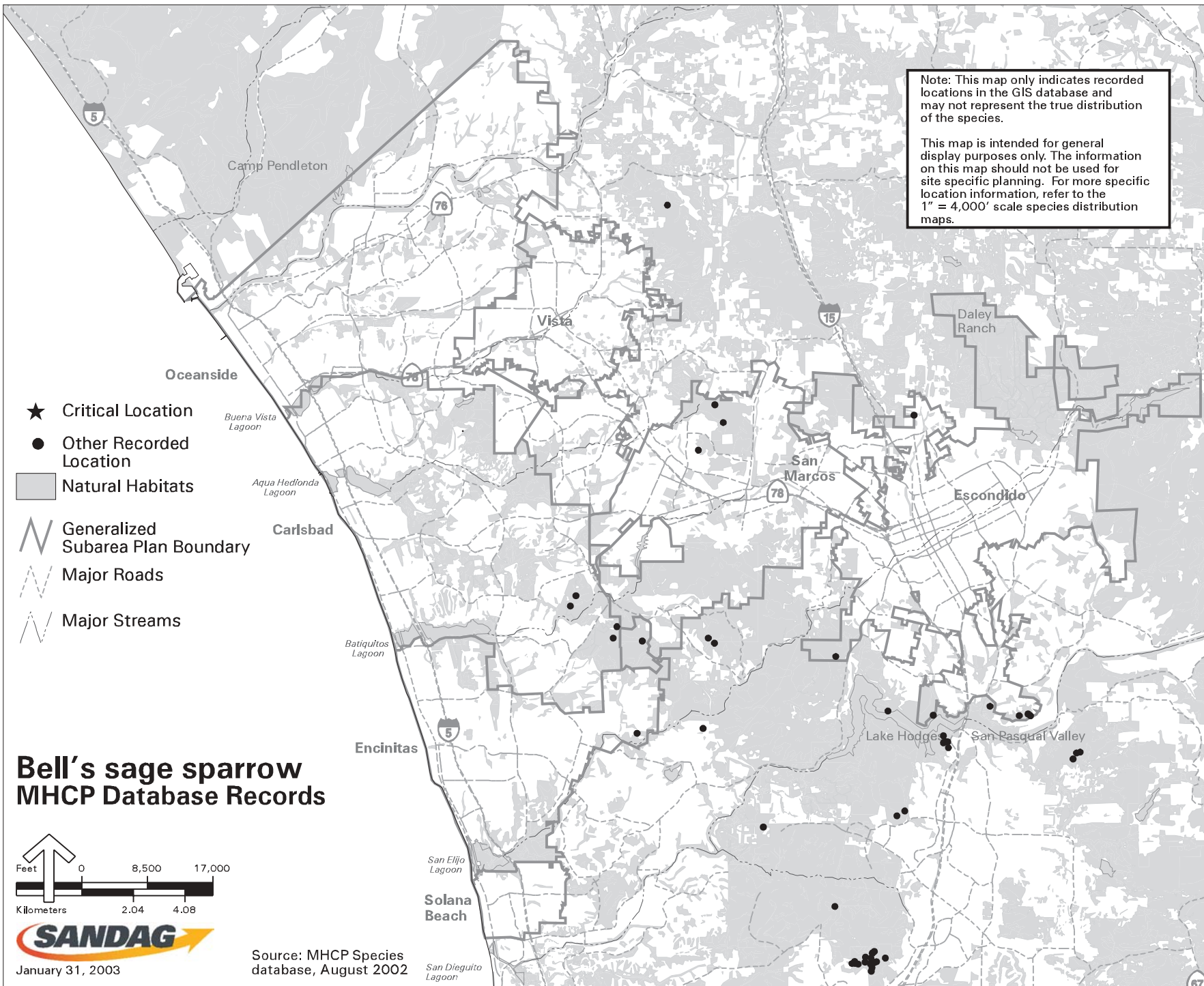
Special Considerations. None identified.

Adaptive Management Program

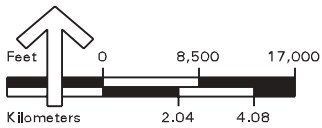
In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



Bell's sage sparrow MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Dieguito Lagoon

Table 4-64

**SUMMARY OF CONSERVATION FOR
BELL'S SAGE SPARROW**

City	Habitat Acres Conserved ¹		Location Points Conserved ²
	Net Acres (%)	BCLA Acres (%)	
Carlsbad	1,470 (65%)	1,398 (67%)	None in database
Encinitas	631 (67%)	572 (67%)	0 (0%)
Escondido	1,576 (68%)	1,454 (82%)	5 (88%)
Oceanside	692 (51%)	603 (67%)	None in database
San Marcos	1,065 (53%)	1,034 (57%)	3 (92%)
Solana Beach	6 (53%)	6 (79%)	None in database
Vista	140 (55%)	118 (72%)	None in database
MHCP Total ³	5,580 (61%)	5,185 (68%)	8 of 10 (80%)

¹ Habitat includes coastal sage scrub and coastal sage scrub/chaparral mix vegetation communities.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Conduct detailed studies to define local demographic and habitat requirements.

Grasshopper Sparrow

Ammodramus savannarum

USFWS: None

CDFG: None

Conservation Goals

Ensure persistence of grasshopper sparrows in the plan area. Contribute to regional population viability and species recovery by enhancing habitat quality.

Conservation Strategy

Conserve existing suitable habitat for grasshopper sparrows in grassland communities. Include within the preserve system all native grassland and potential nonnative grassland habitat suitable for use by grasshopper sparrows. Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, due to insufficient conservation.

Rationale. Levels of conservation expected under the MHCP and subarea plans do not meet the conservation goals for this species. Few large grassland areas will be conserved. Only about 32% of the extant grasslands in the study area (including 47% of grasslands in the BCLA) and 52% of the known location points are expected to be conserved. Critical grassland areas are partially conserved and will become further fragmented.

Conditions. Not applicable.

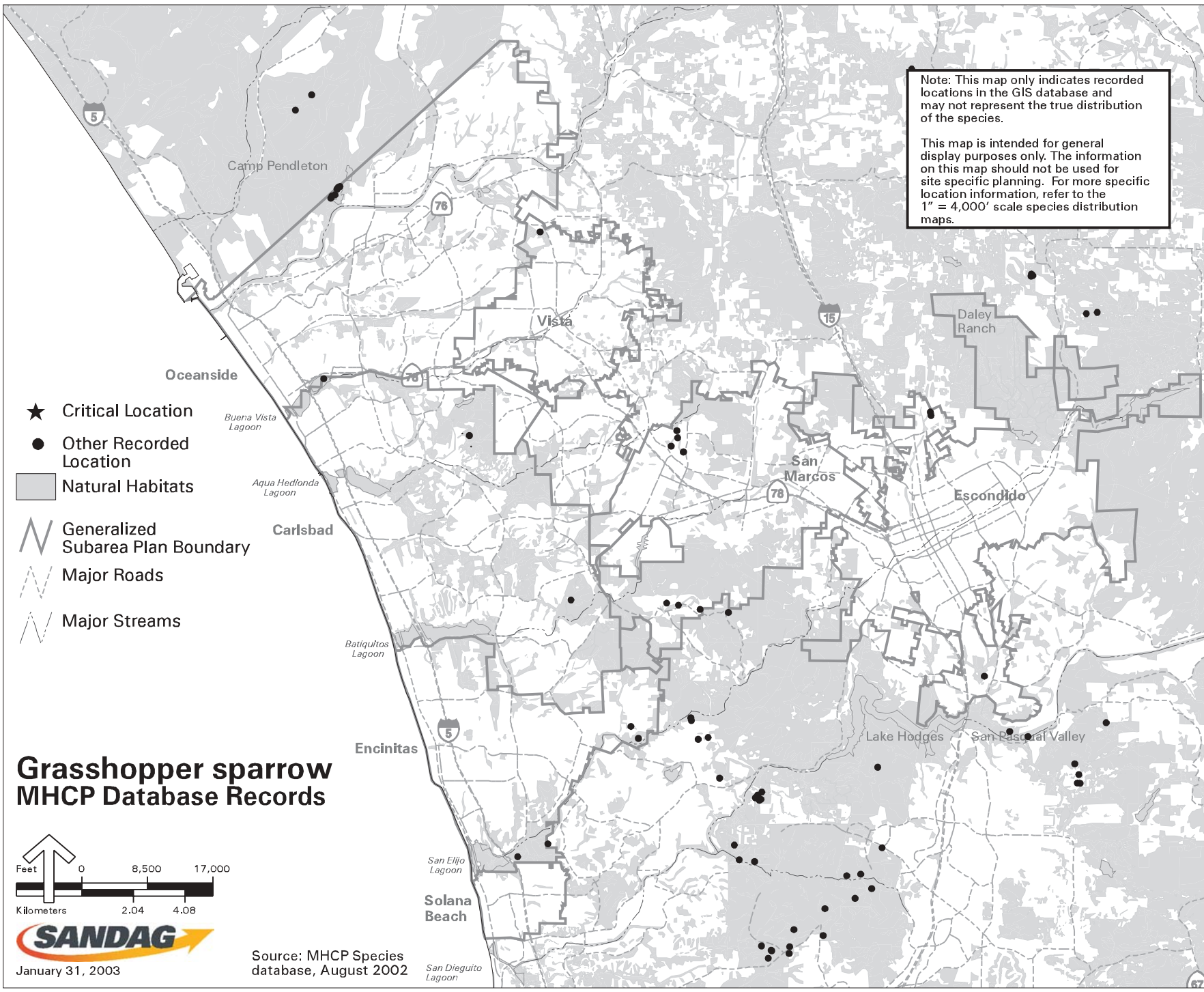
Background

Distribution, Abundance, and Trends. The grasshopper sparrow is a spring/summer resident distributed throughout the continental United States. San Diego County represents the southern extent of the species' breeding range along the west coast and is a rare winter resident in the county (Unitt 1984; Wilbur 1987; Byers et al. 1995). Within the MHCP area, documented grasshopper sparrow locations include the area around Buena Vista Lagoon, north Carlsbad, north and south San Marcos, south and east Encinitas, and south Escondido (see MHCP Database Records Map). This species is restricted to grasslands, especially those dominated by native grasses and forbs. Scattered shrubs are used for singing perches. Although there are no major populations within the MHCP, the limited grassland areas available with suitable habitat are consider critical areas.

Threats and Limiting Factors. The grasshopper sparrow is vulnerable to habitat loss resulting from the rapid decline of suitable grassland breeding habitat in San Diego County (Everett 1979; Unitt 1984).

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



Grasshopper sparrow MHCP Database Records

Feet: 0, 8,500, 17,000

 Kilometers: 0, 2.04, 4.08

 January 31, 2003

Source: MHCP Species database, August 2002

Special Considerations. The grasshopper sparrow may form semicolonial breeding groups.

Conservation Analysis

Conservation and Take Levels. The marginal level of conservation (32%) of the grasslands ecological community (Table 3-2 and Section 3.2) will not provide substantial benefit to this species. The FPA preserve design will include 12 of 23 point localities (52%) (Table 4-65).

Preserve Configuration Issues. The MHCP will not protect the majority of grassland habitat. Although the total acreage of unprotected grasslands is substantial, the grasslands that are included in the preserve design retain good connectivity in a few areas. However, the FPA provides marginal conservation in the critical grassland areas of Carlsbad, Encinitas, Escondido, and Oceanside.

The preserve includes only 1,565 acres (47%) of the potential grasshopper sparrow habitat contained by the BCLA (Table 4-65). The BCLA was delineated to include the most important large blocks of habitat, critical locations, and areas of high biological value. Conservation of the BCLA therefore provides a useful measure for comparing the proposed preserve to a biologically preferred preserve design, given the existing degree of fragmentation in the plan area. Consequently, although about 32% of total potential habitat will be preserved, approximately 47% of the most important potential habitat will be conserved. Some of this acreage will be actively or passively converted to coastal sage scrub, which may further reduce habitat value in a few areas. Additional acres included in the FPA but not in the BCLA generally are isolated, small, or degraded fragments of habitat that may be of lesser biological value.

Effects on Population Viability and Species Recovery. Implementation of the MHCP might allow for continued persistence of the grasshopper sparrow in the plan area; however, the level of conservation is not expected to contribute substantially to regional population viability or species recovery. The number of grasshopper sparrows supported by the preserve is expected to be lower than the number currently supported under existing conditions due to the substantial loss of grassland habitat.

Special Considerations. Loss of habitat is currently the most significant limiting factor.

Adaptive Management Program

Not applicable.

Table 4-65

**SUMMARY OF CONSERVATION FOR
GRASSHOPPER SPARROW**

City	Habitat Acres Conserved ¹		Location Points Conserved ²	Critical Locations Conserved
	Net Acres (%)	BCLA Acres (%)		
Carlsbad	490 (38%)	478 (40%)	3 (100%)	Grasslands in north, central, and southeast Carlsbad are partially conserved
Encinitas	109 (53%)	101 (61%)	3 (75%)	Grasslands in south and east Encinitas are partially conserved
Escondido	401 (67%)	393 (88%)	1 (33%)	Grasslands in north and south Escondido are partially conserved
Oceanside	570 (33%)	527 (44%)	4 (80%)	Grasslands adjacent to Camp Pendleton are partially conserved
San Marcos	91 (13%)	50 (26%)	1 (13%)	Grasslands in San Marcos are poorly conserved
Solana Beach	None present	None present	None present	None present
Vista	27 (4%)	16 (13%)	None known	None known
MHCP Total ³	1,687 (32%)	1,565 (47%)	12 of 23 (52%)	Grassland habitats are partially conserved, all critical areas will be partially taken, and preserved grasslands will be substantially fragmented

¹ Habitat includes grassland vegetation communities. Only a small, unmapped portion of these acreages are native grasslands; however, some nonnative grasslands may also be suitable grasshopper sparrow habitat.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Tricolored Blackbird

Agelaius tricolor

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: Species of Special Concern

MHCP: Obligate Wetlands Species

Conservation Goals

Ensure persistence of the tricolored blackbird in the plan area. Enhance habitat quality and increase the number of breeding colonies and total population size in the plan area. Contribute to regional population viability and species recovery.

Conservation Strategy

Conserve existing tricolored blackbird wetlands breeding habitat and grasslands foraging habitat, and tricolored blackbird point localities in the MHCP. Include within the preserve system existing populations of tricolored blackbird and other potential habitat. Provide appropriate upland buffers (minimum of 50 feet and up to 100 feet wide where possible) for all known populations. Protect potential grasslands and agricultural foraging habitat in vicinity of breeding habitat. Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, due to insufficient conservation.

Rationale. Levels of conservation expected under the MHCP subarea plans do not meet the conservation goals for this species. Few large grassland areas or agricultural areas will be conserved near potential nesting habitats (marshes). Only about 32% of the extant grasslands in the study area are expected to be conserved, and the plan does not protect agricultural lands from development. Critical grassland areas near marsh habitats are partially conserved and will become further fragmented. Persistence of nesting populations of tricolored blackbird cannot be assured within the MHCP area.

Conditions. Not applicable.

Background

Distribution, Abundance, and Trends. The tricolored blackbird distribution is centered in the Sacramento/San Joaquin valleys of California. The species is a common to abundant, but highly localized resident in San Diego County (Beedy et al. 1991; Unitt 1984). Within the MHCP area, documented tricolored blackbird locations include San Luis Rey River/Pilgrim Creek; Buena Vista, Batiquitos, and San Elijo lagoons; and Kit Carson Park in Escondido (see MHCP Database Records Map). This species breeds colonially in freshwater marsh and riparian scrub habitats and forms large nomadic flocks in fall and winter. Tricolored blackbirds feed in grasslands and agricultural fields adjacent to the

nesting colony. There are no known major populations or critical locations in the plan area. However, because this species is nomadic and colonies occur sporadically, major populations and critical locations are difficult to identify.

Threats and Limiting Factors. The number and size of tricolored blackbird breeding colonies have declined with loss of wetland habitats. The state population size is less than 10,000, an 89% decline since the 1930s. This species is also vulnerable to contamination of wetlands, human disturbance, and massive nest loss by a large number of avian and mammalian predators (Beedy et al. 1991).

Special Considerations. Most San Diego County breeding sites are used on an irregular or inconsistent schedule as a result of this species' highly nomadic behavior.

Conservation Analysis

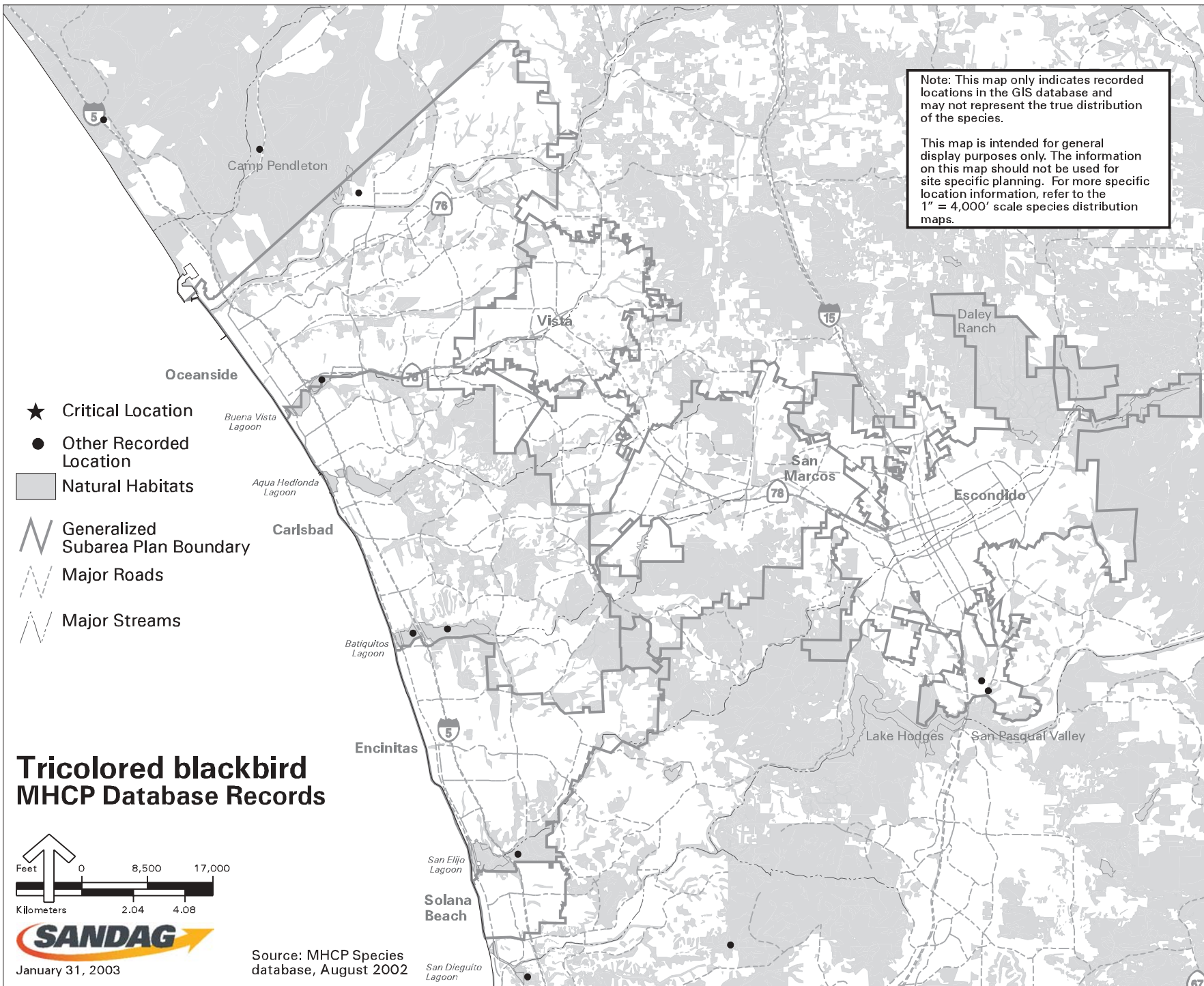
Conservation and Take Levels. The maximum conservation of the riparian ecological community and the lagoon and marsh ecological community (Section 3.2) might benefit this species by protecting potential nesting habitat. However, the low level of conservation of the grassland community required for foraging will not benefit this species. All riparian scrub and freshwater marsh nesting habitat is 100% conserved, while only 32% of grassland foraging habitat is expected to be conserved. The plan neither encourages nor discourages conversion of agricultural lands to other land uses, relative to existing conditions, but availability of agricultural areas for foraging is also likely to decrease over time as cities continue to develop. Most point localities (5 of 7, 71%) will be conserved (Table 4-66).

Preserve Configuration Issues. While the MHCP preserve does not affect the ability of this species to disperse to suitable breeding habitat relative to existing conditions, a substantial amount of potential grasslands foraging habitat will not be protected. Much of the grassland habitat that will be lost is within reasonable foraging distance (up to 4 miles) of the nesting habitat (Orians 1961). Riparian species are especially vulnerable to edge effects due to the linear nature of riparian habitat (high edge-to-core area ratio). Therefore, substantial upland buffers should be provided wherever possible.

Effects on Population Viability and Species Recovery. Implementation of the MHCP will protect a substantial portion of the potential breeding habitat for the species in the plan area, but available foraging habitat within the plan area will decline substantially. Provided that substantial foraging habitat will remain on Camp Pendleton and in unincorporated areas within 4 miles of breeding habitat in the plan area, tricolored blackbird populations may be maintained sporadically in portions of the plan area. However, the substantial decline in foraging habitats is expected to adversely affect this species, possibly precluding future breeding colonies in the area.

