APPENDIX F

Otay Ranch Resource Management Plan Phase 2 Appendices

Otay Ranch

Phase 2
Resource Management Plan

Appendices

Otay Ranch

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Appendix F1
1995 Contribution To Ongoing California Gnatcatcher and Cactus Wren Studies

APPENDIX F1

1995 CONTRIBUTION TO ONGOING CALIFORNIA GNATCATCHER AND CACTUS WREN STUDIES

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8 August, 1995

APPENDIX F1

1995 CONTRIBUTION TO ONGOING CALIFORNIA GNATCATCHER AND CACTUS WREN STUDIES

August 25, 1995

Ongoing habitat and population studies of the California gnatcatcher and cactus wren are required by Policy 1.2 of the Otay Ranch Resource Management Plant (RMP). This document provides the initial task of the ongoing gnatcatcher/cactus wren studies which includes the identification and mapping of the 10, 100-acre study plots for the surveys beginning in 1996, along with the documentation of the previously unpublished data from the Otay River Parcel compiled for the Natural Communities Conservation Planning (NCCP) Scientific Review Panel (SRP).

SELECTION OF 10 STUDY PLOTS

Ongoing studies of the coastal California gnatcatcher (*Polioptila californica californica*; CAGN) and the cactus wren (*Campylorhynchus brunneicapillus*; CAWR) should emphasize obtaining data that can be used to assess the long-term viability of these species on Otay Ranch (Ranch) and provide additional insight into specific habitat requirements. A primary purpose of these studies will be the detection of significant changes (versus annual population fluctuations) in the population status of these species, focusing on key areas of the preserve.

Data from long-term habitat and population studies will demonstrate whether the goals of the RMP are being met for long-term viability of CAGN and CAWR. Monitoring may provide feedback on management activities, resulting in recommendations for changes or improvements in management strategies. In addition, long term studies aid the scientific community by contributing basic knowledge on the productivity and demography of the species and their relationship to the habitat.

One of the goals of the RMP is to provide long-term protection for CAGN and CAWR. Uniform population surveys of selected study sites will demonstrate if the Ranch-wide population numbers of these two species are being maintained within the usual year-to-year fluctuation. The long-term studies will be accomplished through a systematic and regular sampling program. Such a program will entail detailed studies at a selected number of sites rather than large and labor intensive studies of the entire Ranch. Repeating Ranch-wide basic inventory surveys are not efficient economically nor particularly valuable for providing additional information useful for management of the species.