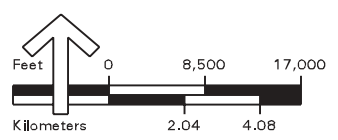
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- Generalized Subarea Plan Boundary
- Major Roads
- Major Streams

Tricolored blackbird MHCP Database Records



Source: MHCP Species database, August 2002

Table 4-66

**SUMMARY OF CONSERVATION FOR
TRICOLORED BLACKBIRD**

City	Habitat Acres Conserved ¹		Location Points Conserved ²
	Net Acres (%)	BCLA Acres (%)	
Carlsbad	1,035 (56%)	970 (58%)	2 (100%)
Encinitas	448 (82%)	422 (87%)	1 (100%)
Escondido	570 (74%)	460 (89%)	1 (50%)
Oceanside	1,577 (58%)	1,236 (65%)	1 (50%)
San Marcos	207 (25%)	80 (36%)	None known
Solana Beach	3 (100%)	3 (100%)	None known
Vista	103 (13%)	26 (21%)	None known
MHCP Total ³	3,943 (53%)	3,198 (65%)	5 of 7 (71%)

¹ Habitat includes riparian scrub, freshwater marsh, and grassland vegetation communities. Not all grasslands may be within suitable distance to breeding habitat.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Special Considerations. Sufficient grassland and agricultural foraging habitat is necessary in the general vicinity of nesting colonies.

Adaptive Management Program

Not applicable.

Townsend's Western Big-eared Bat

Corynorhinus townsendii pallescens

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: Species of Special Concern

Conservation Goals

Ensure species persistence in the plan area. Provide maximum protection of roost sites. Enhance habitat quality and increase the number of suitable roost sites. Contribute to regional population viability and species recovery.

Conservation Strategy

Conserve existing known and potential roost sites, oak and riparian woodlands, and chaparral habitats in the MHCP. Include within the open space preserve system potential roost sites of Townsend's western big-eared bat and foraging habitat immediately adjacent to roost sites. Minimize human disturbance near potential roost sites. Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, due to insufficient information.

Rationale. It is impossible to determine adequacy of conservation for this species based on existing information.

Conditions. Not applicable.

Background

Distribution, Abundance, and Trends. This bat is distributed throughout California, but details of its distribution are not well known. This species is known from Barrett Dam and Ramona. In the MHCP study area, Townsend's western big-eared bats have been reported from Escondido and north San Marcos (Bond 1977). Townsend's western big-eared bats roost in caves, mines, large tree hollows, tunnels, buildings, and other man-made structures. Primary habitats include oak woodland, riparian woodland, and chaparral, but roosts are the limiting factor. This species hibernates from October to April. There are no major populations in the MHCP (no known localities in database). While there are no known active roost sites, any that are found would be considered critical areas.

Threats and Limiting Factors. Sensitivity to human disturbance at roosts is a major factor in the decline of this species (Williams 1986; P. Brown and K. Miner personal communication).

Special Considerations. Roost sites must be free of human disturbance. A water source near the roost site is required.

Conservation and Take Levels. It is impossible to quantify expected levels of conservation and take for this species based on existing information. Maximum conservation of the riparian ecological community (100%) and the high level of conservation of the oak woodland ecological community (79%) and chaparral ecological community (71%) (Section 3.2) might benefit this species. However, an abundance of suitable roost sites is required to support the population. It is not possible to determine the number of potential roost sites that are conserved because the habitat was not mapped at that scale. There is only one record of this species in the database. The point locality occurs in southwest San Marcos and is conserved by the FPA (Table 4-67).

Preserve Configuration Issues. Riparian habitats including riparian woodlands form a backbone for much of the preserve design in the MHCP. Chaparral and oak woodland habitats are typical upland habitats adjacent to the riparian habitat; therefore, contiguity of bat foraging habitat is good within the FPA. Proximity of roosting habitat to water also is critical for this species. While the network of riparian habitats provides a water source within the foraging habitat, it is difficult to assess the proximity to roosting habitat because roosts are not mapped.

Effect on Population Viability and Species Recovery. It is difficult to assess the effect of the MHCP on population viability because the abundance of roost sites is not known. If sufficient roosts sites are available and conserved within the FPA, then the additional conservation of foraging habitat is expected to contribute to population viability and species recovery. However, levels of human disturbance in the study area are extremely high and may preclude future breeding by this species here.

Special Considerations. Additional research is needed to adequately evaluate this species.

Adaptive Management Program

Not applicable.

Table 4-67

**SUMMARY OF CONSERVATION FOR
TOWNSEND'S WESTERN BIG-EARED BAT**

City	Habitat Acres Conserved ¹		Location Points Conserved ²
	Net Acres (%)	BCLA Acres (%)	
Carlsbad	466 (72%)	461 (74%)	None present
Encinitas	206 (80%)	205 (80%)	None present
Escondido	4,474 (80%)	4,287 (81%)	None present
Oceanside	28 (54%)	14 (62%)	None present
San Marcos	1,292 (52%)	1,240 (57%)	1(100%)
Solana Beach	8 (34%)	8 (65%)	None present
Vista	282 (69%)	200 (71%)	None present
MHCP Total ³	6,756 (71%)	6,416 (74%)	1 of 1 (100%)

¹ Habitat includes oak woodlands, riparian woodlands, and chaparral vegetation communities.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

California Mastiff Bat

Eumops perotis californicus

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: Species of Special Concern

Conservation Goals

Ensure species persistence in the plan area. Provide maximum protection of roost sites. Enhance habitat quality and increase the number of suitable roost sites. Contribute to regional population viability and species recovery.

Conservation Strategy

Conserve areas containing existing known and potential roost sites, such as crevices in large boulders, rocky outcrops, and cliff-like areas, and foraging habitats in grassland, coastal sage scrub, and chaparral within the MHCP. Include within the open space preserve system potential roost sites and foraging habitat in contiguous areas. Minimize human disturbance near potential roost sites. Facilitate coordination of local, state, and federal conservation and management actions for this species.

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, due to insufficient information.

Rationale. It is impossible to determine adequacy of conservation for this species based on existing information.

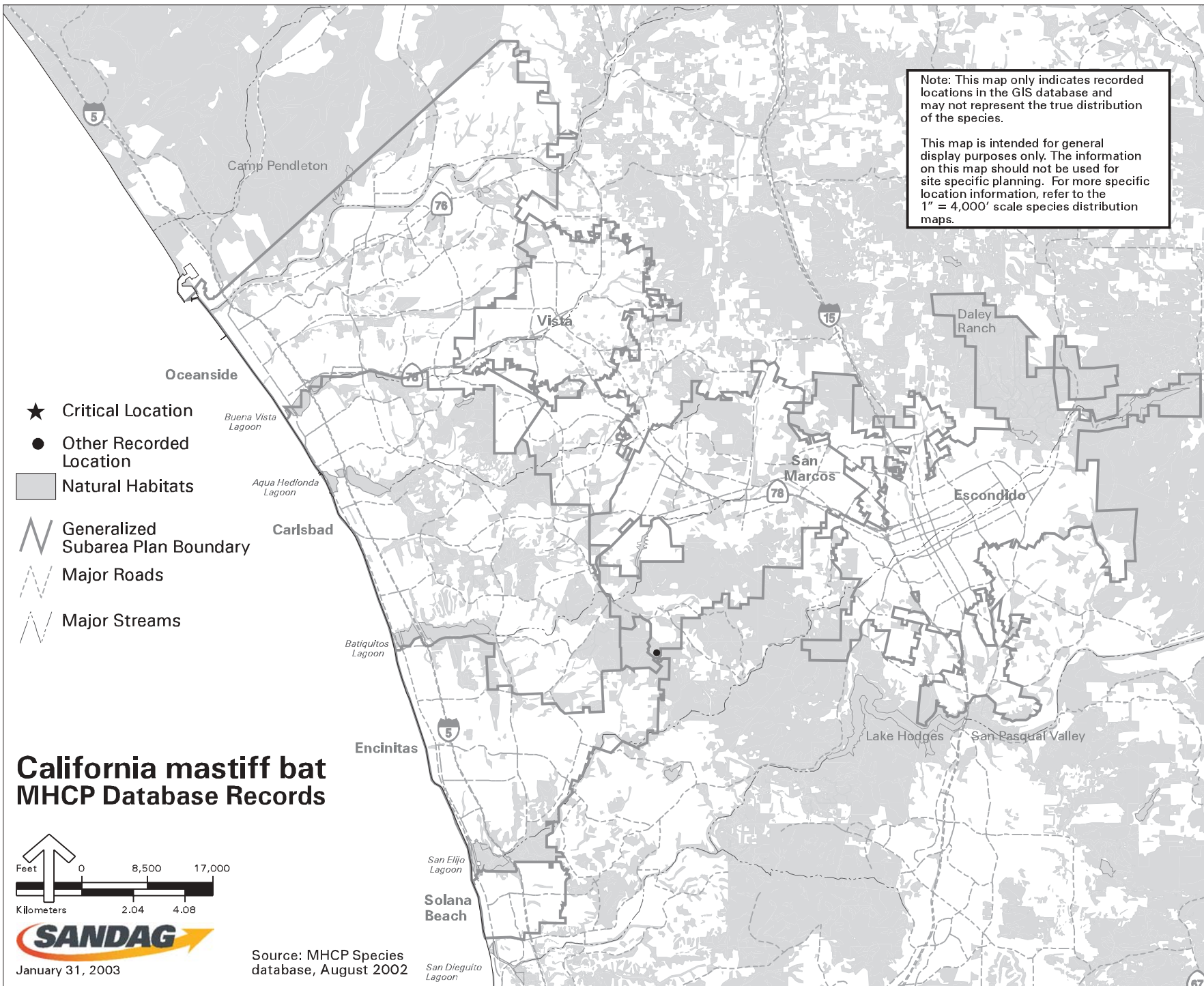
Conditions. Not applicable.

Background

Distribution, Abundance, and Trends. California mastiff bat ranges from north-central California southward to central Mexico. It is a resident species in California, but likely makes localized seasonal movements. Distribution within the MHCP area is not known, but is reported near Lake Hodges (Bond 1977) and Moosa Canyon (K. Miner personal communication) (see MHCP Database Records Map). This species roosts solitarily or in small colonies in crevices in rugged, rocky areas and high buildings (e.g., under Spanish tile roofs) and forages over open habitats including grassland, coastal sage scrub, and chaparral (K. Miner personal communication). When roosting in rock crevices, a vertical face is required to drop from to begin flight. It is often found in association with reservoirs, probably because the rocky cliff type habitat it prefers is typically where dam structures are placed, and these bats drink from large water bodies (K. Miner personal communication). There are no major populations in the MHCP. While there are no known active roost sites, any that are found would be considered critical areas.

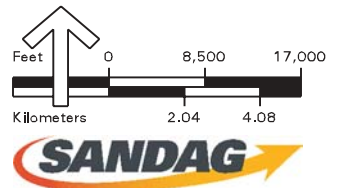
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- Generalized Subarea Plan Boundary
- Major Roads
- Major Streams

California mastiff bat MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Dieguito Lagoon

Threats and Limiting Factors. Decline in this species is due to loss of habitat to urbanization and cultivation of foraging areas, and perhaps a reduction in prey base caused by insecticide use (Williams 1986). Human disturbance, such as rock climbing, at roost sites is also a problem (P. Brown and K. Miner personal communication). Other threats include modification of rock outcrops or cliffs for quarries or reservoir construction.

Special Considerations. None identified.

Conservation and Take Levels. It is impossible to quantify expected levels of conservation and take for this species based on existing information. The moderate level of conservation of the coastal scrub ecological community (61%) and the chaparral ecological community (71%), along with the partial conservation of the grassland community (32%) (Section 3.2) may benefit this species. However, an abundance of suitable roost sites is required to support the population. It is not possible to determine the number of potential roost sites that are conserved because the habitat was not mapped at that scale. There is only one record of this species in the database. The point locality occurs in southwest San Marcos and is conserved by the FPA (Table 4-68).

Preserve Configuration Issues. Much of the preserve consists of a mosaic of grasslands, coastal sage scrub, and chaparral that is conserved in relatively large, contiguous blocks. Therefore, connectivity of the foraging habitat for the mastiff bat is good. Rocky outcrops and cliff-like habitat with suitable roosting habitat is likely to be distributed throughout the steeper portions of the preserve; however, it is difficult to assess the abundance of roost sites and their proximity to foraging habitat because potential roosting habitat is not mapped.

Effect on Population Viability and Species Recovery. It is difficult to assess the effect of the MHCP on population viability because the abundance of roost sites is not known. If sufficient roost sites are available and conserved within the FPA then the additional conservation of foraging habitat is expected to contribute to population viability and species recovery.

Special Considerations. Additional research is needed to adequately evaluate this species.

Adaptive Management Program

Not applicable.

Table 4-68

**SUMMARY OF CONSERVATION FOR
CALIFORNIA MASTIFF BAT**

City	Habitat Acres Conserved ¹		Location Points Conserved ²
	Net Acres (%)	BCLA Acres (%)	
Carlsbad	2,386 (57%)	2,298 (60%)	None known
Encinitas	898 (66%)	830 (67%)	None known
Escondido	5,796 (76%)	5,506 (82%)	None known
Oceanside	1,283 (41%)	1,143 (54%)	None known
San Marcos	2,348 (46%)	2,267 (55%)	1 (100%)
Solana Beach	14 (39%)	14 (70%)	None known
Vista	348 (28%)	306 (57%)	None known
MHCP Total ³	13,073 (58%)	12,364 (66%)	1 of 1 (100%)

¹ Habitat includes grassland, coastal scrub, coastal sage scrub/chaparral mix, and chaparral vegetation communities.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Stephens' Kangaroo Rat

Dipodomys stephensi

USFWS: Endangered

CDFG: Threatened

Conservation Goals

Recognizing that this species may be extirpated from the plan area and that the MHCP area is at the periphery of the species' historic range, contribute to recovery of the Stephens' kangaroo rat by conserving potential habitat within the plan area and allowing for natural recolonization into preserve areas that are contiguous with occupied habitats outside the study area.

Conservation Strategy

Include within the open space preserve system sufficient potential habitat (grassland, disturbed or fallow agricultural areas, or open coastal sage scrub on soils low in clay content) north of the San Luis Rey River in Oceanside to allow for natural recolonization from Marine Corps Base Camp Pendleton and Fallbrook Naval Weapons Annex. Implement species-specific management actions, as necessary to increase habitat quality and population size if the species is detected in these areas. Facilitate coordination of local, state, and federal conservation and management actions for this species, including coordination with the Stephens' kangaroo rat species recovery plan (USFWS 1997b).

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP may contribute to species persistence in the region by maintaining the potential for natural recolonization of suitable habitats and by managing newly found occupied habitat areas for species persistence. Although no populations are currently known within the study area, survey requirements and application of the MHCP Narrow Endemic and Critical Population policies to any newly found populations will contribute to species conservation goals.

Conditions. The following condition must also be met by the MHCP to adequately conserve this species: Any Stephens' kangaroo rat population shall be treated consistent with the Narrow Endemic Policy until all criteria for full recovery (i.e., species delisting) have been met.

1. As part of the project review process (e.g., CEQA) for individual projects within the survey area indicated on the MHCP Database Records Map, a qualified biologist possessing a Section 10(a)1(A) research permit for this species must survey all areas containing potentially suitable habitat (open coastal sage scrub, agricultural fields, and grasslands on soils low in clay content) using approved survey protocols (sign surveys for burrows, scats, tracks, trails, or other sign of

- kangaroo rat presence, followed by protocol trapping surveys to verify species identification if sign is detected). Surveys shall occur prior to any proposed impact regardless of location inside or outside of the FPA. Surveys shall be conducted when impacts could occur as a result of indirect impacts by placement of the project in or adjacent to potential habitat within survey areas shown on the MHCP Database Records Map.
2. Any Stephens' kangaroo rat population shall be treated consistent with the Narrow Endemic Species Policy (Appendix D) until all criteria for full recovery (i.e., delisting) of the species have been met.
 3. Conserve and manage natural habitats contiguous with occupied habitat areas to allow for natural population expansions, to the degree feasible.
 4. Conserve and manage sufficient linkages between occupied areas and other potential or occupied areas within the MHCP study area, or outside the MHCP study area (e.g., on MCB Camp Pendleton), to allow for dispersal and colonization.
 5. Manage any occupied reserve areas to maintain early successional phases required by Stephens' kangaroo rat. Buffer future developments adjacent to occupied habitat to preclude predation by domestic cats and minimize other edge effects. Prohibit use of rodenticides in or near occupied areas.
 6. Projects in or adjacent to occupied habitat shall adhere to the following measures to avoid or reduce impacts:
 - a) The removal of native vegetation and habitat shall be avoided and minimized to the maximum extent practicable. Determination of adequate avoidance and minimization of impacts shall be consistent with Section 3.7 of the MHCP plan. Deviations from these guidelines shall require written concurrence of the USFWS and CDFG. For temporary impacts, the work site shall be returned to preexisting contours and revegetated with appropriate native species. All revegetation shall occur at the ratios specified in Section 4.3 of the MHCP plan. All revegetation plans shall be prepared and implemented consistent with Appendix C (Revegetation Guidelines) and shall require written concurrence of the USFWS and CDFG. If written objections are not provided by the wildlife agencies within 30 days of receipt of written request for concurrence by the local jurisdiction, then the deviation may proceed as approved by the local agency. The wildlife agencies shall provide written comments specifying wildlife agency concerns.
 - b) Projects shall be carried out consistent with Appendix B (Standard Best Management Practices).
 - c) Construction-related vehicle travel shall be limited to daylight hours to minimize roadkill.

d) For temporary impacts involving trenching or other excavation, measures shall be taken to prevent Stephens' kangaroo rats from falling into the trench. Excavations shall not be covered (e.g., with metal plates or boards) to exclude rodents, because these may actually attract them to burrow beneath and become entrapped.

e) To minimize injury or mortality of individuals, the USFWS may authorize qualified biologists to relocate individual Stephens' kangaroo rats to nearby suitable habitat. Authorizations will be granted only to jurisdictions with signed implementing agreements and issued permits and will require coordination with the wildlife agencies and their written concurrence. Such salvage relocation may include exclusion fencing and creation of artificial burrows to increase success, if deemed appropriate by the wildlife agencies.

Background

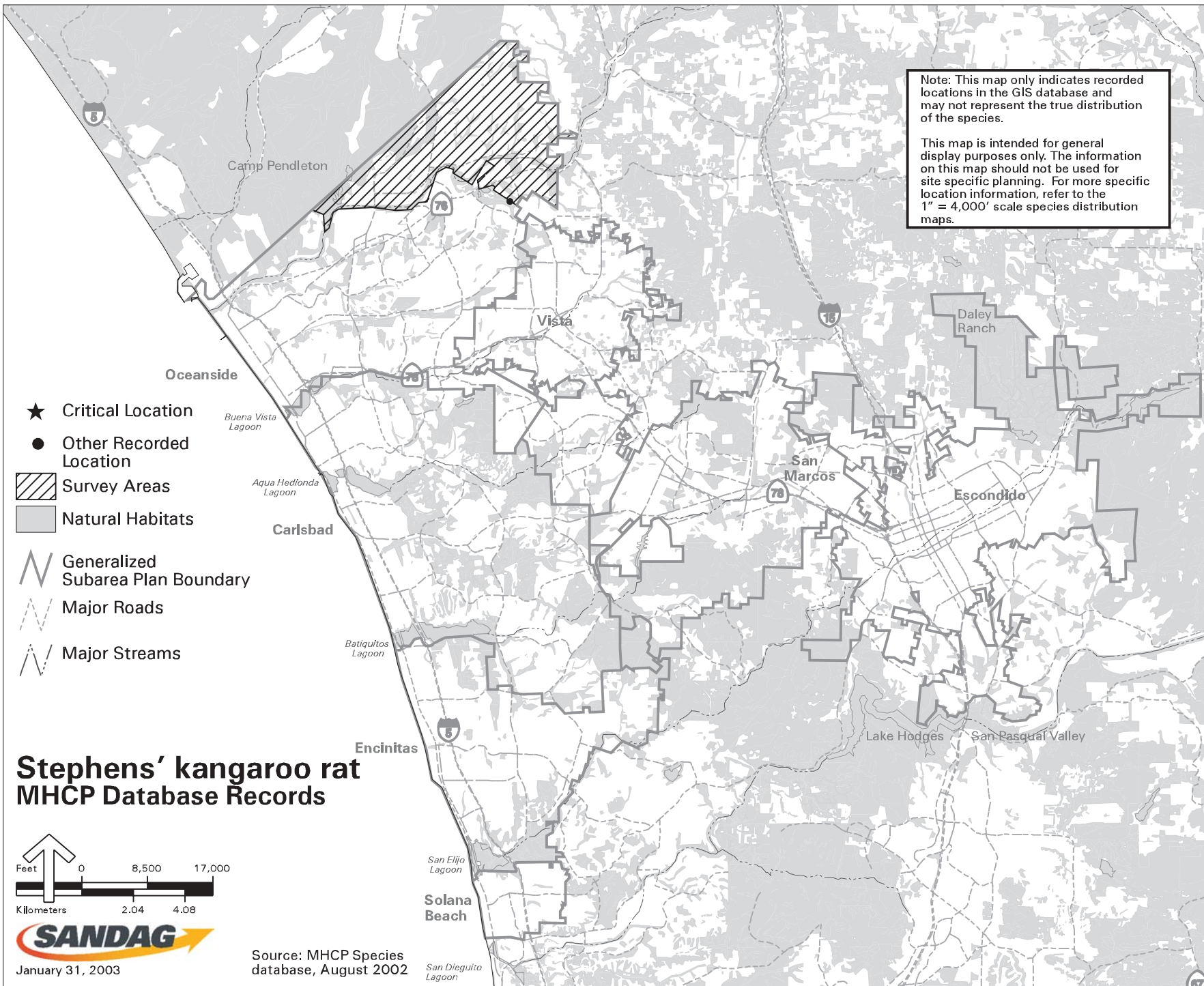
Distribution, Abundance, and Trends. Stephens' kangaroo rat is restricted primarily to western Riverside County, but populations occur in northern San Diego County at Camp Pendleton, Fallbrook Naval Weapons Annex, Lake Henshaw, Santa Maria Valley (Ramona), and Guejito Ranch. Grasslands adjacent to Guajome Lake and Pilgrim Creek are the only known recently (1990) occupied sites in the MHCP area (S. Montgomery personal communication; P. Behrends personal communication), and the current status of these populations is uncertain. A recent (October 1997) discovery of Stephens' kangaroo rat near Ramona (Ogden 1998) suggests that the species could occur more widely in grasslands of San Diego County than previously thought, but suitable grasslands lie mostly north and east of the MHCP plan area. The species could potentially colonize grasslands or agricultural fields in Oceanside, in the vicinity of occupied habitat on Camp Pendleton and Fallbrook Naval Weapons Annex (see MHCP Database Records Map). Suitable habitat consists of relatively level, sparsely vegetated grassland, fallow agricultural land, or open coastal sage scrub. Soils must be low in clay content to allow burrowing. There are no major populations or critical locations currently identified in the MHCP.

Threats and Limiting Factors. Available habitat has been greatly reduced and fragmented through urban and agricultural development. Populations readily invade and abandon habitat patches as they successively increase or decline in quality with changes in vegetation structure. Disturbances that retard vegetation succession by reducing shrub cover and increasing annual plants (e.g., fire or cattle grazing) may improve habitat for this species; but more severe disturbances such as heavy horse grazing, tilling, or unnaturally frequent fires are detrimental.

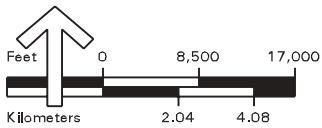
Special Considerations. The MHCP is on the periphery of the species' geographic range and may provide only marginal habitat for dispersing populations. Although this species can disperse more than 1 kilometer (0.6 mile) across open habitats (Price and Kelly 1992), urban development and large roads are likely dispersal barriers.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



Stephens' kangaroo rat MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Dieguito Lagoon

Conservation Analysis

Conservation and Take Levels. Although this species may occur in open coastal sage scrub, its primary habitat is grasslands. Because much of the coastal sage scrub conserved by the FPA is not open enough to be suitable habitat, coastal sage scrub was not included in this analysis. Only about 32% of the remaining grasslands in the MHCP area are expected to be conserved, and much of this occurs on clay soils and in isolated areas that are too small to ensure viable populations of this species. There are no known extant point localities within the study area. One point locality is in the MHCP database near Guajome Lake; however, this location is not a part of the analysis, because this park land is owned and managed by the County of San Diego. The population at that location has also likely been extirpated in recent years due to vegetation succession and isolation (S. Montgomery personal communication).

Preserve Configuration Issues. The MHCP will not protect the majority of grassland habitat on non-clay soils. The preserve design substantially reduces the size of many of the larger patches of suitable grasslands throughout the study area with only 47% of grasslands within the BCLA expected to be conserved. However, the lack of Stephens' kangaroo rat records for habitat south of Guajome Lake suggests that the existing habitat is already too isolated, fragmented, and reduced relative to the species dispersal abilities and area requirements to support viable populations. The species is most likely to be found in, or to recolonize from the north, blocks of open habitat north of the San Luis Rey River in Oceanside (e.g., Whelan Lake Conservation Bank and agricultural lands in northeast Oceanside). Conservation of these areas may benefit the species if the habitat is recolonized.

Effects on Population Viability and Species Recovery. No take of Stephens' kangaroo rat is expected under the plan, since the species is apparently extirpated from the plan area. Implementation of the MHCP may minimally benefit the Stephens' kangaroo rat by allowing for natural recolonization of preserve areas north of the San Luis Rey River, thereby possibly increasing distribution within the region. However, without substantial management to maintain kangaroo rat habitat, the MHCP is not likely to appreciably contribute to the regional population viability or species recovery. The MHCP will, however, increase regional coordination and funding for monitoring and management, which may improve current management of grassland habitats and species stability.

Special Considerations. None identified.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Conduct genetic studies of any newly documented populations to determine genetic variability in relation to Riverside County, Camp Pendleton, Ramona, and Fallbrook populations (McClenaghan and Truesdale 1991).
2. Consider genetic variability in designing management schemes involving translocation of individuals.

Pacific Pocket Mouse*Perognathus longimembris pacificus***USFWS: Endangered****CDFG: Species of Special Concern****MHCP: Narrow Endemic****Conservation Goals**

Recognizing that this species may be extirpated from the plan area, contribute to recovery of the Pacific pocket mouse by conserving potential habitat within the plan area and allowing for natural recolonization or active reintroduction into preserve areas that support appropriate habitat.

Conservation Strategy

Include within the preserve system blocks of appropriate habitat (open coastal sage scrub or grassland on fine loamy sand soils, generally within about 6 kilometers [3.7 miles] of the coast), with particular emphasis on habitat contiguous with natural habitat on Marine Corps Base Camp Pendleton and larger blocks in coastal cities. Totally avoid impacts to any populations found within the study area. Allow for the reintroduction of Pacific pocket mouse in preserve areas supporting suitable habitat, as defined by ongoing research for the Pacific Pocket Mouse Recovery Plan (Spencer et al. 2000a, 2000b, 2001; Spencer in press).

Coverage Determination and Permit Conditions

Coverage Determination. Not covered, unless subarea plans adopt additional species-specific measures.

Rationale. The MHCP might contribute to conservation of this species by helping maintain the potential for natural recolonization of suitable habitats, allowing for active translocations to establish new populations in managed preserve areas, and by managing newly found occupied habitat areas for species persistence. Although no populations are currently known within the study area, survey requirements and application of the MHCP Narrow Endemic and Critical Population Policies to any newly found populations might contribute to species conservation goals. A city would need to commit to allowing reintroductions or translocations into reserve areas within the city in order to meet species' conditions and be allowed to take occupied habitat outside the reserve.

Conditions. The following conditions must be met by the MHCP to adequately conserve this species:

1. As part of the project review process (e.g., CEQA) for individual projects within the MHCP area, a qualified biologist possessing a Section 10(a)1(A) research permit for this species must survey all areas containing potentially suitable habitat (open scrub or grassland habitat on sandy loam or loamy sand soils, within 6

- kilometers [3.7 miles] of the Pacific coast) using approved survey protocols (trapping surveys conducted for a minimum of 5 consecutive nights during the seasonal survey windows, as determined by concurrent USFWS monitoring results at known population sites). Surveys shall occur prior to any proposed impact regardless of location inside or outside of the FPA. Surveys shall be conducted when impacts could occur as a result of indirect impacts by placement of the project in or adjacent to potential habitat.
2. Until all criteria for downlisting the Pacific pocket mouse from endangered to threatened status are met (USFWS Recovery Plan), any Pacific pocket mouse population shall be treated consistent with the Critical Population Policy (Appendix D) and all impacts to the population avoided. These recovery criteria include protection and management of 10 viable populations distributed throughout the species' historic geographic range.
 3. Allow for the reintroduction of Pacific pocket mouse in preserve areas supporting suitable habitat, as defined by ongoing research for the Pacific pocket mouse.
 4. Manage any populations to remove threats, including exotic predators and human disturbance. Buffer future developments adjacent to occupied habitat to reduce predation by domestic cats and minimize other edge effects (e.g., artificial lighting, trampling, Argentine ant invasion). Manage vegetation structure, if necessary using controlled burning or hand thinning of shrub cover, to optimize habitat quality for Pacific pocket mouse., or with adaptive management practices developed by ongoing research and monitoring.
 5. Conserve and manage natural habitats contiguous with occupied habitat areas to allow for natural population expansions.
 6. Projects in or adjacent to occupied habitat shall adhere to the following measures to avoid or reduce impacts:
 - a) The removal of native vegetation and habitat shall be avoided and minimized to the maximum extent practicable. Determination of adequate avoidance and minimization of impacts shall be consistent with Section 3.7 of the MHCP plan. Deviations from these guidelines shall require written concurrence of the USFWS and CDFG. For temporary impacts, the work site shall be returned to preexisting contours, with the same soil composition and depth, and revegetated with appropriate native species. All revegetation shall occur at the ratios specified in Section 4.3 of the MHCP plan. All revegetation plans shall be prepared and implemented consistent with Appendix C (Revegetation Guidelines) and shall require written concurrence of the USFWS and CDFG. If written objections are not provided by the wildlife agencies within 30 days of receipt of written request for concurrence by the local jurisdiction, then the deviation may proceed as approved by the local agency. The wildlife agencies shall provide written comments specifying wildlife agency concerns.

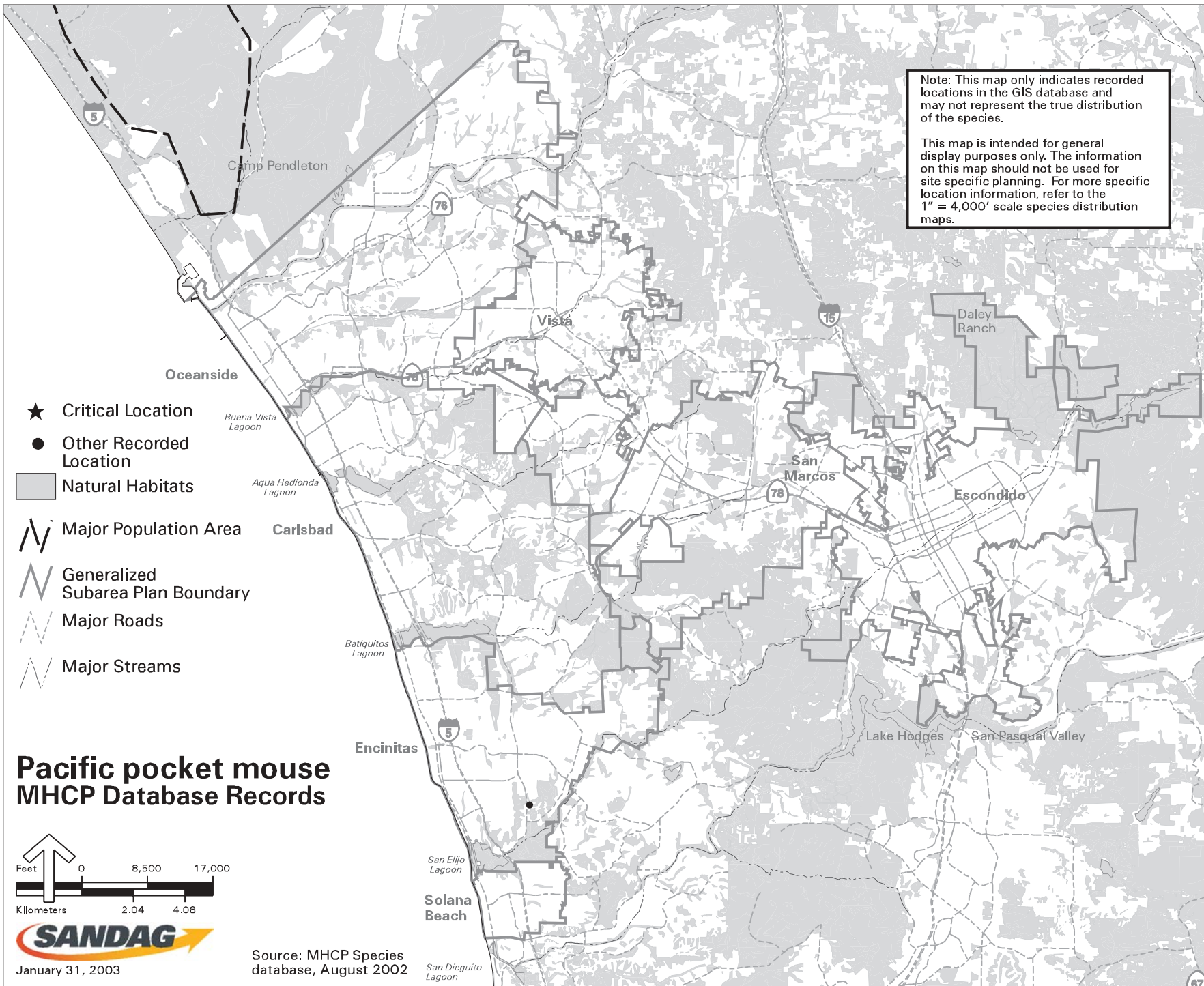
- b) Projects shall be carried out consistent with Appendix B (Standard Best Management Practices).
- c) Construction-related vehicle travel shall be limited to daylight hours to minimize roadkill.
- d) For temporary impacts involving trenching or other excavation, measures shall be taken to prevent Pacific pocket mouse from falling into the trench. Excavations shall not be covered (e.g., with metal plates or boards) to exclude mice, because these may actually attract mice to burrow beneath and become entrapped.
- e) Projects in or adjacent to occupied Pacific pocket mouse habitat shall be constructed to avoid the active season to the maximum extent practicable. The active season shall be defined as March 15 through October 15, unless monitoring suggests that the Pacific pocket mouse are active outside that period during the year of interest.

Background

Distribution, Abundance, and Trends. The Pacific pocket mouse is the smallest subspecies of the little pocket mouse, a burrow-dwelling, mostly granivorous, heteromyid rodent species restricted to the arid Southwest. Historically, this subspecies occurred on fine, sandy soils within about 4 to 6 kilometers (2.5 to 3.7 miles) of the Pacific coast of southern California, from near the Mexican border to Marina del Rey and El Segundo in Los Angeles County. Since the 1930s, the majority of its historic habitat has been greatly reduced in area and fragmented by urban development and agriculture. After an approximate 20-year period during which the species was not detected, a small population was rediscovered on the Dana Point Headlands in 1993 (Brylski 1993). The subspecies was emergency listed as endangered by the USFWS in 1994 due to immediate threats to this remnant population of 25 to 36 animals (USFWS 1998c). Subsequently, three additional population sites have been discovered (two of which may represent one population) on Marine Corps Base Camp Pendleton, San Diego County, California (Ogden 1995, 1997; MBA 1997). Despite extensive survey efforts throughout the range, these four sites probably represent the full extent of the species' current range (USFWS 1998c; Spencer in press). None of these sites are within the MHCP area, although the largest lies about 1.5 miles north of Oceanside in the Oscar One Training Area of Camp Pendleton. Habitats in north Oceanside have not been fully surveyed for the species and have a small possibility of supporting the species. One observation in the MHCP study area, at Lux Canyon, Encinitas (see MHCP Database Records Map), was not adequately documented to confirm the species, and this location may subsequently have been developed.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location

■ Natural Habitats

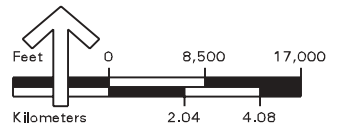
▮ Major Population Area

▮ Generalized Subarea Plan Boundary

▬ Major Roads

▬ Major Streams

Pacific pocket mouse MHCP Database Records



January 31, 2003

Source: MHCP Species database, August 2002

San Dieguito Lagoon

Threats and Limiting Factors. Habitat loss and fragmentation are primary contributors to this species' endangerment. Three of the four occupied sites are less than 30 acres each in size, and their populations are thought to number under 50 individuals at each site (Spencer et al. 2000a, 2000b). Such small sizes predispose these populations to a high risk of extirpation due to stochastic events, catastrophes, inbreeding depression, or other factors. Recent genetics analyses indicate that genetic diversity is very low at one of the extant sites (Dana Point) and that continued loss of genetic diversity is inevitable in all sites unless the current low population sizes are increased (Swei et al. in press). Monitoring at these sites suggests that the populations may be in decline, perhaps due in part to vegetation succession, which is reducing the openness of the shrub communities and therefore reducing habitat value. Predation by house cats has also been identified as a potential threat to one extant population adjacent to urban development (USFWS 1994), and likely affects two other sites (Spencer et al. 2000a, 2000b). Habitat degradation from off-road vehicles, human foot traffic, artificial lighting, and proliferation of nonnative species may also contribute to extirpations (USFWS 1998c). Exotic Argentine ants may adversely affect the species directly (via predation in burrows) or indirectly (via alterations to native plant composition and seed banks that pocket mice depend upon). Argentine ant populations are closely associated with irrigated landscaping in San Diego County (Suarez et al. 1998; T. Case personal communication).

Special Considerations. Pocket mouse populations can fluctuate greatly from year to year in both distribution and abundance, and recolonization of unoccupied but contiguous habitat areas may occur. The species is difficult to detect at low population densities and could be missed by protocol surveys even if present. Existing development may preclude dispersal from or between occupied sites. Dispersal may be possible into habitat areas north of the San Luis Rey River, Oceanside, from the largest extant population on Camp Pendleton.

Criteria for recovery of the species (USFWS 1998c) include permanent protection of 10 independently viable populations. Achieving this goal will likely require active reintroductions and management (Spencer et al. 2000a; Spencer in press). A research program is actively ongoing pursuant to the species recovery plan, with the following emphases: (1) identify possible reintroduction sites throughout the historic range; (2) clarify species biology to better characterize threats to viability and to design a possible translocation or captive propagation program to reintroduce the species; (3) characterize genetic diversity within and between extant and historic populations; (4) continue monitoring extant population sizes and extents; and (5) test possible habitat enhancement measures (Spencer, in press).

Recent experimental habitat manipulations at the Dana Point Headlands site indicate that thinning of shrub densities (in this case, to 30% cover) resulted in at least short-term behavioral shifts by individuals into the thinned habitat, although long-term positive effects on population sizes have not been observed (Spencer in press). Genetics results indicate that reintroductions or translocations could mix individuals from multiple sites to increase genetic diversity in the resultant populations (Swei et al. in press; Spencer in press).

Conservation Analysis

Conservation and Take Levels. Since the Pacific pocket mouse is likely extirpated from the study area, no take is expected under the plan. If an experimental population were established within one or more MHCP preserve areas, some take of individuals may occur outside of preserve boundaries. Some harassment take would also be necessary in the donor populations, since individuals would be removed for the translocation.

A habitat suitability model was prepared for the Pacific pocket mouse, covering all land within 8 kilometers (5 miles) of the Pacific coast in Orange and San Diego counties (Spencer et al. 2001a; Spencer in press). This GIS model uses soil types and vegetation communities to rank habitat suitability as very high, high, medium, or low, with a conservative bias towards possibly overestimating habitat quality so as not to miss potentially suitable areas. The purpose of this conservative model is to focus field studies necessary to more precisely identify and rank potential reintroduction sites for the species. Results of this model were overlaid in the GIS with the MHCP FPA to calculate acreages and proportions of high, medium, and low suitability habitat expected to be conserved by the MHCP preserve (Table 4-69).

Many of the very high to moderate potential habitat areas within the study area have already been surveyed for Pacific pocket mice without detecting the species, and it is likely the species is extirpated from the study area. However, a few significant blocks (>80 acres) of high and moderate suitability habitat exist in Oceanside and Carlsbad, with lesser amounts of habitat, generally scattered in smaller blocks, in Encinitas and Vista. Habitat blocks north of the San Luis Rey River in Oceanside could potentially harbor remnant populations of Pacific pocket mouse, or could be naturally recolonized from Camp Pendleton; however, the steepness of these canyons may reduce their habitat value somewhat relative to the conservative predictions of the GIS model. These areas in Oceanside (Benet Canyon, Tuley Canyon, and adjacent areas) would be relatively well conserved by the MHCP preserve.

Current information suggests that the best potential area within the MHCP for reintroducing Pacific pocket mice is the Manchester Conservation Area in Encinitas, which was one of the highest ranking sites in the geographic range of the species based on field reconnaissance (Spencer et al. 2001a). This mitigation bank property has highly suitable soils and is managed for biological values by the Center for Natural Lands Management. Other areas that showed some potential as reintroduction sites included Lawrence Canyon and the Vista de la Valle mitigation area in Oceanside; the Calavera/Holly Springs area, Dawson-Los Monos Preserve/Carlsbad Oaks area, Macario Canyon, and Villages of La Costa area in Carlsbad; and possibly bluffs overlooking Batiquitos Lagoon in Encinitas. However, field inspections suggest that these areas are unlikely to support Pacific pocket mice now or in the future due to soil characteristics, steep slopes, levels of disturbance, and other factors. For the most part, these areas of potential pocket mouse habitat will be partially preserved under the MHCP plan, and partially developed.

Table 4-69

**CONSERVATION OF POTENTIAL HABITAT
FOR THE PACIFIC POCKET MOUSE**

City	Very High to High Suitability Habitat Acres Conserved ¹ (%)	Moderate Suitability Habitat Acres Conserved ² (%)	Low Suitability Habitat Acres Conserved ³ (%)
Carlsbad	1,149 (52%)	323 (85%)	788 (64%)
Encinitas	392 (65%)	172 (86%)	758 (72%)
Escondido	None present ⁴	None present ⁴	None present ⁴
Oceanside	578 (52%)	167 (92%)	287 (78%)
San Marcos	None present ⁴	None present ⁴	None present ⁴
Solana Beach	8 (59%)	3 (72%)	22 (33%)
Vista	7 (47%)	53 (89%)	None present ⁴
MHCP Total⁵	2,135 (54%)	718 (87%)	1,854 (68%)

¹ Very High and High Suitability Habitat includes sandy, loamy sand, or sandy loam soils supporting coastal sage scrub or grassland vegetation, within 8 km of the Pacific coast.

² Moderate Suitability Habitat includes sandy, loamy sand, or sandy loam soils supporting other natural vegetation communities, within 8 km of the Pacific coast.

³ Low Suitability Habitat includes loam, silt loam, or silty soils supporting natural vegetation, within 8 km of the Pacific coast.

⁴ Jurisdiction considered too far inland (>8 km) to support Pacific pocket mouse.

⁵ Numbers may not total due to rounding.

Preserve Configuration Issues. The areas identified above with potential for natural recolonization or active reintroduction of Pacific pocket mouse will generally be subject to strong edge effects, due to high edge-to-area ratios, some internal fragmentation, and isolation from larger blocks of habitat. Pocket mouse dispersal between any of these areas is probably precluded by intervening development. The largest remaining blocks of potential habitat (Calavera/Holly Springs, Dawson-Los Monos/Carlsbad Oaks, and Villages of La Costa) tend to be further inland than most historic Pacific pocket mouse populations, which has unknown consequences for reintroduction success at this time.