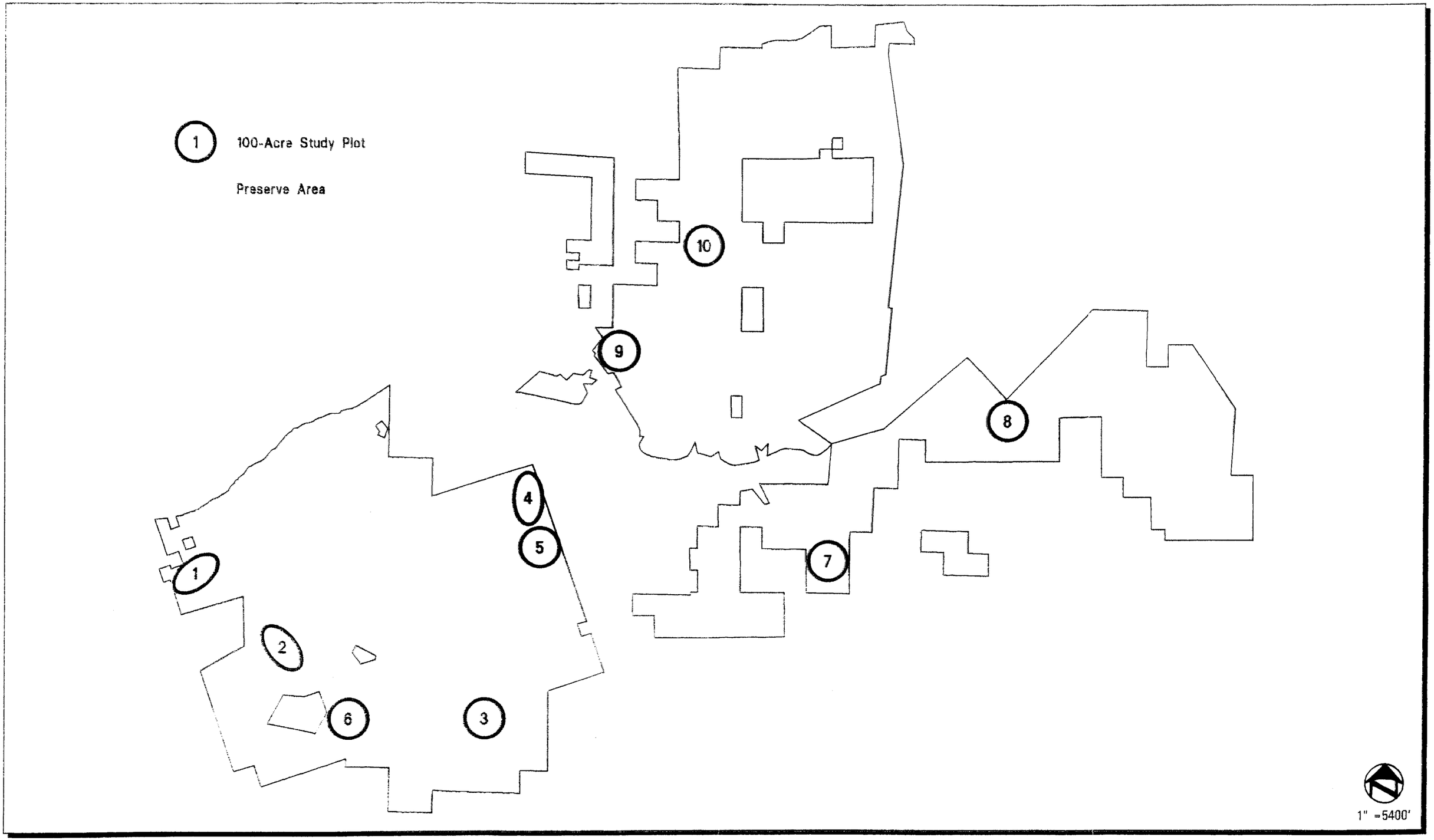
Habitat and population studies will be conducted within permanently established study plots within the preserve. Ten (10) study plots of approximately 100 acres each will be identified. Five of the plots have been selected in areas believed to be of particular significance for CAGN and CAWR. Areas suggested in the RMP for these study plots included Salt Creek, the Otay River Valley, Poggi Canyon, western San Ysidro Mountains, and southeast of Otay Lakes. Five additional plots were scattered randomly throughout the

preserve where coastal sage scrub (CSS) is present. The plots will be approximately circular in shape, to follow accepted avian censusing techniques, however, the shape will be modified if needed depending on topography and habitat quality. Because this program is focussing on CAGN and CAWR population studies, an effort will be made to include areas of habitat suitable for these two species and omit habitat that is clearly unsuitable, such as non-native grassland, agriculture, or developed areas.

In order to select 10 appropriate study plots, based on the above criteria, the mapping produced for the NCCP Scientific Review Panel (discussed below) was used to locate suitable study plots. The criteria for being one of the five study plots of particular significance for CAGN and CAWR include: presence of undisturbed CSS and/or maritime succulent scrub (MSS) habitat, presence of at least one pair of CAGN and at least one pair of CAWR. A total of 10 potentially suitable study plots were identified using this methodology. The suitable plots were then numbered and five numbers were selected from a random number generator to identify the selected study plots. The criteria for being one of the five other study plots include: presence of CSS and/or MSS habitat and the presence of at least one pair of CAGN. A total of 20 potentially suitable study plots were identified using this methodology. The suitable plots were then numbered and five numbers were selected from a random number generator to identify the selected study plots. The selected 10, 100-acre study plots for the ongoing CAGN and CAWR population studies are shown on the attached map (1"=2000') (Figure 1). Figure 1 depicts the general locations of the 10 study plots. Prior to initiation of formal surveys in 1996, the boundaries of each of the 10 study plots will be marked in the field and mapping for each plot will be assembled at 1" = 200' on topographic maps. The five study plots of particular significance for CAGN and CAWR are located in Poggi Canyon, Wolf Canyon, Johnson Canyon and in Salt Creek (2 plots). The five other study plots are located in Otay Valley, San Ysidro Mountains Parcel (2), and Jamul Mountains Parcel (2).