Effects on Population Viability and Species Recovery. The plan has potential to enhance population viability and further recovery of the species if suitable habitat areas are selected for reintroduction based on additional research, and if reintroduction sites are actively managed to control exotic species and other threats to pocket mice. If an experimental population were established within one or more MHCP preserve areas, some take of individuals may occur outside of preserve boundaries. Some harassment take would also be necessary in the donor populations, since individuals would be removed for the translocation. However, such incidental take of individuals would not be expected to reduce overall viability of the Pacific pocket mouse, because successful reintroduction within the preserve area would contribute to the species' overall viability. Reintroduction would only be attempted if ongoing recovery research indicated that it could be performed without harming the extant (donor) populations (Spencer et al. 2000a; Spencer in press).

Special Considerations. This species is cryptic and difficult to survey, so it may be present but not detected in some areas. Due to population fluctuations, failure to detect the species during a single survey does not necessarily preclude presence in future years, provided that potential dispersal avenues exist from extant populations. However, habitat isolation by urban development probably precludes natural recolonization. Vegetation succession may reduce habitat value, and management should consider experimental thinning and controlled burning to reduce shrub canopies and increase annual plant abundance. The well-drained soils preferred by this species may help control invasions by Argentine ants, which generally require areas with moist soils.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Institute field studies of any population discovered in the future, in cooperation with the species recovery plan and ongoing research, including genetic characterization relative to other extant populations.

Northwestern San Diego Pocket Mouse

Chaetodipus fallax fallax

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: Species of Special Concern

Conservation Goals

Ensure species persistence within the plan area. Enhance habitat quality and contribute to regional population viability.

Conservation Strategy

Include within the preserve system large blocks of appropriate habitat (open scrub habitats or grassland with sandy or gravelly areas), with particular emphasis on habitat contiguous with natural habitat outside of the study area (e.g., Camp Pendleton, north and east of Escondido, and the unincorporated core).

Coverage Determination and Permit Conditions

Coverage Determination. Covered.

Rationale. The MHCP will adequately conserve this species by conserving about 61% of remaining habitat (upland vegetation communities on soils low in clay), including some large preserve blocks contiguous with open spaces outside the study area, and by managing the preserve consistent with species' needs. Conservation of the additional 400-500 acres of coastal sage scrub in the unincorporated core area will also benefit this species.

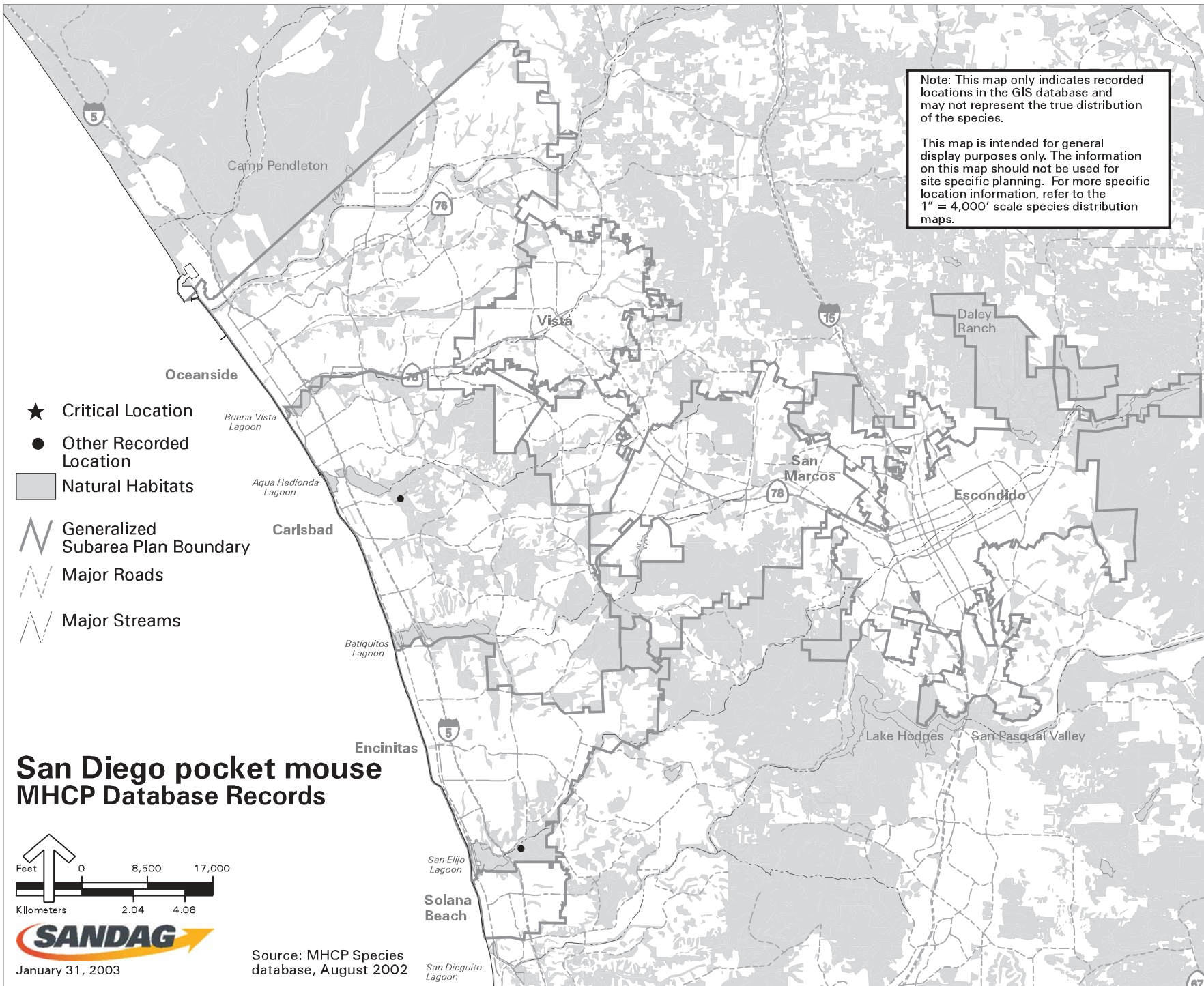
Conditions. Not applicable, although general habitat management actions instituted for other coastal sage scrub species should benefit this species as well.

Background

Distribution, Abundance, and Trends. This species ranges from near San Bernardino south into Baja California, Mexico, and west of the inland deserts to the coast. It is a fairly common species where suitable habitat remains (P. Behrends, S. Montgomery, M Pavelka, and W. Spencer personal communications). Primary habitat of the Northwestern San Diego pocket mouse includes arid habitats with a scrub component (such as coastal sage scrub, chaparral, oak woodlands, and annual grasslands) and sandy herbaceous areas in association with rocks or coarse gravel (Grinnell 1933; Miller and Stebbins 1964). There are no major populations or critical locations in the study area. There are only two location points in the MHCP study area (see MHCP Database Records Map), but this primarily reflects lack of survey effort for the species, which is expected to be fairly abundant in appropriate habitats.

Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



Threats and Limiting Factors. Suspected to be declining due to habitat loss and fragmentation, but is found in moderate to high numbers in scrub-dominated habitats throughout western San Diego County.

Special Considerations. None identified.

Conservation Analysis

Conservation and Take Levels. Moderate conservation of the coastal scrub, oak woodland, and chaparral ecological communities (Section 3.2) should benefit this species. Grasslands are not well preserved, but grasslands are not primary habitat for this species. Although the northwestern San Diego pocket mouse is widely distributed throughout a number of habitats in San Diego County, it is not likely to occur where soils are not suitable for burrowing (i.e., in clay soils). Habitats occurring on clay soils have been removed from the acreage calculations below. The preserve will include approximately 13,934 acres (61%) of potentially suitable habitat and 1 of 2 point localities (50%) (Table 4-70).

Preserve Configuration Issues. Large blocks of suitable habitat are protected in the Daley Ranch area of north Escondido, and several smaller blocks are protected in southwest San Marcos, east Carlsbad, and north Oceanside. Much of the protected habitat is contiguous with large blocks of habitat outside the study area. The preserve includes about 66% of the potential northwestern San Diego pocket mouse habitat contained by the BCLA, and thus the areas of high biological value. Conservation of the additional 400-500 acres of coastal sage scrub in the unincorporated core area will also benefit this species. This species probably does not disperse well through developed areas or over roads, so some subpopulations may be isolated. However, the species is likely to persist indefinitely in appropriate habitat patches more than a few hundred acres in size, and occasional dispersers may reach other areas to maintain genetic diversity.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to maintain the population viability of the Northwestern San Diego pocket mouse in the region through increased management and monitoring. The species is likely to persist on larger habitat blocks throughout the study area, especially those connected to habitats outside the study area. The species may disappear from smaller more isolated blocks of habitat, particularly in the coastal cities. The MHCP preserve and policies will maintain consistency with other recovery planning and management goals for this species.

Special Considerations. Domestic cats pose a potential threat to this species, especially in the smaller habitat patches surrounded by residential development. The abundance and impacts of domestic cats should be monitored in the preserve and controlled through public education or trapping where necessary.

Table 4-70**SUMMARY OF CONSERVATION FOR
NORTHWESTERN SAN DIEGO POCKET MOUSE**

City	Habitat Acres Conserved¹	Location Points Conserved²
	Net Acres (%)	
Carlsbad	2,341 (60%)	0 of 1 (0%)
Encinitas	1,313 (74%)	1 of 1 (100%)
Escondido	6,444 (76%)	None known
Oceanside	1,114 (44%)	None known
San Marcos	2,350 (48%)	None known
Solana Beach	30 (35%)	None known
Vista	343 (30%)	None known
MHCP Total³	13,934 (61%)	1 of 2 (50%)

¹ Habitat includes all scrub, oak, and grassland vegetation communities without clay soils.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

San Diego Black-tailed Jackrabbit

Lepus californicus bennettii

USFWS: Federal Species of Concern (former Category 2 Candidate)

CDFG: Species of Special Concern

Conservation Goals

Ensure species persistence within the plan area, enhance habitat quality, and contribute to regional population viability.

Conservation Strategy

Include within the preserve system large blocks of appropriate habitat (open scrub and grassland habitats), with particular emphasis on habitat contiguous with natural habitat outside of the study area (e.g., Camp Pendleton, north and east of Escondido, and the unincorporated core).

Coverage Determination and Permit Conditions

Coverage Determination. Covered.

Rationale. The MHCP may adequately conserve this species by conserving some large blocks of habitat that are connected to even larger blocks outside the study area, and by managing preserve areas consistent with species' needs. The MHCP will protect roughly 51% of remaining habitat, including about 62% of habitat within the BCLA. About 71% of species location points are expected to be conserved. Although increasing habitat fragmentation will likely lead to losses of this species in some portions of the study area, it is expected to persist in larger blocks and in areas adjacent to larger habitat blocks outside the study area.

Conditions. Not applicable, although general habitat management actions instituted for other species should benefit this species as well.

Background

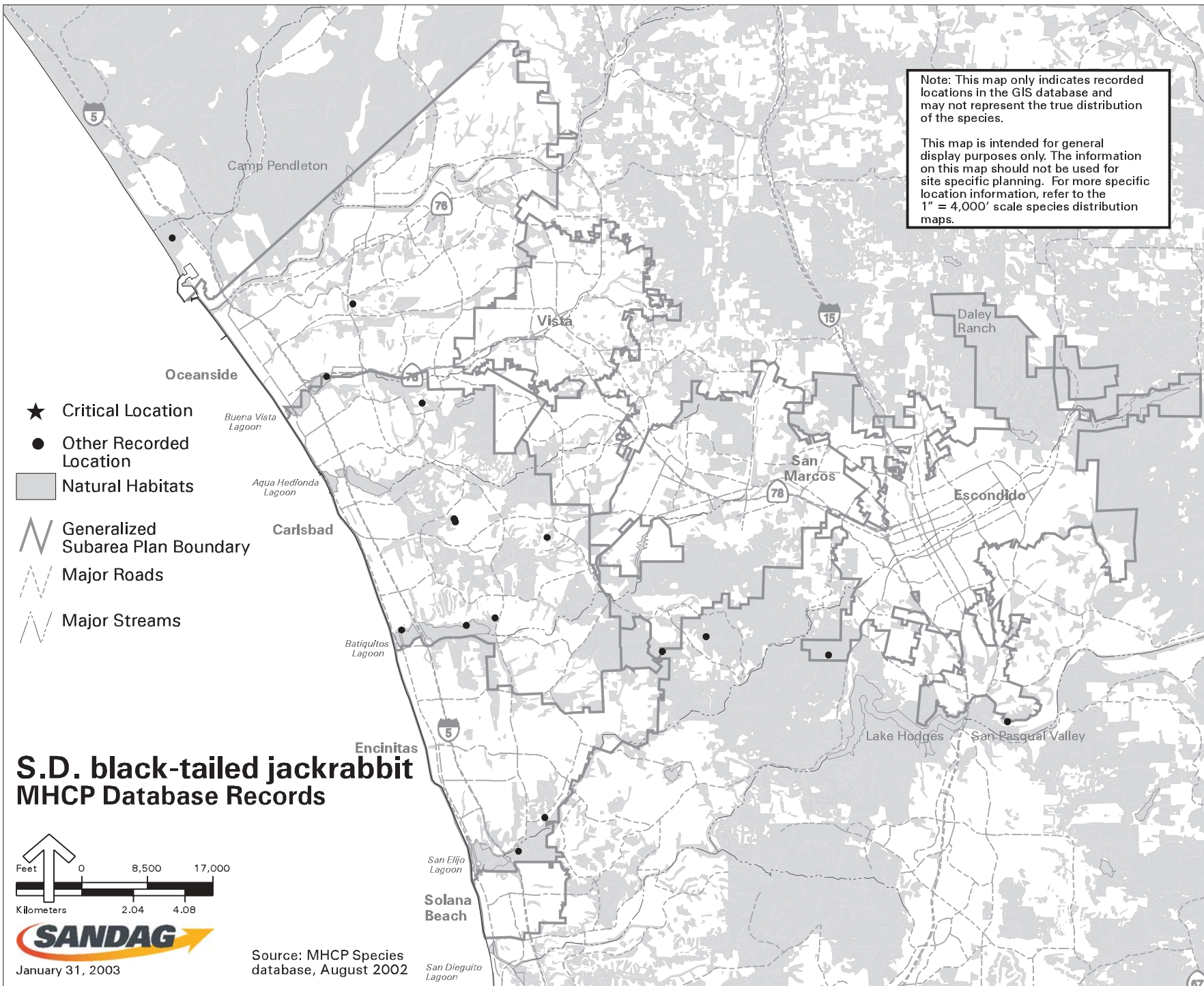
Distribution, Abundance, and Trends. This species is fairly common in coastal sage scrub, grassland, and open chaparral habitats throughout western San Diego County. There are no major populations or critical locations identified in the plan area, but scattered observations occur throughout natural habitats in the area (see MHCP Database Records Map).

Threats and Limiting Factors. Black-tailed jackrabbits are suspected to be declining due to habitat loss and fragmentation, although they remain relatively common in larger areas of appropriate habitat.

Special Considerations. None identified.

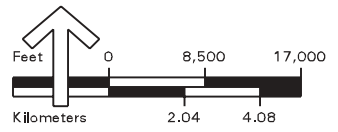
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

This map is intended for general display purposes only. The information on this map should not be used for site specific planning. For more specific location information, refer to the 1" = 4,000' scale species distribution maps.



- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- Generalized Subarea Plan Boundary
- Major Roads
- Major Streams

S.D. black-tailed jackrabbit MHCP Database Records



Source: MHCP Species database, August 2002

San Dieguito Lagoon

Conservation Analysis

Conservation and Take Levels. The moderate level of conservation of the coastal scrub ecological community (Section 3.2) may benefit this species. The grassland ecological community is not well preserved and does not substantially contribute to this species conservation. The reserve will include approximately 7,267 acres (51%) of potentially suitable habitat and 9 of 12 point localities (71%) (Table 4-71).

Preserve Configuration Issues. Large blocks of suitable habitat are protected by the preserve design in the Daley Ranch area of north Escondido, and several smaller blocks are protected in southwest San Marcos, east Carlsbad, and north Oceanside. Much of the protected habitat is contiguous with large blocks of habitat outside the study area. This species is fairly adaptable and can disperse across areas of nonnative habitat such as agricultural areas and golf courses. The preserve includes 6,750 acres (62%) of the potential San Diego black-tailed jackrabbit habitat contained by the BCLA (Table 4-71). The BCLA was delineated to include the most important large blocks of habitat, critical locations, and areas of high biological value. Conservation of the BCLA therefore provides a useful measure for comparing the proposed preserve to a biologically preferred preserve design, given the existing degree of fragmentation in the plan area. Consequently, although only about 51% of total potential habitat will be preserved, approximately 62% of the most important potential habitat will be conserved. Additional acres included in the FPA but not in the BCLA generally are isolated, small, or degraded fragments of habitat that may be of lesser biological value.

Effects on Population Viability and Species Recovery. Implementation of the MHCP is expected to maintain the population viability of the San Diego black-tailed jackrabbit in the region through increased management and monitoring. The MHCP preserve and policies will maintain consistency with other management goals for this species.

Special Considerations. None identified.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Table 4-71

**SUMMARY OF CONSERVATION FOR
SAN DIEGO BLACK-TAILED JACKRABBIT**

City	Habitat Acres Conserved ¹		Location Points Conserved ²
	Net Acres (%)	BCLA Acres (%)	
Carlsbad	1,960 (55%)	1,876 (57%)	6 of 8 (69%)
Encinitas	740 (64%)	673 (66%)	1 of 2 (50%)
Escondido	1,977 (68%)	1,846 (83%)	1 of 1 (100%)
Oceanside	1,262 (41%)	1,131 (54%)	1 of 1 (100%)
San Marcos	1,155 (43%)	1,084 (54%)	None known
Solana Beach	6 (53%)	6 (79%)	None known
Vista	167 (18%)	134 (48%)	None known
MHCP Total ³	7,267 (51%)	6,750 (62%)	9 of 12 (71%)

¹ Habitat includes coastal sage scrub, coastal sage scrub/chaparral, and grassland vegetation communities.

² Approximate number of known location points expected to be conserved based on the applicable calculation rules described in Section 2.2. The percentage in parentheses estimates the overall conservation level as a weighted average for all points, where each point is first assigned a conservation level based on location (e.g., inside or outside FPA) and species type (e.g., narrow endemic or wetland obligate).

³ Numbers may not total due to rounding.

Mountain Lion

Felis concolor

USFWS: None

CDFG: Special Protected Mammal (No Take)

Conservation Goals

Ensure species persistence within the plan area and contribute to regional population viability by providing suitable movement corridors between larger habitat blocks, and especially connections to large blocks of habitat outside the MHCP study area.

Conservation Strategy

Include within the preserve system large blocks of appropriate habitat with particular emphasis on habitat contiguous with natural habitat outside of the study area (e.g., Camp Pendleton, north and east of Escondido, and the unincorporated core area). Maintain suitable corridors between major blocks of habitat. Modify road crossings or corridors to minimize the potential for roadkill.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP will adequately conserve this species by conserving a few large blocks of habitat contiguous with larger open spaces outside the study area, and by managing those preserve areas consistent with species' needs. Although existing conditions preclude allowing for movement between major habitat blocks across the study area, opportunities for connections to large blocks outside the study area are conserved (e.g., east from Daley Ranch across Escondido Water District lands; south from San Marcos into the unincorporated core area; and north from Oceanside into Camp Pendleton). Mountain lions are therefore expected to persist in these portions of the study area, consistent with MHCP biological goals.

Conditions. The following conditions must be met by subarea plans to adequately conserve this species:

1. Maintain and enhance habitat linkages between conserved habitat areas that are intended to support mountain lion. New roads or improvements to existing roads must include adequate wildlife under-crossings and appropriate fencing to accommodate safe movements between occupied habitats on either side (Ogden 1992a). Placement and design of road crossings and associated improvements (fencing, vegetation restoration) should be done based on site-specific wildlife movement surveys and biological criteria.
2. Periodically monitor key habitat linkages to assess their use by mountain lions.

3. Institute a public awareness campaign to educate people on the importance of large carnivores in natural ecosystems and ways to avoid problem encounters with mountain lions.

Background

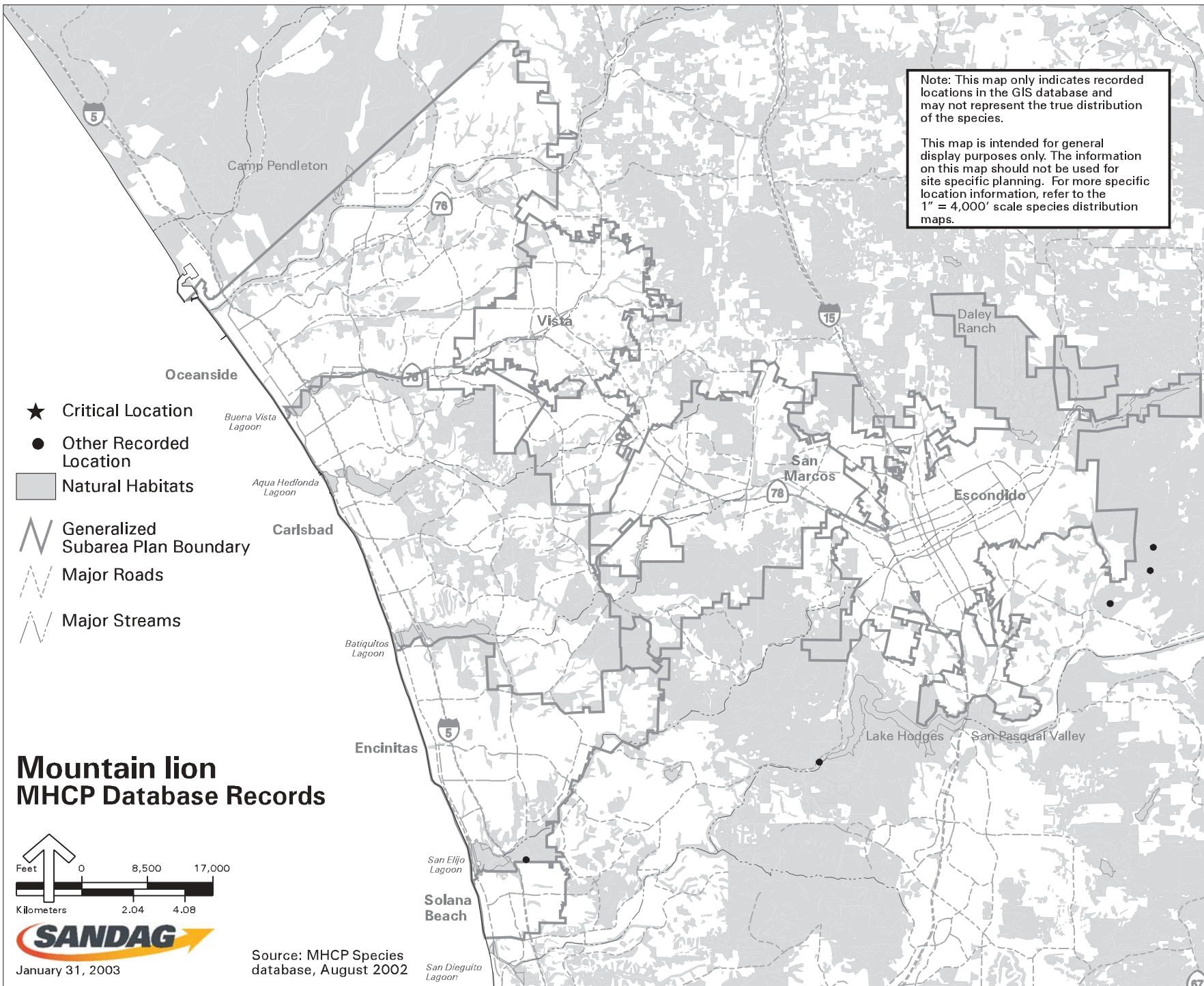
Distribution, Abundance, and Trends. The mountain lion has the largest geographical distribution of any mammal species in the western hemisphere, but it is restricted primarily to unpopulated regions in western North America (Hall and Kelson 1959). The species had become relatively uncommon in the early 20th century due to human persecution, but a moratorium on hunting was passed in California in 1972, and the species was given special protection under state Proposition 117 in 1990, which has led to a dramatic increase in populations. The recent state population estimates range from 2,500 to 6,000 individuals with an increasing population trend. In coastal San Diego County, mountain lions occupy most larger blocks of habitat, with recent observations at Camp Pendleton, Palomar, Carlsbad, Oceanside, San Marcos, Escondido, Laguna Indian Reservation, Los Peñasquitos Canyon Reserve, Del Mar, Torrey Pines State Park, NAS Miramar, Poway, Sweetwater River, and Otay Lakes. Mountain lions inhabit forest and shrubland habitats throughout California where deer, their primary prey, are found. There are no major populations or critical locations in the study area for this species, although it probably occupies some of the larger natural habitat areas, such as Daley Ranch, and scattered observations have been made in and near the study area (see MHCP Database Records Map).

Threats and Limiting Factors. The primary threats to the mountain lion are loss and fragmentation of large expanses of suitable habitats and human-lion interactions typically resulting in the death of the individual lion involved. Roadkill mortality is a frequent factor in more urbanized areas (Beier 1993; Ogden 1992a). Roadkill was the primary cause of mortality in a three-year radio-tracking study by Paul Beier in the Santa Ana Mountains (Beier 1993, Dickson and Beier 2002).

Special Considerations. Mountain lion populations have increased dramatically in California due to a moratorium on hunting. This has increased potential for problem encounters between lions and humans in urban/wildland interface areas, and dictates that humans become better educated at avoiding such encounters. Lions appear not to avoid roads within their home ranges in southern California, especially when roads are located in preferred riparian areas (Dickson and Beier 2002), and roadkill is a highly significant mortality factor. New or realigned roads should be removed from riparian corridors, and properly designed road undercrossings, with wildlife fencing along roadways, should be installed at natural crossing locations to minimize vehicle-lion encounters.

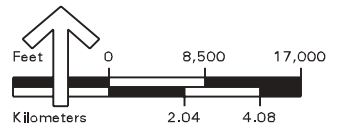
Note: This map only indicates recorded locations in the GIS database and may not represent the true distribution of the species.

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- ★ Critical Location
- Other Recorded Location
- Natural Habitats
- Generalized Subarea Plan Boundary
- Major Roads
- Major Streams

Mountain lion MHCP Database Records



Source: MHCP Species database, August 2002

San Dieguito Lagoon

Conservation Analysis

Conservation and Take Levels. Virtually all terrestrial habitats in the study area are suitable for mountain lions if they are sufficiently connected by wildlife corridors to accommodate mountain lion and deer, their primary prey. The moderate to high level of conservation of the coastal scrub, chaparral, oak woodland, and riparian ecological communities (Section 3.2) will benefit this species. The FPA will conserve approximately 17,214 acres (63%) of potentially suitable habitat (Table 4-72). A single point locality in the database is in an area to be conserved in Encinitas, but this is not considered a good representation of conservation for this species.

Preserve Configuration Issues. While there are only approximately 27,000 acres of potential habitat in the entire study area, the home range of a male mountain lion is typically a minimum of 15 square miles (144,000 acres) (Russell 1978). Therefore, no preserve design based on existing MHCP conditions could provide enough suitable habitat to support even one adult male mountain lion without relying on contiguity with suitable habitats outside of the MHCP area. Most of the habitat in the interior of the study area is too fragmented into smaller patches to support deer and is not suitable foraging habitat for mountain lions. Moreover, numerous roads throughout the study area make it very dangerous for lions or deer. Only the large blocks of habitat in Daley Ranch and possibly around the unincorporated core area in San Marcos and Carlsbad are expected to consistently sustain deer and could be considered suitable mountain lion foraging habitat.

The preserve includes 15,506 acres (70%) of the potential mountain lion habitat contained by the BCLA (Table 4-72). The BCLA was delineated to include the most important large blocks of habitat, critical locations, and areas of high biological value. FPA conservation of the BCLA therefore provides a useful measure for comparing the proposed preserve to a biologically preferred preserve design, given the existing degree of fragmentation in the plan area. Consequently, although about 63% of total potential habitat will be preserved, approximately 70% of the most important potential habitat will be conserved. Additional acres included in the FPA but not in the BCLA generally are isolated, small, or degraded fragments of habitat that may be of lesser biological value.

Currently, Valley Center Road is being expanded and realigned between Escondido and Valley Center, on habitat lands lying between Daley Ranch and Lake Wohlford within the Escondido subarea. As part of this project, the county Department of Public Works is designing and installing three wildlife undercrossings at strategic locations. Similar efforts should be undertaken, based on site-specific field studies, for any new or redesigned roads in areas where lions or other large mammals are subject to roadkill.

Effects on Population Viability and Species Recovery. Due to the limited number of individuals that the study area could support in its current state of urbanization, implementation of the MHCP is not expected to substantially increase or decrease the population viability of the mountain lion and will have little effect on species abundance

Table 4-72

**SUMMARY OF CONSERVATION FOR
MOUNTAIN LION**

City	Habitat Acres Conserved ¹	
	Net Acres (%)	BCLA Acres (%)
Carlsbad	3,147 (62%)	3,020 (64%)
Encinitas	1,651 (75%)	1,539 (77%)
Escondido	6,851 (77%)	6,249 (82%)
Oceanside	2,375 (56%)	1,932 (67%)
San Marcos	2,556 (48%)	2,353 (56%)
Solana Beach	31 (36%)	30 (55%)
Vista	603 (40%)	382 (63%)
MHCP Total ²	17,214 (63%)	15,506 (70%)

¹ Habitat includes all upland and riparian vegetation communities.

² Numbers may not total due to rounding.

or recovery as a whole. However, large blocks of habitat on the periphery of the study area are likely to contribute to the continued persistence of mountain lions in San Diego County. Improved road crossings for new or realigned major roads, would also benefit this species.

Special Considerations. The MHCP has not attempted to increase lion populations within urban areas. However, continued accommodation of lion populations in wild areas of San Diego County will require an increase in public awareness of (1) the importance of large predators in natural ecosystems, and (2) methods for avoiding problem encounters between humans and lions.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Perform studies to design cost-effective and biologically effective road-crossing improvements for this species in appropriate locations.

Southern Mule Deer

Odocoileus hemionus fuliginata

USFWS: None

CDFG: Regulated Game Species

Conservation Goals

Ensure species persistence within the plan area. Enhance habitat quality, provide suitable corridors, and contribute to regional population viability.

Conservation Strategy

Include within the preserve system large blocks of appropriate habitat with particular emphasis on habitat contiguous with natural habitat outside of the study area (e.g., Camp Pendleton, north and east of Escondido, and the unincorporated core). Maintain suitable corridors between major blocks of habitat. Modify road crossings or corridors to minimize the potential for roadkill.

Coverage Determination and Permit Conditions

Coverage Determination. Covered, subject to species-specific conditions.

Rationale. The MHCP will adequately conserve this species by conserving a few large blocks of habitat that are contiguous with larger blocks outside the study area, and by managing those preserve areas consistent with species' needs. Although existing conditions preclude allowing for movement between major habitat blocks across the study area, opportunities for connections to large blocks outside the study area are conserved (e.g., east from Daley Ranch across Escondido Water District lands; south from San Marcos into the unincorporated core area; and north from Oceanside into Camp Pendleton). Mule deer are therefore expected to persist in these portions of the study area, consistent with MHCP biological goals.

Conditions. The following conditions must be met by subarea plans to adequately conserve this species:

1. Maintain and enhance habitat linkages between conserved habitat areas that are intended to support mule deer. New roads or improvements to existing roads must include adequate wildlife under-crossings and appropriate fencing to accommodate safe movements between occupied habitats on either side (Ogden 1992a). Placement and design of road crossings and associated improvements (fencing, vegetation restoration) should be done based on site-specific wildlife movement surveys and biological criteria.
2. Periodically monitor key habitat linkages to assess their use by mule deer

Background

Distribution, Abundance, and Trends. Mule deer presently are widespread throughout undeveloped portions of western San Diego County, although they may be declining in the county. Recently documented occupied areas include the Laguna Mountains, Camp Pendleton, Torrey Pines, Miramar, Palomar, Escondido, San Marcos, Carlsbad, Los Peñasquitos Canyon Reserve, La Jolla, Poway, Sweetwater River, and Otay Lakes (Bond 1977). Deer are fairly common in portions of the MHCP area where sufficient habitat is present, but are apparently disappearing from coastal cities due to habitat fragmentation (e.g., Dawson-Los Monos Reserve; I. Kay personal communication). Deer require relatively large, undisturbed tracts of chaparral, coastal sage scrub, and mixed grassland/shrub habitats (Padley 1992). There are no major populations or critical locations in the plan area (see MHCP Database Records Map).

Threats and Limiting Factors. The southern mule deer is not threatened with extinction within its range, but the present checkerboard of private property distribution in western San Diego County and urbanization could result in local extirpation without appropriate conservation measures. Roads are a significant source of direct mortality and habitat fragmentation.

Special Considerations. Migration and dispersal corridors that minimize the potential for roadkill are an important component of a preserve design and will benefit mule deer. Mule deer are an important prey for mountain lions. New or realigned roads should be removed from riparian corridors, and properly designed road undercrossings, with wildlife fencing along roadways, should be installed at natural crossing locations to minimize vehicle-deer encounters.

Conservation Analysis

Conservation and Take Levels. Virtually all terrestrial habitats in the study area are suitable for mule deer if they are sufficiently connected by wildlife corridors appropriate for deer. Moderate conservation of the coastal scrub, chaparral, oak woodland, and riparian ecological communities (Section 3.2) should benefit this species. The FPA will conserve approximately 17,214 acres (63%) of potentially suitable habitat (Table 4-73). Conservation of point localities is not considered a reliable measure of conservation for this species.

Preserve Configuration Issues. Most of the habitat in the interior of the study area is too fragmented into smaller patches to consistently support deer. Only the large blocks of habitat in Daley Ranch and other areas adjacent to more extensive habitats outside the plan area (e.g., south San Marcos, southeast Carlsbad, and north Oceanside) are expected to consistently sustain deer. Connectivity of these large blocks inside the plan area is adequately maintained with habitat outside of the plan area and conserved habitat. The vicinity of Daley Ranch substantially contributes to the connectivity of habitat north and east of the study area.

Table 4-73**SUMMARY OF CONSERVATION FOR
SOUTHERN MULE DEER**

City	Habitat Acres Conserved¹	
	Net Acres (%)	BCLA Acres (%)
Carlsbad	3,147 (62%)	3,020 (64%)
Encinitas	1,651 (75%)	1,539 (77%)
Escondido	6,851 (77%)	6,249 (82%)
Oceanside	2,375 (56%)	1,932 (67%)
San Marcos	2,556 (48%)	2,353 (56%)
Solana Beach	31 (36%)	30 (55%)
Vista	603 (40%)	382 (63%)
MHCP Total²	17,214 (63%)	15,506 (70%)

¹ Habitat includes all upland and riparian vegetation communities.

² Numbers may not total due to rounding.

The preserve includes 15,506 acres (70%) of the potential mule deer habitat contained by the BCLA (Table 4-73). The BCLA was delineated to include the most important large blocks of habitat, critical locations, and areas of high biological value. FPA conservation of the BCLA therefore provides a useful measure for comparing the proposed preserve to a biologically preferred preserve design, given the existing degree of fragmentation in the plan area. Consequently, although about 63% of total potential habitat will be preserved, approximately 70% of the most important potential habitat will be conserved. Additional acres included in the FPA but not in the BCLA generally are isolated, small, or degraded fragments of habitat that may be of lesser biological value.

Currently, Valley Center Road is being expanded and realigned between Escondido and Valley Center, on habitat lands lying between Daley Ranch and Lake Wohlford within the Escondido subarea. As part of this project, the county Department of Public Works is designing and installing three wildlife undercrossings at strategic locations. Similar efforts should be undertaken, based on site-specific field studies, for any new or redesigned roads in areas where deer or other large mammals are subject to roadkill.

Effects on Population Viability and Species Recovery. Conservation of several large blocks of habitat on the periphery of the plan area will marginally contribute to viability of the regional deer population. Road-crossing improvements should also benefit this species in the study area.

Special Considerations. None identified.

Adaptive Management Program

In addition to conserving habitat, the MHCP will manage and monitor conserved areas in accordance with the MHCP Biological Monitoring and Management Plan. Monitoring results will help refine the management program so that management activities can be adjusted to maximize species viability in the study area and contribute to species recovery.

Additional Conservation and Management Recommendations. The following recommendations may be implemented based on results of the monitoring program and/or the availability of funding.

1. Perform studies to design cost-effective and biologically effective road-crossing improvements for this species in appropriate locations.

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SECTION 5.0

REFERENCES

5.0 REFERENCES

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APPENDIX A

**CALIFORNIA GNATCATCHER
HABITAT EVALUATION MODEL AND
POPULATION VIABILITY ANALYSIS
November 2000**

APPENDIX A

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APPENDIX A

CALIFORNIA GNATCATCHER HABITAT EVALUATION MODEL AND POPULATION VIABILITY ANALYSIS November 2000

INTRODUCTION

Appendix A describes two complex computer modeling exercises, a Habitat Evaluation Model (HEM) and Population Viability Analysis (PVA), that were used to support conservation planning for the California gnatcatcher (*Polioptila californica californica*) in the MHCP study area. Although these models are just two of the many tools used in the conservation planning process, they are powerful because they help integrate biological, ecological, demographic, and geographic information across the entire study area. The purpose of the gnatcatcher HEM is to comprehensively identify the best remaining high-quality habitat in the vicinity of the study area. The gnatcatcher HEM is designed to apply biological and ecological information for the gnatcatcher to the best available geographic data to predict the potential distribution and quality of gnatcatcher habitat. The PVA is used as a heuristic tool that helps integrate knowledge of gnatcatcher biology (e.g., reproductive rates, dispersal, and territory size) with the geographic distribution of habitat in the regional vicinity of the MHCP study area. It is not appropriate to assume that a PVA could provide definitive answers to conservation and preserve design questions; however, it is a useful tool to assist conservation biologists in comparing various preserve design options relating to patch size, connectivity and dispersal corridors, and habitat restoration needs. Additional scientific input and review was provided by Jon Atwood, Pat Mock, and Gerald Braden.

BACKGROUND

The California gnatcatcher is one of three recognized subspecies within the species *Polioptila californica* (Atwood 1991). This small songbird was previously a widespread resident of coastal sage scrub (CSS) habitats in much of southern California and northern Baja California. The subspecies was recorded from coastal areas of southern Ventura County to approximately 30 degrees North Latitude in Baja California. Eastern limits of the species' U.S. distribution historically were the most western portions of San Bernardino and Riverside counties. The interior distributional limits of *P. c. californica* in northern Baja California are not accurately known, but it is believed to be limited primarily to a relatively narrow band of suitable habitat along the coast below elevations of 250 meters (Atwood 1991; Atwood and Bolsinger 1992).

The distribution and relative abundance of California gnatcatchers appear to have been patchy and highly localized even prior to the extensive changes in land use during the past 90 years. Grinnell (1898) found gnatcatchers to be "numerous" in the San Fernando Valley and about Pomona and Claremont, but gnatcatchers were not detected between these two localities (i.e.,

near Pasadena), although suitable habitat apparently was present. This patchy distributional pattern has been accentuated by the agricultural and urban development of southern California.

Population declines have been most evident in the three northern counties of the species' historical distribution. Gnatcatchers apparently have been largely extirpated from Ventura and San Bernardino counties, and a single remnant population is known on the Palos Verdes Peninsula in Los Angeles County. Other small remnant populations may still exist near Azusa, Tujunga, and Claremont, where relatively recent sightings (1960-1984) were documented (Atwood 1990). The most substantial U.S. populations of California gnatcatchers currently occur in Orange, Riverside, and San Diego counties.

Atwood (1990, 1992) estimated that approximately 1,811 to 2,291 pairs of coastal California gnatcatchers remained in southern California. Based on later information, the USFWS (1993) estimated that about 2,562 pairs of coastal California gnatcatchers remained in the United States. Approximately 2,800 pairs of *P. c. californica* are estimated to occur in the Mexican portion of the subspecies' range (J. Newman pers. comm. 1992).

It should be noted that the above estimates for gnatcatcher abundance in California (roughly 1,800 to 2,500 pairs, with 1,000 to 1,500 pairs in San Diego County) were made during the early 1990s, following a period of extended drought in southern California. Results of more recent (late 1990s) surveys suggest that gnatcatcher populations may have increased following relaxation of the drought (P. Mock pers. comm.; M. Fugagli pers. comm.). Given the frequency of drought in southern California, it seems prudent to use the lower "drought condition" population estimate for conservation planning and in assessing species viability.

CURRENT STATUS OF THE CALIFORNIA GNATCATCHER

In 1993, the California gnatcatcher was listed as a threatened species under the federal Endangered Species Act of 1973 (USFWS 1993). Critical habitat for the gnatcatcher is currently proposed by the USFWS on suitable gnatcatcher habitat within approximately 800,000 acres in Los Angeles, Orange, Riverside, San Bernardino, and San Diego counties, California. Critical habitat identifies specific areas, both occupied and unoccupied, that are essential to the conservation of a listed species (e.g., areas for foraging, nesting, rearing of young, intra-specific communication, roosting, dispersal, genetic exchange, or sheltering) and that may require special management considerations or protection (USFWS 2000). Areas that do not currently contain all of the primary constituent elements, but that could develop them in the future, may be essential to the conservation of the species and may be designated as critical habitat. The original comment period on the critical habitat proposal closed on April 7, 2000; however, it was reopened and extended until July 31, 2000. A final rule on California gnatcatcher critical habitat is pending.

CALIFORNIA GNATCATCHER HABITAT EVALUATION MODEL

A geographic information system (GIS) HEM was developed in 1991 for the San Diego Multiple Species Conservation Program (MSCP; Ogden 1995) and was adapted for use within

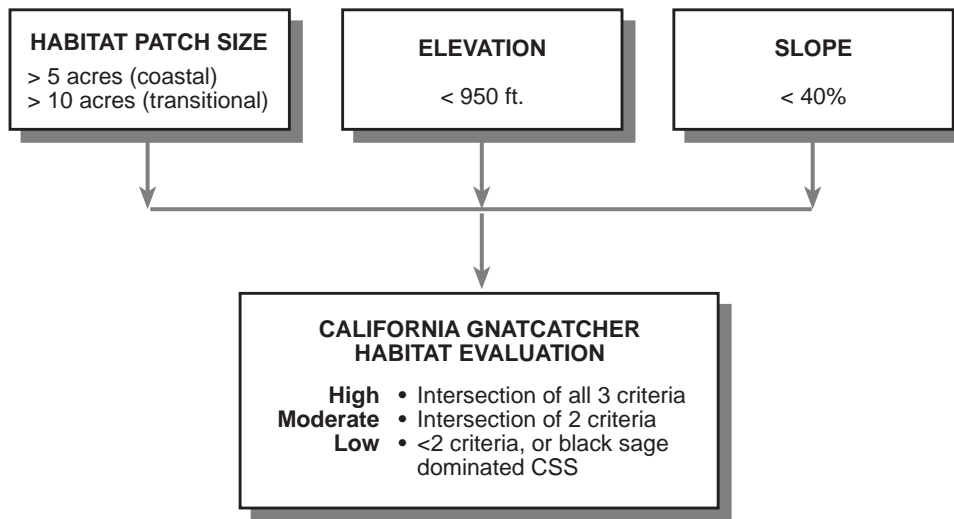
the MHCP study area. The model is programmed in Arc Macro Language (AML) and runs on ARC/INFO GRID software. The purpose of the HEM was to rank patches of coastal sage scrub (CSS) habitat based on habitat value to the gnatcatcher. The criteria for determining habitat value were patch size and shape, slope, and elevation, all of which were shown to be correlated with use by the California gnatcatcher. Our purpose in using the gnatcatcher HEM is two-fold: (1) to identify and rank areas of gnatcatcher habitat to better quantify gnatcatcher conservation by the MHCP plan; and (2) to help parameterize the PVA for the gnatcatcher by estimating the carrying capacity (K) for gnatcatchers in different areas.