The locations of the 10 study plots are described in general terms as follows:

Location	Description	Aspect and Habitat
Poggi Canyon (1)	Near western property boundary	South facing slope; CSS and MSS
Wolf Canyon (2)	Approximately half-way up the canyon from Otay Valley	South and west facing slopes; CSS and MSS
Johnson Canyon (3)	Mouth of the canyon where it intersects Otay Valley	South, north, and east facing slopes; CSS and MSS
Salt Creek (4)	At the northeastern corner of the parcel, north of the aqueduct	West and south facing slopes; CSS
Salt Creek (5)	On the east side of the creek, north of the aqueduct	South and west facing slopes; CSS and MSS
Otay Valley (6)	North side of the Valley at the eastern side of the quarry	South facing slope; CSS
San Ysidro Mountains (7)	South of Dulzura Creek at eastern end of Lower Otay Reservoir	West facing slope; CSS
San Ysidro Mountains (8)	Northeastern corner of the parcel	North and east facing slope; CSS
Jamul Mountains (9)	East of Proctor Valley in the central part of the parcel	South, east, and west facing slopes; CSS
Jamul Mountains (10)	East of Upper Otay Reservoir	West facing slope; CSS



Ongoing Biological Studies of Sensitive Species on Otay Ranch

Ten 100-acre Study Plots for Long-term California Gnatcatcher/Cactus Wren Population Studies

FIGURE 1

Prior to initiation of surveys on these 10 study plots, permanent markers will be placed in the center of each plot using four-foot lengths of rebar and posthole cement. The rebar will be painted with fluorescent paint and tagged with metal tree tags. Placement of the study plots markers will occur in conjunction with the surveys of the plots which will commence in 1996.

OTAY RIVER PARCEL DATA COMPILATION

The contribution to ongoing CAGN and CAWR studies also includes the documentation of the previously unpublished data from the Otay River Parcel compiled for the NCCP Scientific Review Panel. The data and mapping points were evaluated to eliminate points that represent "double-counting" of CAGN or CAWR. These results provide a conservative estimate of the population size on the Otay River Parcel, and illustrate areas of occupation. This document summarizes the results to present the composite, multi-year (1988 - 1992) population results, including the spatial distribution throughout the Otay River Parcel on the accompanying maps. The numbers derived from the review serve as a baseline for the CAGN and CAWR population size within the parcel, and may form the basis for monitoring ongoing potential future "take" of CAGN and CAWR. Future monitoring of Ranch-wide or SPA-level populations also may be compared to this baseline. Other sensitive species were also recorded and mapped during the 1992 surveys.