Initial application of the MSCP HEM to the MHCP area proved inadequate in identifying all areas known to support gnatcatchers. The original MSCP HEM was developed for a much larger area that covered more diverse environmental gradients north to south and east (inland) to west (coast). Therefore, the HEM was modified for the MHCP study area to better fit the smaller project area and reduced environmental gradients. The modifications also incorporated significant new data regarding gnatcatcher habitat usage with respect to patch size and vegetation subassociation preference.

The HEM proceeds through a series of steps to identify and rank patches of CSS (Figure A-1). First, the HEM identifies all areas covered by CSS, including the maritime succulent scrub, coastal sage scrub, mixed coastal sage scrub/chaparral, and alluvial fan scrub Holland (1986) vegetation types. (Note that no alluvial fan scrub is located within the MHCP area.) The original MSCP HEM then located all patches with a square core window of CSS greater than 25 acres in the coastal climate zone (within approximately 10 miles of the coast) and 50 acres in the transitional climate zone (greater than approximately 10 miles of the coast). Patch size was based on the relatively large area requirements of the gnatcatcher and the expected edge effects that increase as patch size decreases. The patch size differs between climate zones because research on home range and territory size indicated that territory size increased with distance from coast (ERCE 1991; Preston et al. 1998). The requirement that the patch must fill the square core window area ensures that the patch has the minimum shape requirements (e.g., narrow linear patches were less desirable and could not fill the 25- or 50-acre window even if they were large, while rounded patches of at least 25 or 50 acres could fill the window).

Additional research and data now indicate that, at least within the MHCP study area, the minimum patch size that can consistently support gnatcatchers is substantially smaller than previously thought, especially within more coastal areas. A frequency distribution of the occupied patch size shows patches 5 to 6 acres are most frequently occupied (Figure A-2). This does not suggest that these smaller patches are preferred by gnatcatchers over larger patches, or that gnatcatcher reproduction in these patches is equal to that in larger patches. However, the available data suggest that these smaller patches are capable of supporting nesting gnatcatchers and should not be discounted in assessing habitat quality and potential contributions to preserve design due exclusively to their small size. Therefore, we have modified the HEM to locate all patches of CSS that are 5 acres or greater, which results in a more conservative model relative to exclusion of areas from consideration as preserve areas.

California Gnatcatcher Habitat Evaluation (3 map layers)

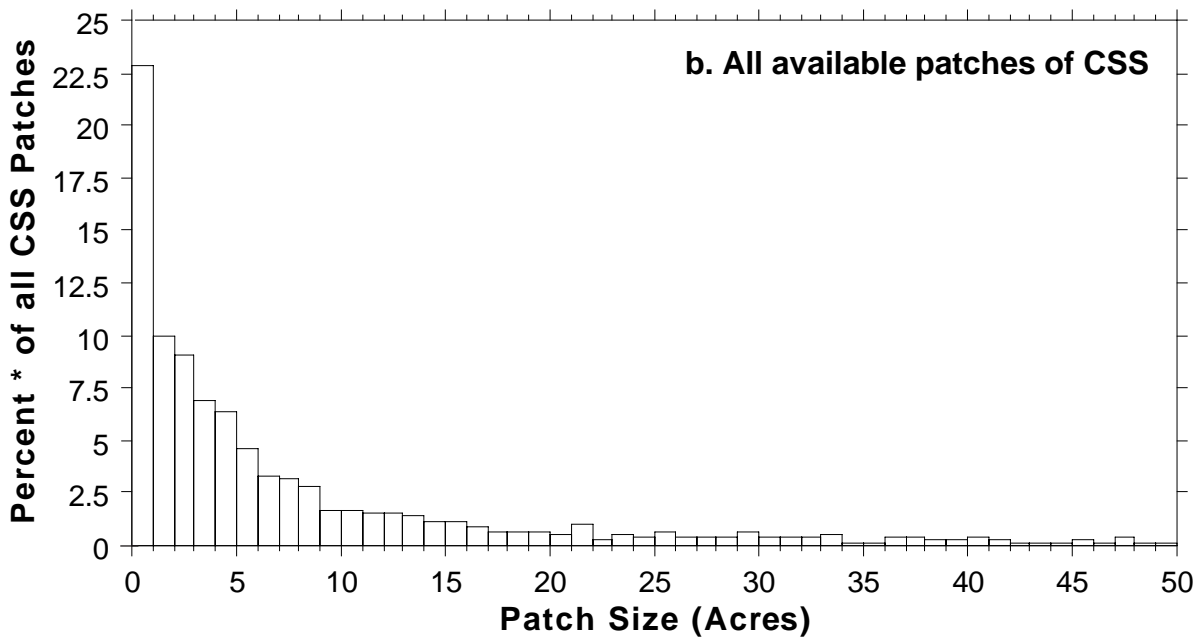
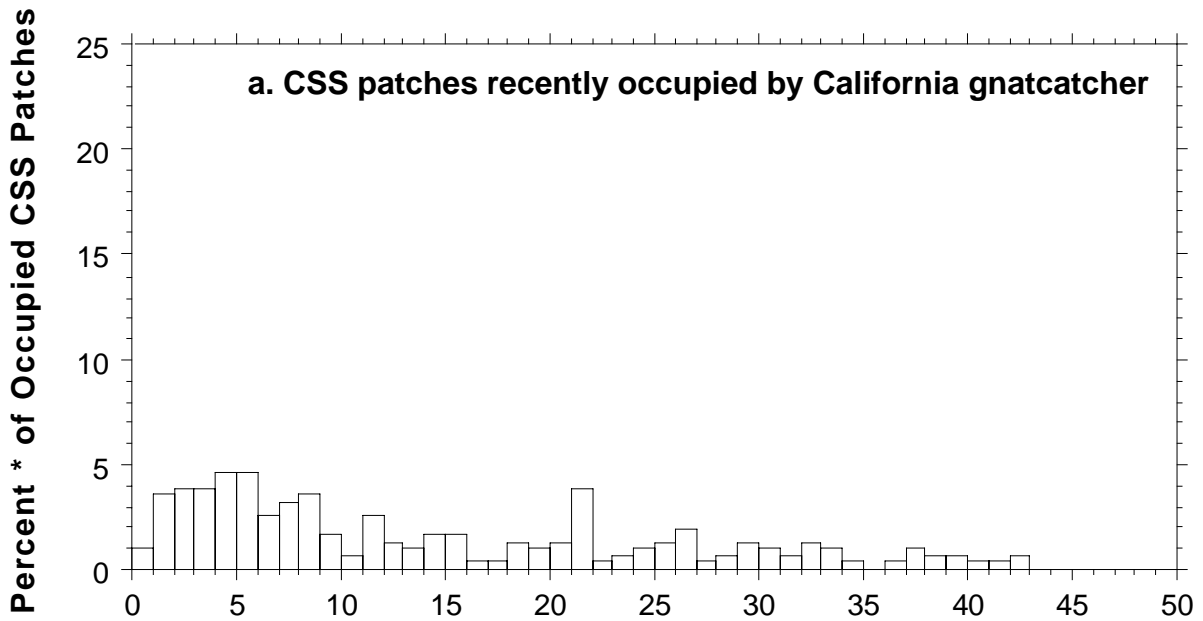


F I G U R E

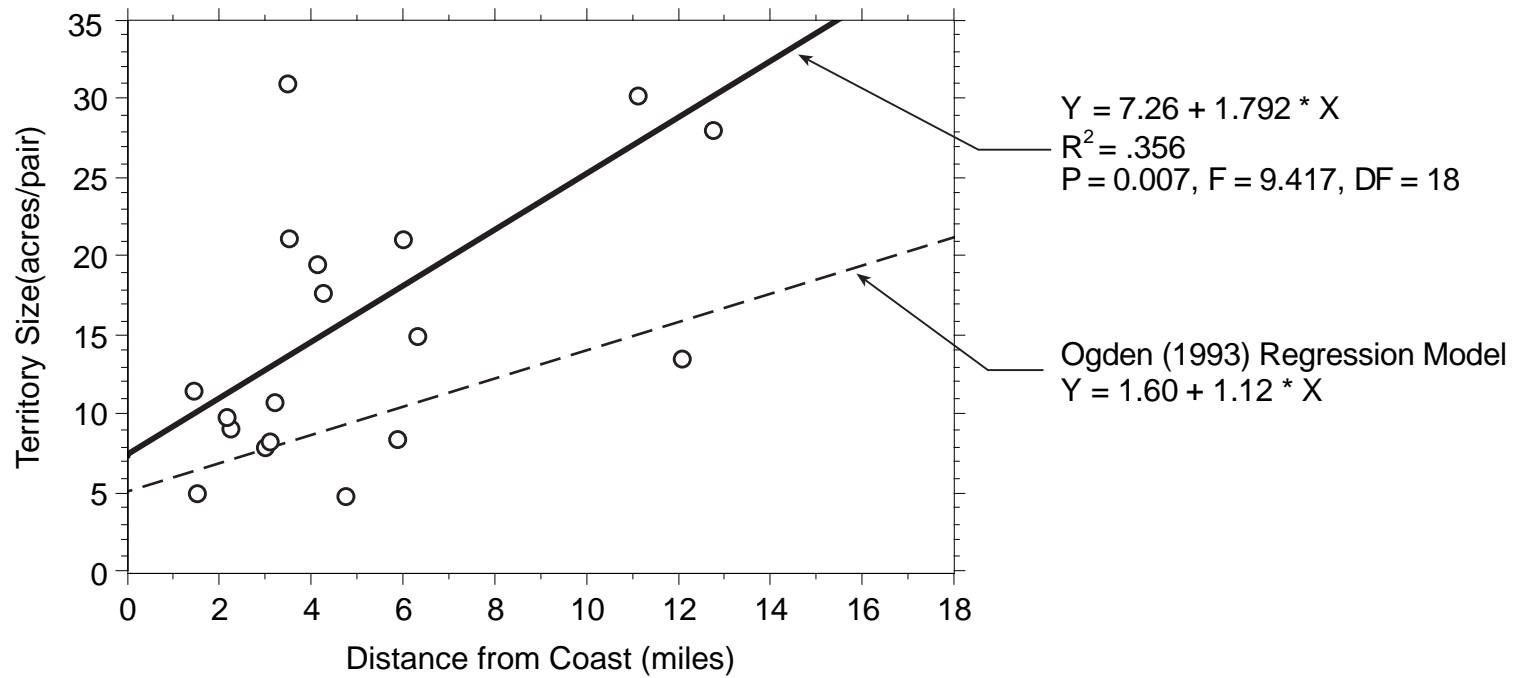


GIS Habitat Evaluation Model for the California Gnatcatcher
in the MHCP Study Area

A-1



* The intervals specified do not contain the entire range of the data.



FIGURE

Gnatcatcher Territory Size Regression Model

A-3

We used single-year survey data from sites that were well surveyed to estimate gnatcatcher densities on a number of patches in the vicinity of the study area. We used the inverse of the density of survey data points documenting pair locations to estimate territory size and fit a regression line to our data (Figure A-3). The regression shows an increase in territory size (or a decrease in density) as distance from the coast increases. This pattern is similar to that identified by Preston et al. (1998) where territory size was measured directly by following banded individuals. To determine how we should assign a greater minimum patch size to the patches in the transitional climate zone, we separated data for patches with gnatcatcher location points and for our territory size estimates into coastal and transitional groups and looked at the arithmetic and harmonic means, minimum, and median for patch size and territory size. In general, each of these statistics was 2 to 3 times larger for the data from the transitional climate zone. Therefore, these data support the assumption that occupied patch and territory size is larger in the transitional climate zone, and that it is at least double that in the coastal zone. Based on this analysis, we have modified the HEM to include 10 acres as the minimum patch size in the transition zone. This modification to the HEM better fits the distribution of habitat in the MHCP (i.e., fragmented into a stepping-stone configuration) and supports the inclusion of some smaller patches in the preserve design.

CSS patches are imbedded in a matrix of other habitat, disturbed, and developed areas. Gnatcatcher territories often include areas of non-CSS habitats within a habitat matrix. Consequently, it is necessary to evaluate the habitat value as it exists within this matrix. After identifying the patches of CSS, the HEM searches the habitat matrix surrounding the central patch to add satellite patches that are likely to be used by gnatcatchers in the habitat matrix. A search radius of 1,600 feet was established by Ogden (1993). Satellite patches within this radius are added to the central patch and coded as usable habitat independent of satellite patch size.

Once sizable central patches and associated satellites have been identified, the HEM applies the next two criteria, elevation and slope. The original MSCP HEM next identifies all patches that occur below 950 feet. Atwood and Bolsinger (1992) showed that the majority (94%) of gnatcatcher sightings in San Diego County are below the 800-foot elevation contour. Within the MSCP study area, Ogden found over 90% of documented gnatcatcher sightings below 950 feet. Although no formal analyses have been performed to statistically test whether this apparent elevational pattern may only reflect survey efforts biased to lower elevational areas (Braden pers. comm.), we know of many surveys performed by qualified biologists in higher elevational CSS habitats. Collective knowledge of numerous experienced gnatcatcher biologists support the observation that few gnatcatcher populations are reliably found above about 900 or 1,000 feet in San Diego County. Furthermore, within the MHCP area, nearly all higher elevational areas have been repeatedly and intensively surveyed, with very few observations of gnatcatchers. Over 99% of documented gnatcatcher sightings in the MHCP area are below 950 feet; therefore, we have retained the 950-foot elevation criterion in this HEM. Note that less than 5% of the coastal sage scrub in the study area is above 950 feet elevation.

The original MSCP HEM used slopes less than 40% as the third criterion for ranking gnatcatcher habitat. Ogden's detailed studies (Mock and Bolger 1992; Ogden 1992a) and

other observations (e.g., Bontrager 1991, B. Wagner pers. comm.) suggest that gnatcatchers avoid nesting on very steep slopes (> 40%). At Rancho San Diego, gnatcatchers exhibited neutral selection for slopes less than 20%, significantly positive selection for slopes of 20% to 40%, and negative selection (avoidance) of slopes greater than 40% in siting their nests (Mock and Bolger 1992). However, habitat on slopes greater than 40% are nevertheless suitable for foraging and dispersal. Approximately 93% of the documented gnatcatcher sightings within the MSCP study area occur where the slope gradient is less than 40%, and 99% of the sightings within the MHCP study area occur where the slope gradient is less than 40%. Therefore, the MHCP HEM has also retained the original slope criterion.

In Ogden (1993) these three criteria (sizable CSS patches, elevation, and slope) were combined to highlight areas that have the best potential to support gnatcatchers. Areas meeting all three criteria were ranked as high value gnatcatcher habitat, areas meeting at least two criteria were ranked medium value, and areas meeting zero or one criterion were ranked low value. Ogden (1993) also used population “core areas” as a fourth criterion, which resulted in a “very high” habitat ranking if the other three criteria were met. Because the population core areas were not specifically defined for the MHCP, this additional criterion was not included in the MHCP gnatcatcher HEM.

More recent data have shown that the CSS subassociation dominated by black sage (*Salvia mellifera*) (BS-CSS) does not support high densities of gnatcatchers and should not be considered high quality habitat even if it meets the patch size, slope, and elevation criteria (P. Mock pers. comm.). To incorporate this additional information into the HEM, we have added a second tier to the habitat ranking process. Ogden biologists and local experts (H. Wier, A. Hayworth, and P. Mock) mapped areas of known BS-CSS in and near the MHCP study area, and the habitat value of these areas was then reduced to “low.” The final HEM output is a three-level ranking of potential gnatcatcher habitat based on the criteria of these two tiers. The final results of the gnatcatcher HEM are shown in Figure A-4.

POPULATION VIABILITY ANALYSIS FOR THE CALIFORNIA GNATCATCHER

PVA is a predictive modeling technique for population biology. PVA integrates data and estimates of a species' key life history parameters (e.g., survival, fecundity, and dispersal rates) into a sophisticated mathematical computer model to generate quantitative estimates of the extinction risk faced by the species (i.e., expected time to extinction, or probability of persisting for a given period of time). Like weather forecasts and economic forecasts, PVA seeks to predict events that will occur in the future. The future events of interest in a PVA are trends in population size that may lead to extinction of a species. The farther into the future a prediction is attempted, the greater the uncertainty of the prediction. Also, the less data available to build a PVA, the greater the uncertainty in the prediction. PVA does not give absolute answers; instead PVA models help integrate available knowledge of species data and environmental variability to narrow the uncertainty of the predictions or forecasts of the species' population status at some time in the future. Because uncertainty is inherent in the construction of a PVA model, uncertainty must be incorporated into the predictions made by a PVA model. In spite of these obstacles, PVA has been applied to conservation problems for a wide variety of species

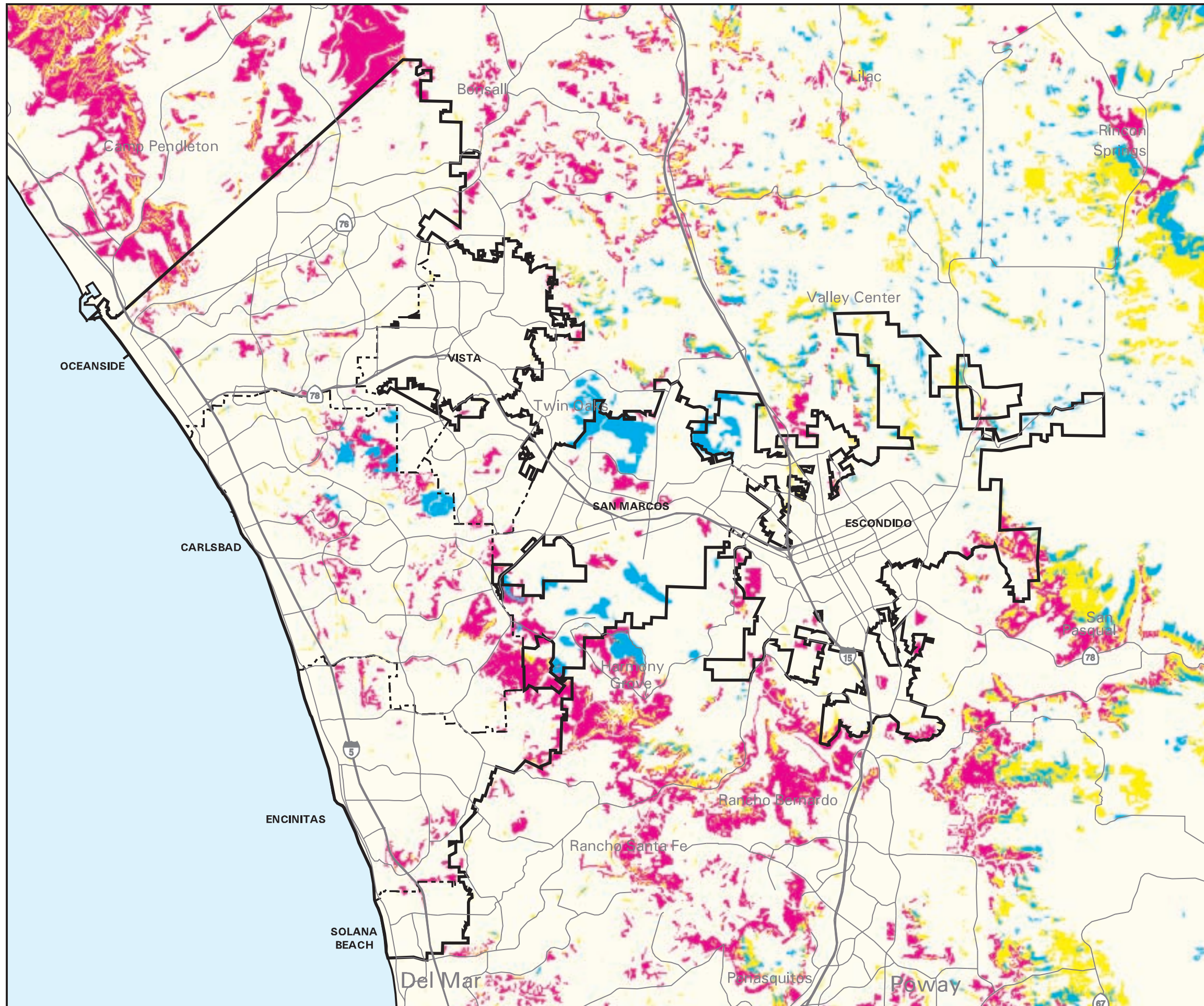
from streamside plants (Menges 1990) to top carnivores (Shaffer 1981). Recently, however, many researchers have raised doubts about the usefulness and validity of estimates generated by PVA models (Ludwig 1999).

Appropriate Use of PVA

Within the context of conservation planning, PVA has been used as a tool for investigating relative merits of proposed conservation and management actions for the species of interest; however, a PVA should never be the only conservation tool upon which conservation decisions are based. Although PVA is a *forecasting tool*, the accuracy of the quantitative forecasts PVAs produce has been seriously questioned (Boyce 1992; Ludwig 1999). PVA is also a useful *heuristic tool* for conceptualizing a species' population dynamics in space and time. The process of building a PVA model is a useful way in which to synthesize a better understanding of a species' population biology within a given conservation context. Akçakaya and Burgman (1995) emphasize the utility of the model-building process in PVA as the important conservation tool. By focusing on the model-building process, PVA can be a useful tool to assist conservation biologists in evaluating and comparing various preserve design options relating to patch size, connectivity and dispersal corridors, and habitat restoration needs. Finally, PVA models should be seen as an active part of species management and monitoring, such that, as more data become available and assumptions or management directions change, the PVA model is modified and refined in response to and as an integral part of active adaptive species management.

PVA was applied to conservation planning for the gnatcatcher in the MHCP as a model-building heuristic tool. Therefore, PVA became integrated into the preserve design and conservation planning process, but does not and was not intended to provide meaningful quantitative results regarding risk of extinction within the MHCP study area.

**Figure A-4
Gnatcatcher Habitat Value
MHCP Study Area**



- High Value
(meets all 3 criteria)
- Moderate Value
(meets 2 criteria)
- Low Value
(meets only 1 criterion or
dominated by black sage)

- Generalized Subarea
Plan Boundary
- MHCP Boundary

SOURCE: Gnatcatcher Habitat Evaluation Model, Feb 1999

↑
 Feet 0 6,500 13,000
 Kilometers 1.56 3.12
SANDAG
 February 25, 2003

Application to MHCP Biological Goals, Standards, and Guidelines

The primary goals for the California gnatcatcher in the Biological Goals, Standards, and Guidelines for the MHCP (Ogden 1998) are to ensure species persistence within the plan area and to contribute to regional metapopulation viability and species recovery by ensuring genetic and demographic connectivity between larger core breeding habitats north and south of the plan area (see Section 4). The PVA was used in the analysis of the connectivity of habitat through the MHCP study area, but it was not used to test the ability of the MHCP to ensure the species persistence within the study area for the reasons stated under “Appropriate Use of PVA,” above.

Regional Context of the PVA

The gnatcatcher PVA is a spatially explicit metapopulation model that simulates the interaction of distinct subpopulations (local populations) of gnatcatchers distributed throughout the MHCP study area as well as with subpopulations outside of the study area. A metapopulation model interprets the landscape as a network of idealized habitat patches or fragments. Species occur in these patches as discrete local populations that are connected by migration between patches (Hanski 1998). Typically, the relative contribution of each subpopulation to the viability of the overall metapopulation varies. Some subpopulations may have positive net population growth (source populations) and act as a source of dispersing immigrants to other less productive subpopulations (Pulliam 1988; Pulliam and Danielson 1991; Dunning et al. 1992). Other subpopulations may have negative net population growth (sink populations) and may depend on source populations to maintain their numbers or to recolonize or rescue the subpopulation following local population extirpation (Brown and Kodric-Brown 1977; Stacey and Taper 1992). In this way, both source and sink subpopulations provide critical linkages to connect the network of dispersing individuals throughout the metapopulation. Linkages are critical because they provide the flow of individuals from source to sink and because they provide gene flow throughout the metapopulation. Lack of gene flow between subpopulations leads to genetic isolation, increased inbreeding, and possible loss of population viability due to inbreeding depression or loss of genetic diversity, which maintains evolutionary adaptive potential. Therefore, smaller subpopulations that are not self-sustaining still can be critical to the integrity of the overall metapopulation if they provide important “stepping stones” for gene flow between larger source subpopulations.

There are few large patches of gnatcatcher habitat in the MHCP; therefore, the subpopulations in the study area are relatively small (Calvera, northwest and northeast San Marcos/Escondido, Aviara, San Elijo, Oceanside, and Hedionda; Table A-1 and Figure A-4). There are a number of large patches of habitat and larger subpopulations occurring near the MHCP to the north (two subpopulations on Camp Pendleton) and to the south (east La Costa/southwest San Marcos [part in MHCP and part in County], Penasquitos Preserve, Black Mountain) and southeast (San Pasqual, south Poway, and Poway). Many of the smaller habitat patches in the coastal region of the MHCP appear to function as stepping stones and provide an important north-south linkage between these larger subpopulations. Overall, the smaller MHCP populations enhance the connectivity of the regional population.

Table A-1

**PROPORTIONAL DISTRIBUTION OF THE CALIFORNIA GNATCATCHER IN
SUBPOPULATIONS IN NORTH SAN DIEGO COUNTY**

North San Diego County Gnatcatcher Subpopulations <i>Inside</i> MHCP	North San Diego County Gnatcatcher Subpopulations <i>Outside</i> MHCP	Percent of North County Population*
1.	Central Pendleton	30.8%
2.	E.La Costa/SW San Marcos	11.5%
3.	NE Pendleton	7.7%
4.	San Pasqual	5.0%
5.	Penasquitos Preserve	5.0%
6.	Black Mountain	4.8%
7.	S. Poway	4.1%
8.	Poway	3.3%
9.	Pala	3.1%
10.	Lake Hodges	3.0%
11.	Hellhole Canyon	2.9%
12.	SW Poway/BlueSky	2.9%
13. Calavera		2.6%
14.	Bonsall/I-15	2.6%
15. NW San Marcos/Escondido		1.3%
16. Aviara		1.3%
17. San Elijo		1.2%
18.	SE of Ramona	1.2%
19. Oceanside		1.1%
20. NE San Marcos/Escondido		1.0%
21.	Fallbrook	1.0%
22.	Pauma Valley	0.9%
23.	Del Mar Mesa	0.8%
24. Hedionda		0.5%
25.	Palomar	0.2%
Inside MHCP Total	Outside MHCP Total	100%
9.1%	90.9%	

* Proportional distribution of populations is based on carrying capacity estimates from the gnatcatcher habitat evaluation model. Populations sorted by size.

PVA Data Requirements

PVA models require extensive and detailed data on a species' life history, such as seasonal or annual reproduction and mortality rates, population genetic traits, and dispersal capabilities. PVA models also require data on how these characteristics vary with habitat quality, the age and sex of individuals comprising the population, environmental fluctuations, and other factors. Confidence in model results requires sensitivity analyses of the input parameter values, which help identify those parameters of the model that more strongly influence model results and must be most carefully estimated. The data required to determine the model parameter values and to perform reliable analyses are available for very few species and are especially lacking for rare and poorly studied species. Due to lack of sufficient data and potential abuses of PVA models, PVA model results are not appropriate measures to evaluate preserve adequacy for the majority of MHCP species. The California gnatcatcher has been studied relatively intensely over the last decade; therefore, there are sufficient data for many of the key parameters of the PVA (Table A-2). All parameters and assumptions for the gnatcatcher PVA are based on the best available data at the time of model development (circa 1998).

Modeling Software and Model Parameterization

The simulation software used for the PVA was RAMAS/Metapop (Akçakaya 1998), which is a stochastic metapopulation simulation program. RAMAS/Metapop is a simulation model that simulates the changes in population size over time based on annual birth and death rates; it is a metapopulation model that simulates dispersal between subpopulations throughout the area of interest. RAMAS/Metapop is a stochastic simulation model, which means that it incorporates randomness in the variation in birth, death, and dispersal to simulate environmental variation (e.g., climatic variation that affects food abundances and survival) and demographic variation (including variation in number and sex of offspring, and dispersal direction and distance). Because the model is stochastic, each run of the model produces a different trajectory with its own pattern of increasing and decreasing population size over time. To make the model output interpretable, the simulation is run hundreds of times and the results are averaged to produce a mean trajectory with confidence intervals with which one can make probabilistic statements about the metapopulation under consideration.

A PVA for the gnatcatcher was developed for the MSCP (Ogden 1993). The model parameters used in the Ogden (1993) PVA underwent extensive peer review; therefore, we have suggested changes to parameters only where warranted based on new data. The basic PVA parameters include values for fecundity, survival, and dispersal rates. Variance in these vital rates and in the carrying capacity of the habitat (based on the HEM results) are incorporated into the PVA to simulate the effects of environmental stochasticity, which was based on variance in climate data for the region and on average variance in vital rates for other passerine species (Ogden 1993). Akçakaya and Atwood (1997) developed a similar model for the gnatcatcher in Orange County. We have used their model (Akçakaya and Atwood 1997) along with Ogden (1993) as a basis for our PVA model parameterization (Table A-2). The effects of demographic stochasticity were also included in the model; however, genetic stochasticity was not.

Sensitivity Analysis

A sensitivity analysis was conducted so that potentially sensitive parameters (those for which a small change in value results in a large change in model outcome) could be evaluated relative to the data confidence and conservatism used to estimate them. We tested the sensitivity of the stage matrix (survival and fecundity) means and standard deviations, K , all dispersal rates, density dependent dispersal, and all environmental correlations between subpopulations (Table A-3). The stage matrix means were highly sensitive, and the stage matrix standard deviations and environmental correlations were moderately sensitive. None of the other parameters we tested was significantly sensitive to change.

Table A-2 (Page 1 of 5)

**MHCP PVA RAMAS METAPOPOPULATION MODEL
PARAMETERS AND ASSUMPTIONS***

Parameters etc.	MHCP PVA Value	Compare with Akcakaya and Atwood (1997) Orange County Gnatcatcher PVA	Compare with Mock (1992) San Diego County Gnatcatcher PVA	Comments
Simulation Software	RAMAS/Metapop	RAMAS/Metapop	RAMAS/Space	
Replications	50	1000	300	Increase once model parameters finalized
Duration	200 years	50 years	200 years	Long-time horizon to detect long-term equilibrium state
Populations	56 subpopulations	13 subpopulations	35-47 subpopulations	Subpopulation delineation was refined for the MHCP vicinity based on an update of the Habitat Evaluation Model. This update only affected 16 of the 56 subpopulations originally delineated by Ogden (1993).
Carrying Capacity (K)	Acres/pair Coast: H=25; M=50; L=n/a Inland: H=50; M=100; L=n/a	Avg.=11.59 ± 20% (H→L) H=13.9 ac/pr M=11.6 ac/pr L=9.3 ac/pr	Determined from assumed population densities, climate zone, and calculated edge effects. Varies by subpopulation.	Within MHCP vicinity K multipliers were estimated based on a number of considerations including survey point density, habitat evaluation model correlation w/ point density, and total species population estimates. Outside of the MHCP vicinity K from Mock (1992) was used.
Metapopulation K	4,462 pairs	629 pairs	1,521-2,847 pairs	MHCP PVA includes Orange Co. populations (in 2 subpops).

Table A-2 (Page 2 of 5) (Continued)

**MHCP PVA RAMAS METAPOPULATION MODEL
PARAMETERS AND ASSUMPTIONS**

Parameters etc.	MHCP PVA Value	Compare with Akcakaya and Atwood (1997) Orange County Gnatcatcher PVA	Compare with Mock (1992) San Diego County Gnatcatcher PVA	Comments
Initial Abundances	80 % of K	80 % of K	80% of K	Arbitrary starting point. For long-term modeling exercises (e.g., > 25 years) this is not a sensitive parameter. Atwood based 80% on proportion of data points/K.
Growth Model	Ceiling	Ceiling	Logistic	Recommended for territorial spp. where density increases exponentially until territories are 100% occupied. This is a simplified version of the Beverton-Holt Contest Competition model (Akçakaya 1998).
Lambda (λ)	Coast = 1.1038 Intermed. = 1.075 Inland = 1.0497	1.0713	Coast = 1.092, R = 1.2 Intermed. = 1.048, R = 1.1 Inland = 1.025, R = 1.05	RAMAS GIS calculation
Density dependence	affects all vital rates	affects all vital rates	affects all vital rates	Ceiling model does not use density dependence until population is greater than K. It is an exponential model w/ truncation to K.
Demographic stochasticity	Active	Active	Active	Subpopulations are expected to reach small sizes where demographic stochasticity is a significant effect.

Table A-2 (Page 3 of 5) (Continued)

**MHCP PVA RAMAS METAPOPULATION MODEL
PARAMETERS AND ASSUMPTIONS**

Parameters etc.	MHCP PVA Value	Compare with Akcakaya and Atwood (1997) Orange County Gnatcatcher PVA	Compare with Mock (1992) San Diego County Gnatcatcher PVA	Comments
Stage Matrix	2 stages	2 stages	n/a	Stage 1 is HY/Age 1 first time breeders with a lower survival and fecundity. Stage 2 is ASY/Age 2+ experienced breeders.
Survival-Coast	HY=0.369 AHY=0.55	HY=0.3441 AHY=0.498	0.55	0.55 for adult songbirds is based on lit. review (see Mock 1992). HY CaGn have 2/3 survival rate of AHY (Ogden unpubl. data Rancho San Diego and Amber Ridge)
Fertility- Coast	1.5 Es per E	HY=1.5, AHY=1.8	1.5	Ogden unpubl. data (Rancho San Diego and Amber Ridge) during drought years.
Fecundity-Coast	HY=0.554 AHY=0.825	HY=0.5376 AHY=0.8899	0.825	Fecundity = survival * fertility in Leslie Matrix structure
Survival-Inland	HY=0.333 AHY=0.50	n/a	0.40	A more conservative value for survival was assigned to inland populations based on field data (Ogden 1992).
Fertility- Inland	same	n/a	1.5	
Fecundity-Inland	HY=0.401 AHY=0.600	n/a	0.60	Fecundity = survival * fertility in Leslie Matrix structure

Table A-2 (Page 4 of 5) (Continued)

**MHCP PVA RAMAS METAPOPULATION MODEL
PARAMETERS AND ASSUMPTIONS**

Parameters etc.	MHCP PVA Value	Compare with Akcakaya and Atwood (1997) Orange County Gnatcatcher PVA	Compare with Mock (1992) San Diego County Gnatcatcher PVA	Comments
Std.Dev. Matrix	30% of f and S for coast. 40% of f and S for intermediate and inland.	Fecund.: HY=44% f , AHY<1% S: HY=25%, AHY=5%	30% of f and S for maritime and coastal, 40% of f and S for intermediate and inland.	Coefficient of variation of vital rates ranged from 30-40% for other songbirds (lit. review in Mock 1992). Coastal climate zone is less variable; therefore, we used 30% for coast, 40% for inland populations.
Dispersal Matrix	Dispersal Function: $M_{ij}=.46\exp(-D_{ij}^{0.44})$	Dispersal Function: $M_{ij}=.40\exp(-D_{ij}^{0.35})$	Dispersal Function: $M_{ij}=.46\exp(-D_{ij}^{0.44})$	Dmax is 14 miles. Based on Ogden dispersal data (Ogden 1992). Dispersal will be edited to preclude dispersal across significant areas of urbanization.
Maximum Dispersal	10 miles	9.3 miles	10 miles	
Density-dependent dispersal	0.001	variable, mean = 0.008	0.5	No data to justify density-dependent dispersal.
Relative dispersal	HY 1.0 AHY 0.0	HY 1.0 AHY 0.0	n/a	Only Age 1 birds disperse. Age 2+ are assumed to have 100% subpopulation fidelity (although they may change territories, which is not accounted for in the model).
CV for Dispersal	0.10	0.0	n/a	Arbitrary. Assume some stochastic variation in dispersal.

Table A-2 (Page 5 of 5) (Continued)

**MHCP PVA RAMAS METAPOPULATION MODEL
PARAMETERS AND ASSUMPTIONS**

Parameters etc.	MHCP PVA Value	Compare with Akcakaya and Atwood (1997) Orange County Gnatcatcher PVA	Compare with Mock (1992) San Diego County Gnatcatcher PVA	Comments
Environmental Stochasticity Distribution	Lognormal	Lognormal	Binomial	Reflects the skewed distribution of environmental fluctuation (lots of small perturbations with relatively few large ones).
Extinction threshold	Metapop.=0	60	0	Allows total recovery from as little as a single pair. Only used to calculate time to quasi-extinction curve.
Within-subpop correlation	f , S , and K are correlated	f , S , and K are correlated	f , S , and K are correlated	Assume that all three are driven primarily by climatic factors and therefore are correlated. If predation were a major factor in survival, then this may not be true.
Catastrophe	None	Fire: 2 fires in largest patches ↓ K by 48%, recov. by 10 yr. Weather: $P=0.14$ ↓ f & S by ~75% 1 yr.	None	Should want to include occasional major fires or 100-year El Niño events.
Correlation matrix	Correlation function: $C_{ij} = .86 \exp(-D_{ij}^{0.002})$	Correlation function: $C_{ij} = 1.0 \exp(-D_{ij}^{0.033})$	Correlation function: $C_{ij} = .86 \exp(-D_{ij}^{0.002})$	Assumes environmental stochasticity driven by climatic factors. Based on weather station data (Ogden 1992).
Population management actions	None	None	None	No direct management is included in the model.

*Terms represented by letters or symbols: AHY = after hatch year; C = correlation between subpopulations i and j ; CV = coefficient of variation; D = distance between subpopulations i and j ; f = fecundity; H = high; HY = hatch year; K = carrying capacity; L = low; M = dispersal rate; M = medium; R = net reproductive rate; S = survivorship; λ = finite rate of increase in the population

Table A-3

MHCP GNATCATCHER PVA SENSITIVITY ANALYSIS

Parameter	Initial Value	% Change	Difference in Probability of Interval % Decline	P-value	Comments
Density	0.001	100%	0.10	>0.10	Value is slope of the line pop. size (x) by dispersal rate (y). Mock suggests a value of 0.5, Atwood used ~0.001 Conclusion: Not sensitive.
Dependent		500%	0.09	>0.10	
Dispersal		1000%	0.06	>0.10	
		10000%	0.05	>0.10	
Stage Matrix Means	See Table A-2	3%	0.31	<0.001	Conclusion: Very sensitive to change.
		5%	0.47	<0.001	
		10%	0.71	<0.001	
		25%	0.94	<0.001	
Stage Matrix Std. Dev.	See Table A-2	3%	0.10	>0.10	Conclusion: Sensitive to change.
		5%	0.15	<0.05	
		10%	0.26	<0.001	
		25%	0.52	<0.001	
Carrying Capacity (K)	See Table A-2	3%	0.08	>0.10	Conclusion: Not sensitive.
		5%	0.07	>0.10	
		10%	0.13	>0.10	
		25%	0.09	>0.10	
All Dispersal rates	See Table A-2	3%	0.08	>0.10	Conclusion: Not sensitive.
		5%	0.05	>0.10	
		10%	0.06	>0.10	
		25%	0.06	>0.10	
All correlations	See Table A-2	3%	0.06	>0.10	Conclusion: Very sensitive after reaching threshold (between 10-25% increase). Not sensitive between 0 and 10% increase.
		5%	0.05	>0.10	
		10%	0.10	>0.10	
		25%	0.99	<0.001	

Discussion

This PVA is not intended to test viability of an isolated gnatcatcher population contained within the MHCP study area. The gnatcatcher subpopulations contained within the MHCP study area appear to be closely linked (in terms of demographics and gene flow) to populations north, south, and southeast of the study area. Based on our understanding of source-sink dynamics and the structure of the regional gnatcatcher metapopulation, we conclude that the MHCP gnatcatcher population is dependent on the linkages to other subpopulations outside the MHCP for long-term viability. Conversely, these subpopulations outside the MHCP rely on the linkages provided by the MHCP population to maintain gene flow and possibly long-term metapopulation viability. Therefore, results of this PVA modeling exercise are interpreted in terms of their effect on the critical linkages, and source-sink dynamics within and through the MHCP area, rather than on the isolated viability of the gnatcatcher population in the MHCP study area.

We have used this PVA heuristically as an exploratory research tool, whereby we have organized and tested our knowledge of gnatcatcher biology relative to the MHCP biogeographic context. The process of building and manipulating the PVA provided a structure for considering connectivity for gnatcatchers in the MHCP during preserve design and evaluation. The development of this PVA has been a mechanism by which the MHCP linkages that support the regional gnatcatcher metapopulation can be visualized and studied. We modeled the hypothesized functioning of these linkages such that this PVA has been a useful tool to demonstrate the probable metapopulation dynamics in the MHCP vicinity. However, this PVA is not a confirmation of the functioning of this linkage or the metapopulation dynamics of the MHCP. Nonetheless, it has been one of many tools used to evaluate the MHCP preserve design and conservation plan for the California gnatcatcher.

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APPENDIX B

**STANDARD BEST MANAGEMENT
PRACTICES**

APPENDIX B

STANDARD BEST MANAGEMENT PRACTICES

1. A qualified biologist shall conduct a training session for all project personnel prior to proposed activities. At a minimum, the training shall include a description of the target species of concern and its habitats, the general provisions of the Endangered Species Act (Act) and the MHCP, the need to adhere to the provisions of the Act and the MHCP, the penalties associated with violating the provisions of the Act, the general measures that are being implemented to conserve the target species of concern as they relate to the project, and the access routes to and project site boundaries within which the project activities must be accomplished.
2. A water pollution and erosion control plan shall be developed that describes sediment and hazardous materials control, dewatering or diversion structures, fueling and equipment management practices, and other factors deemed necessary by reviewing agencies. Erosion control measures shall be monitored on a regularly scheduled basis, particularly during times of heavy rainfall. Corrective measures will be implemented in the event erosion control strategies are inadequate. Sediment/erosion control measures will be continued at the project site until such time as the revegetation efforts are successful at soil stabilization.
3. The footprint of disturbance shall be minimized to the maximum extent feasible. Access to sites shall be via pre-existing access routes to the greatest extent possible.
4. The upstream and downstream limits of projects disturbance plus lateral limits of disturbance on either side of the stream shall be clearly defined and marked in the field and reviewed by the biologist prior to initiation of work.
5. Projects should be designed to avoid the placement of equipment and personnel within the stream channel or on sand and gravel bars, banks, and adjacent upland habitats used by target species of concern.
6. Projects that cannot be conducted without placing equipment or personnel in sensitive habitats should be timed to avoid the breeding season of the target species of concern.
7. When stream flows must be diverted, the diversions shall be conducted using sandbags or other methods requiring minimal instream impacts. Silt fencing or other sediment trapping materials shall be installed at the downstream end of construction activity to minimize the transport of sediments off-site. Settling ponds where sediment is collected shall be cleaned out in a manner that prevents the sediment from re-entering the stream. Care shall be exercised when removing silt fences, as feasible, to prevent debris or sediment from returning to the stream.

8. Equipment storage, fueling, and staging areas shall be located on upland sites with minimal risks of direct drainage into riparian areas or other sensitive habitats. These designated areas shall be located in such a manner as to prevent any runoff from entering sensitive habitat. All necessary precautions shall be taken to prevent the release of cement or other toxic substances into surface waters. All project related spills of hazardous materials shall be reported to appropriate entities including but not limited to applicable jurisdictional city, FWS, and CDFG, SWQCB and shall be cleaned up immediately and contaminated soils removed to approved disposal areas.
9. Erodible fill material shall not be deposited into water courses. Brush, loose soils, or other similar debris material shall not be stockpiled within the stream channel or on its banks.
10. The qualified project biologist shall monitor construction activities throughout the duration of the project to ensure that all practicable measures are being employed to avoid incidental disturbance of habitat and any target species of concern outside the project footprint. Construction monitoring reports shall be completed and provided to the jurisdictional City, FWS, and the CDFG summarizing how the project is in compliance with applicable conditions. The project biologist should be empowered to halt work activity if necessary and to confer with staff from the applicable city, FWS, and CDFG to ensure the proper implementation of species and habitat protection measures.
11. The removal of native vegetation shall be avoided and minimized to the maximum extent practicable. Temporary impacts shall be returned to pre-existing contours and revegetated with appropriate native species. All revegetation plans shall be prepared and implemented consistent with Appendix C (Revegetation Guidelines) and shall require written concurrence of the FWS and CDFG.
12. Exotic species that prey upon or displace target species of concern should be permanently removed from the site.
13. To avoid attracting predators of the target species of concern, the project site shall be kept as clean of debris as possible. All food related trash items shall be enclosed in sealed containers and regularly removed from the site(s). Pets of project personnel shall not be allowed on-site where they may come into contact with any listed species.
14. Construction employees shall strictly limit their activities, vehicles, equipment, and construction materials to the proposed project footprint and designated staging areas and routes of travel. The construction area(s) shall be the minimal area necessary to complete the project and shall be specified in the construction plans. Construction limits will be fenced with orange snow screen. Exclusion fencing should be maintained until the completion of all construction activities. All employees shall be instructed that their activities are restricted to the construction areas.

15. Any habitat destroyed that is not in the identified project footprint shall be disclosed immediately to the jurisdictional city, FWS, and CDFG and shall be compensated at a minimum ratio of 5:1.
16. If dead or injured listed species are located, initial notification must be made within three working days, in writing, to the Service's Division of Law Enforcement in Torrance, California and by telephone and in writing to the applicable jurisdiction, Carlsbad Field Office of the FWS, and CDFG.
17. The jurisdictional City shall have the right to access and inspect any sites of approved projects including any restoration/enhancement area for compliance with project approval conditions including these BMP. The FWS and CDFG may accompany City representatives on this inspection.
18. Any planting stock to be brought onto the site for landscaping or ecological restoration shall first be inspected by a qualified pest inspector to ensure it is free of pest species that could invade natural areas, including but not limited to Argentine ants, fire ants, and other insect pests. Any planting stock found to be infested with such pests shall not be allowed on the project site or within 300 feet of natural habitats. The stock shall be quarantined, treated, or disposed of according to best management principles by qualified experts in a manner that precludes invasions into natural habitats.
19. Projects adding new utility lines or towers or modifying existing utility lines or towers will implement designs that preclude or minimize harm to wildlife due to collisions or electrocution. Information on such designs can be found at www.migratorybirds.fws.gov/issues/towers.
20. Where appropriate based on site-specific survey results, wildlife undercrossings shall be designed and implemented for new roads or road improvement projects that could disrupt wildlife movements or result in increased roadkill. Such undercrossings, along with any necessary wildlife fencing or other facilities, shall be designed based on best available information to maximize use of the undercrossing by species of concern. Undercrossing design shall strive to maximize the openness index ([width x height]/length), minimize traffic noise within the crossing, use appropriate fencing to funnel wildlife into the crossing rather than across the road surface, and screen the undercrossing openings with natural vegetation.
21. All mitigation sites shall be conserved through fee title acquisition or conservation easement, and proof of recordation shall be provided to the jurisdictional city prior to land disturbance.

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APPENDIX C

**GENERAL OUTLINE FOR REVEGETATION
GUIDELINES**

APPENDIX C

GENERAL OUTLINE FOR REVEGETATION GUIDELINES

Introduction

- Background and project location(s) (with maps)
- Project purpose and restoration goal(s) and objectives

Existing Conditions

- Environmental setting/vegetation & wildlife of affected/impacted area(s)
- Environmental setting, ownership, land uses of area to be revegetated (figures/maps)
- Descriptions/evaluations of vegetation, soil, hydrology/drainage conditions, topography, constraints (topo maps)
- Reference Site(s) for development of specifications, and for monitoring use.

Responsibilities

- Financial Responsibility
- Revegetation Team:
 - Project biologist (include training of contractors, as needed)
 - Monitor, if different
 - Landscape/Revegetation/Maintenance Contractor(s)

Site Preparation

- Removal of debris, if necessary
- Land shaping/grading and drainage plan, if needed
- Topsoil/brush and propagule salvage and translocation plan, if needed
- Weed eradication
- Soil preparation

Planting Specifications

- Seed sources and procurement
- Seed mixes/container plant lists (lbs/ac)
- Planting design (include timing/schedule, planting plan)
- Seed application methods (imprinting, hydroseed or mulch, hand broadcasting, etc.)
- Irrigation

Maintenance

- Site protection (fencing, signage)
- Weed control (methods, schedule)
- Horticultural treatments (pruning, leaf litter, mulching, removal of diseased plants)
- Erosion control
- Replacement plantings and reseeding
- Vandalism
- Irrigation maintenance, if needed

Monitoring and Success Assessment

Monitoring and reporting schedules

Performance standards

Monitoring procedures

Horticultural (seeding and plant assessments)

Biological, including sampling methods

Reporting Program

Remediation and Contingency

Performance Bond

Notification of Completion

APPENDIX D

**NARROW ENDEMIC SPECIES POLICY AND
CRITICAL POPULATION POLICY**

APPENDIX D

NARROW ENDEMIC SPECIES POLICY AND CRITICAL POPULATION POLICY

(as adapted from Third Draft of Issue Paper 9)

NARROW ENDEMIC SPECIES POLICY

Narrow endemic species are MHCP species that are highly restricted by their habitat affinities, edaphic requirements, or other ecological factors, and that may have limited but important populations within the MHCP area, such that substantial loss of these populations or their habitat within the MHCP area might jeopardize the continued existence or recovery of that species. Nearly all known populations of narrow endemics, and certainly all major and critical populations, must be substantially conserved for the species to be considered covered. Jurisdictions will specify measures in their subarea plans to ensure that impacts to narrow endemic species are avoided to the maximum extent practicable. However, some limited taking of narrow endemics is anticipated to occur outside the Focused Planning Areas (FPA) in exchange for species-specific mitigation measures.

Inside of FPAs, the MHCP assumes that all subarea plans will require, in priority order, maximum avoidance of project impacts, minimization of impacts, and species-specific mitigation measures for unavoidable impacts. Maximum avoidance and minimization shall be interpreted as avoidance of impacts to the degree practicable without precluding reasonable use of the property (see Section 3.7 of the MHCP for the process to determine adequacy of avoidance and minimization). Avoidance and minimization measures shall include biologically justified buffer zones around narrow endemic population sites to allow for natural expansion and contraction of populations, persistence of pollinators, and other essential ecological functions (see species evaluations in Volume II of the MHCP). Mitigation for unavoidable impacts and management practices shall be designed to achieve no net loss of narrow endemic populations, occupied acreage, or population viability within the FPA. In no case shall a city permit more than 5% gross cumulative loss of narrow endemic populations or occupied acreage (whichever is most appropriate for the species) within the FPA.

Outside of FPAs, the MHCP assumes that all subarea plans will require maximum avoidance of impacts to critical and major populations, and will require, in priority order, avoidance, minimization, and mitigation for impacts to any populations. In no case shall a city permit more than 20% gross cumulative loss of narrow endemic locations, population numbers, or occupied acreage (whichever is most appropriate for the species) within the city. Unavoidable impacts shall be mitigated based on species-specific criteria defined in subarea plans. Such mitigation shall be designed to minimize adverse effects to species viability and to contribute to species recovery. Any conserved lands that support narrow endemic species must be added to the MHCP preserve system and managed for the continued viability of the population. Mitigation for unavoidable impacts must be designed to achieve no net loss of narrow endemic population

locations, occupied acreage, or population viability in the MHCP subregion, and preferably, but not necessarily, within each subarea.

CRITICAL POPULATIONS POLICY

For Narrow Endemics. Regardless of location (inside or outside of FPA), narrow endemic populations listed as “Critical” in Volume II of the MHCP must be totally avoided, and any narrow endemic populations that are later discovered and determined to meet the criteria for a critical population must be maximally avoided. Maximum avoidance shall be interpreted as avoidance of impacts to the degree practicable without precluding reasonable use of the property (see Section 3.7 of the MHCP for the process to determine adequacy of avoidance and minimization). Avoidance and minimization measures shall include biologically justified buffer zones around critical population sites to allow for natural expansion and contraction of populations, persistence of pollinators, and other essential ecological functions (see species evaluations in Volume II of the MHCP). Mitigation for unavoidable impacts and management practices must be designed to achieve no net loss of critical populations, occupied acreage, or population viability within the MHCP area. In no case shall a city permit more than 5% gross cumulative loss of critical populations or occupied acreage (whichever is most appropriate for the species).

For Other Species. For species not considered narrow endemics, populations listed as “Critical” in Volume II of the MHCP must be maximally avoided, as defined above. Avoidance and minimization measures for critical populations of non-narrow endemics shall consider all pertinent biological requirements for the species, including buffer widths, corridor widths, and other considerations discussed for that species in Volume II. Mitigation for unavoidable impacts and management practices must be designed to achieve no net loss in viability of critical populations, including no net loss in ecological functions for habitat areas, wildlife movement corridors, and linkages. In no case shall a city permit more than 20% gross cumulative loss of critical populations or occupied habitat acreage (whichever is most appropriate for the species).

APPENDIX E

CONDITIONS FOR ESTUARINE SPECIES

APPENDIX E

CONDITIONS FOR ESTUARINE SPECIES

The following Conditions for Estuarine Species shall apply to all wetland and aquatic habitats within and adjacent to the lagoons in the study area, from the Pacific Ocean east to the following points:

Lagoon/River	Eastern boundary
San Elijo Lagoon	El Camino Real and La Bajada
Batiquitos Lagoon	El Camino Real
Agua Hedionda Lagoon	El Camino Real
Buena Vista Lagoon	Jefferson Street
San Luis Rey River	Benet Road

E.1 LAND USES ADJACENT TO THE PRESERVE -- WATERSHED ISSUES

1. Do not allow land uses within 200 feet of estuarine areas that would contribute to degraded water quality, changes in surface water or groundwater hydrology, or increased runoff, erosion, and sedimentation.
2. Require that “best management practices” (BMPs) be used to prevent pollution, generated by agricultural and urban development activities, from entering surface and groundwater. BMPs should also ensure that nonstormwater discharges (e.g., sewage, industrial wastes) are not discharged into stormwater drainage systems. BMPs may include:
 - a. Regulatory measures, such as erosion control ordinances and floodplain restrictions.
 - b. Structural measures, such as detention or retention basins, filters, weirs, check dams, or drainage diversions.
 - c. Vegetative controls that reduce runoff volume and accomplish pollutant removal by a combination of filtration, sedimentation, and biological uptake.
 - d. Maintenance of pump station and sewer lines and stormwater conveyance systems.
 - e. Cultural practices like restrictions on pesticide and fertilizer applications, storage or disposal of toxic chemicals, or washing of vehicles or equipment in areas that can drain to the estuary.
 - f. Public education programs that educate residents about proper disposal of oil or chemicals and that provide opportunities (e.g., designated locations) for residents to properly dispose of contaminants.

3. For clearing, grading, and other construction activities within the watershed, ensure that proper irrigation and stormwater runoff mitigation measures are employed to reduce sediment loads and to prevent contamination from pesticides, fertilizers, petroleum products, and other toxic substances.
4. Restrict/limit recreational or other activities within 200 feet of important foraging, breeding, and roosting areas.
5. Require attenuation measure for activities that generate noise levels greater than 60 dB if occurring within 200 feet of important breeding habitat during the breeding season.

E.2 LAND USES WITHIN THE PRESERVE -- ACCESS/RECREATION

The following activities shall be strictly regulated or prohibited in or near (within 200 feet of) preserve areas. Construction or other modifications or disturbances that are performed explicitly to benefit biological resources (for example, wetland restoration or revegetation projects, biological research, or monitoring) may be exempt from some of these prohibitions on a case-by-case basis.

1. Offroad vehicle use will be prohibited within preserve areas.
2. Construction that would adversely modify hydrology or degrade water quality of estuarine areas (e.g., no diking or filling of wetlands, no activities that would contribute to erosion and sedimentation, no diversion of surface flows). Exceptions to this include certain approved restoration activities.
3. Introduction of invasive nonnative species.
4. Activities that would contribute pesticides, fertilizers, oil, or other pollutants.
5. Use of chemical pesticides for mosquito control (rely on biological agents).
6. Human disturbance at important foraging, breeding, and roosting areas.
7. Watercraft or other recreational activities within important foraging, breeding, and roosting areas.
8. Human access during the breeding season (see species-specific guidelines for breeding season dates).
10. Activities creating noise levels greater than 60 dB.
11. Camping or picnicking, except in designated areas.

E.3 AREA-SPECIFIC MANAGEMENT DIRECTIVES

Area-specific management directives for estuarine areas will include specific guidelines for managing and monitoring covered species and their habitats, including using BMPs and implementing management measures to protect against detrimental edge effects. Edge effects may include (but are not limited to) trampling, dumping, vehicular traffic, competition with invasive species, predation by domestic animals, excessive noise, excessive light and glare, collecting, recreational activities, and other human intrusion.

1. Management measures may include:
 - a. Identification and enforcement of restricted access areas, including clearly marked trails, boardwalks, trail closures, and other access-restricted areas (e.g., breeding areas).
 - b. Seasonal restrictions on human activity during breeding season (see species-specific guidelines for breeding season dates).
 - c. Erection of fences and other physical barriers for breeding areas to restrict human access.
 - d. Trapping, fencing, or other control of introduced predators, artificially enhanced populations of natural predators, and domestic animals.
 - e. Removal and control of invasive exotic plant species.
 - f. Habitat enhancement to induce initiation of new breeding colonies (e.g., modification of nesting substrate, vegetation clearing in limited areas, vegetation maintenance, creation of tidal creeks or islands).
 - g. Creation or restoration of saltmarsh habitat and adjacent uplands.
 - h. Shoreline and streambank stabilization to control erosion.
 - i. Removal of trash, including removal of water-borne debris in breeding areas during the nonbreeding season.
 - j. Routinely opening the mouth of the estuary, where feasible and appropriate.
2. Develop a monitoring program that evaluates:
 - a. Biodiversity in and around wetland/estuary, including basic community structure in major estuarine habitat types (e.g., uplands, emergent wetlands) and population trends of important target species, including those of commercial, recreational, or conservation significance (e.g., marsh plants, wading birds, waterfowl).
 - b. The level and effects of recreation and other land uses on biological resources in the estuary and surrounding watershed.
 - c. Populations of introduced, natural, and domestic predators.
 - d. Extent of freshwater marsh, brackish water marsh, and saltmarsh.
 - e. Population size, demography, and productivity of covered species populations.
 - f. Use of the area by migratory or wintering birds.
 - g. Success of restoration efforts.
 - h. Presence and extent of invasive exotic plant species.
 - i. Evaluate potential restoration sites.

3. Develop a public awareness and education program to provide an understanding and appreciation of estuarine ecology and human roles in the estuarine environment.
 - a. Include local residents in public education, enforcement, monitoring, exotic plant removal, and restoration activities.
 - b. Develop community outreach programs such as guided walks, films, and talks.
 - c. Improve trails and trailhead markings and post interpretive signs for new restoration and research projects.

APPENDIX F

**MHCP DEFINITIONS FOR GRASSLANDS,
AGRICULTURAL LANDS, AND
DISTURBED LANDS**

APPENDIX F

MHCP DEFINITIONS FOR GRASSLANDS, AGRICULTURAL LANDS, AND DISTURBED LANDS

Most grasslands in the MHCP area are dominated by nonnative, but naturalized, annual grasses and forbs. These “nonnative” or annual grasslands have not traditionally been regulated for biological purposes, but their conservation is critical to achieving MHCP preserve design goals. In addition to supporting some grassland specialist species, the continued presence of grasslands is important to the MHCP preserve system’s connectedness and resilience to disturbances, such as fire and drought.

In order to conserve grasslands or require mitigation for impacts to grasslands, the MHCP must clearly define and map annual grasslands as opposed to agricultural, ruderal, or disturbed lands. Historically, different biologists have mapped these vegetation communities in different ways. For example, some areas mapped as annual grasslands may be actually be fallow agricultural fields. Consequently, subarea plan implementation must include unambiguous mapping of grasslands, as distinct from non-regulated vegetation communities.

For purposes of determining conservation and take of biological resources and associated mitigation requirements, MHCP subarea plans will use the following recommended vegetation community descriptions. These definitions will be applied by qualified biologists to create subarea plan vegetation maps using current aerial photography and field verification. Alternatively, qualified biologists may use these definitions to create project-specific biological resource maps pursuant to a city’s subarea plan project review process.

Definitions

The MHCP will define annual [nonnative] grassland consistent with the annual grassland series described by Sawyer and Keeler-Wolf (1995. A manual of California vegetation. California Native Plant Society.). This definition is also consistent with the MHCP Biological Goals, Standards, and Guidelines (Ogden 1998) and with the original MHCP vegetation mapping performed by Dudek and Ogden (1992; updated by Ogden in 1997). This definition is also consistent with the MSCP vegetation mapping criteria (Ogden. 1995. Multiple Species Conservation Program (MSCP). Volume 1: MSCP resource document. Prepared for the City of San Diego.).

Annual (Nonnative) Grassland. Annual grassland is a mixture of annual grasses and broad-leaved, herbaceous species. Annual species comprise from 50 percent to more than 90 percent of the vegetative cover, and most annuals are nonnative species. Nonnative grasses typically comprise at least 30 percent of the vegetation, although this number can be much higher in some years and lower in others, depending on land use and climatic conditions. Usually, the annual grasses are less than 1 m (3 ft) in height,

and form a continuous or open cover. Emergent shrubs and trees may be present, but do not comprise more than 15 percent of the total vegetative cover. Characteristic annual grassland species include foxtail chess (*Bromus madritensis* ssp. *rubens*), ripgut grass (*Bromus diandrus*), wild oats (*Avena* spp.), fescues (*Vulpia* spp.), red-stem filaree (*Erodium cicutarium*), mustards (*Brassica* spp.), lupines (*Lupinus* spp.), and goldfields (*Lasthenia* spp.), among others.

Lands that meet these vegetative criteria for annual grasslands, but that are identified in a subarea plan as agricultural land and that have been cultivated in 3 of the last 5 years or according to accepted cultural practices (as determined by the County Agriculture Commission) are considered fallow agricultural land. However, agricultural lands that are proposed for conversion to non-agricultural land uses (e.g., residential, commercial, industrial), shall be mapped and mitigated according to the actual vegetation type (e.g., annual grassland) based on vegetative characteristics, without regard to current or historic land uses.

Disturbed Land. Disturbed land includes areas in which the vegetative cover comprises less than 10 percent of the surface area (disregarding natural rock outcrops) and where there is evidence of soil surface disturbance and compaction (e.g., grading); or where the vegetative cover is greater than 10 percent, there is soil surface disturbance and compaction, and the presence of building foundations and debris (e.g., irrigation piping, fencing, old wells, abandoned farming or mining equipment) resulting from legal activities (as opposed to illegal dumping). Vegetation on disturbed land (if present) will have a high predominance of nonnative, weedy species that are indicators of surface disturbance and soil compaction, such as Russian thistle (*Salsola tragus*), telegraph weed (*Heterotheca grandiflora*), horehound (*Marrubium vulgare*), and sow-thistle (*Sonchus oleraceus*). Although nonnative grasses may be present on disturbed land, they do not dominate the vegetative cover. Examples of disturbed land include recently graded firebreaks, graded construction pads, construction staging areas, off-road vehicle trails, and old homesites.

Lands that meet the criteria for disturbed land but are identified in a subarea plan as agricultural land and have been cultivated in 3 of the last 5 years or according to accepted cultural practices (as determined by the County Agriculture Commission) are considered fallow agricultural land.

Agricultural (including Fallow) Land. Active agricultural land includes lands that are currently disturbed by cultivation or other agricultural activities involving crop production practices (e.g., nurseries, orchards, field crops, improved pastures). Fallow agricultural land is land that has been previously disturbed by cultivation, but is currently out of production. Vegetation on fallow land is dependent, in part, on prior crops and crop culture practices. Depending on the type and intensity of disturbance, fallow fields may support either annual grassland or disturbed vegetative associations. Lands that are not currently in production but that are identified in a subarea plan as agriculture and have been cultivated in 3 of the last 5 years or according to accepted cultural practices (as defined by the County Agriculture Commission) will be considered fallow agriculture, regardless of species composition. Conversely, agricultural lands that have not been

cultivated in 3 of the last 5 years, or that are proposed for conversion to non-agricultural land uses (e.g., residential, commercial, industrial), shall be mapped and mitigated according to the actual vegetation type (e.g., annual grassland or disturbed land) based on vegetative characteristics, without regard to current or historic land uses.

Pastures should be mapped as active agriculture (see above) if cultivation practices such as seeding or irrigation have been used to improve these lands for livestock forage. Unimproved or natural grazing lands should be mapped and mitigated according to the current vegetation type (e.g., annual grassland).

Please note that the MHCP will no longer use *ruderal* as a vegetation community type. Areas that formerly would have been classified as ruderal will now fall into one of the above categories, according to the onsite characteristics. This simplification should minimize inconsistencies in mapping by different biologists, who traditionally have used the ruderal classification in varied ways.

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