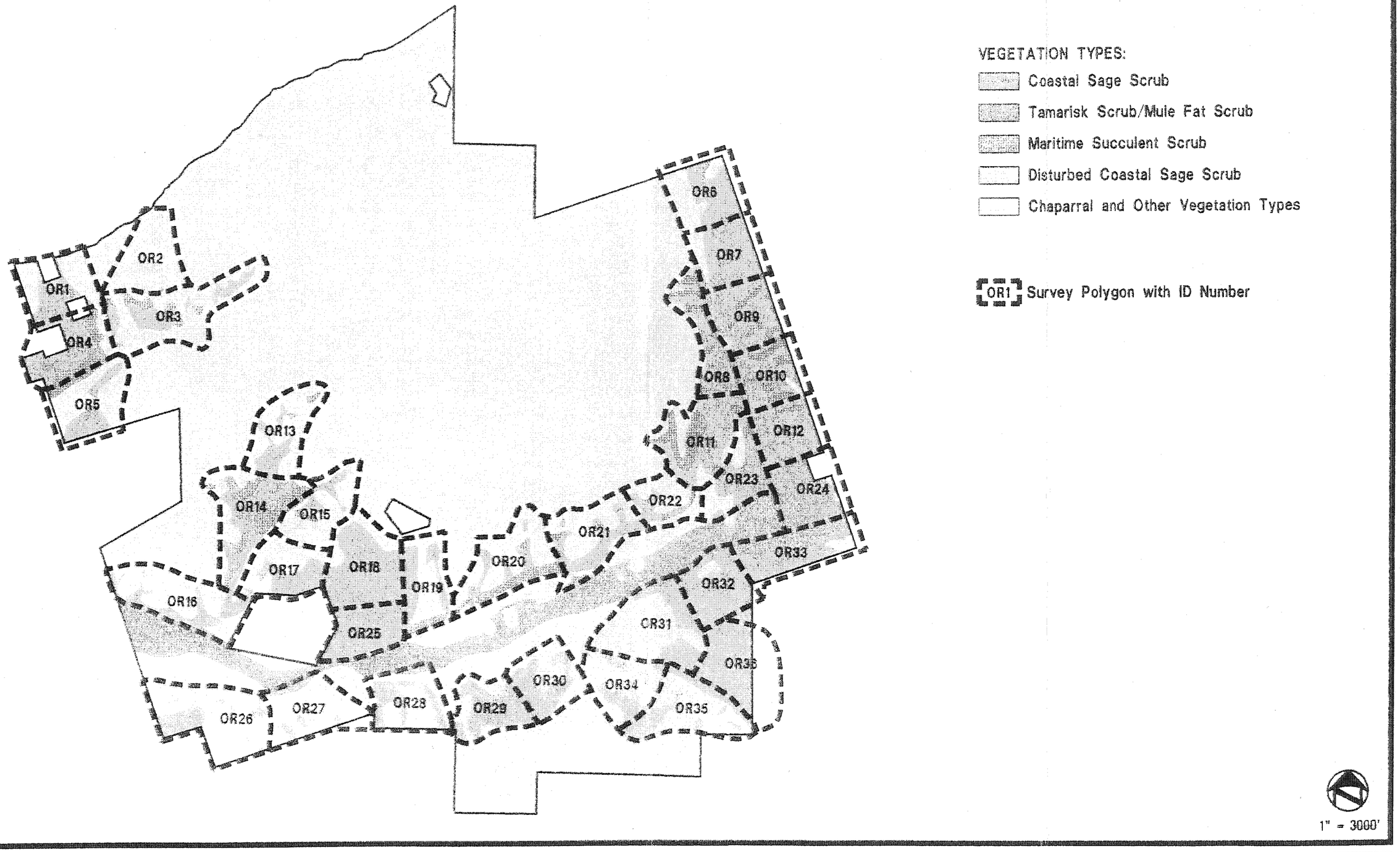
This report includes CAGN and CAWR population data from a number of sources conducted over the past few years. The first population studies were conducted in 1988 by Advanced Sciences, Inc. (ASI). A second population study of the parcel was conducted in 1989 (revised in 1991) by RECON. The information from these two data sources was summarized in the Otay Ranch EIR (OGDEN 1992). The 1992 SRP study conducted by Dudek and Associates, Inc. (DUDEK) is reported in its entirety below.

In order to provide specific data on CSS for use by the SRP, biologists from DUDEK conducted focused biological survey work on the Otay Valley Parcel of Otay Ranch in southern San Diego County, California, during the spring and summer of 1992. The field work did not conform precisely with the standards as detailed in the SRP Guidelines; instead, a modified survey methodology was developed through coordination with the SRP.

Materials and Methods

The 9,400-acre Otay Valley parcel was divided into 36 approximately 100-acre polygons, each containing at least 50 acres of coastal sage scrub, maritime succulent scrub, or coastal sage scrub/grassland (Figure 2). The 36 polygons encompassed all 2,100 acres of CSS present on the parcel. In general, boundaries of polygons were defined by topography and limited by the 100 acre maximum. Each polygon was surveyed at least once for animal species, focusing on the target organisms.

California gnatcatcher and CAWR data were obtained by a single field pass through each polygon. This single pass augmented previous survey efforts conducted by RECON in 1989. The 1992 surveys generally were conducted between 6:00 a.m. and 12:00 noon, usually involving no more than 100 acres of CSS



Ongoing Biological Studies of Sensitive Species on Otay Ranch

1992 Scientific Review Panel Study -- Survey Polygons (Otay Valley Parcel)

FIGURE 2

habitat during a single visit. In some areas, such as Salt Creek in the extreme eastern portion of the parcel, two-person teams were necessary to accurately survey the polygons. Tape recordings of CAGN and CAWR were used to elicit responses from the birds.

Results

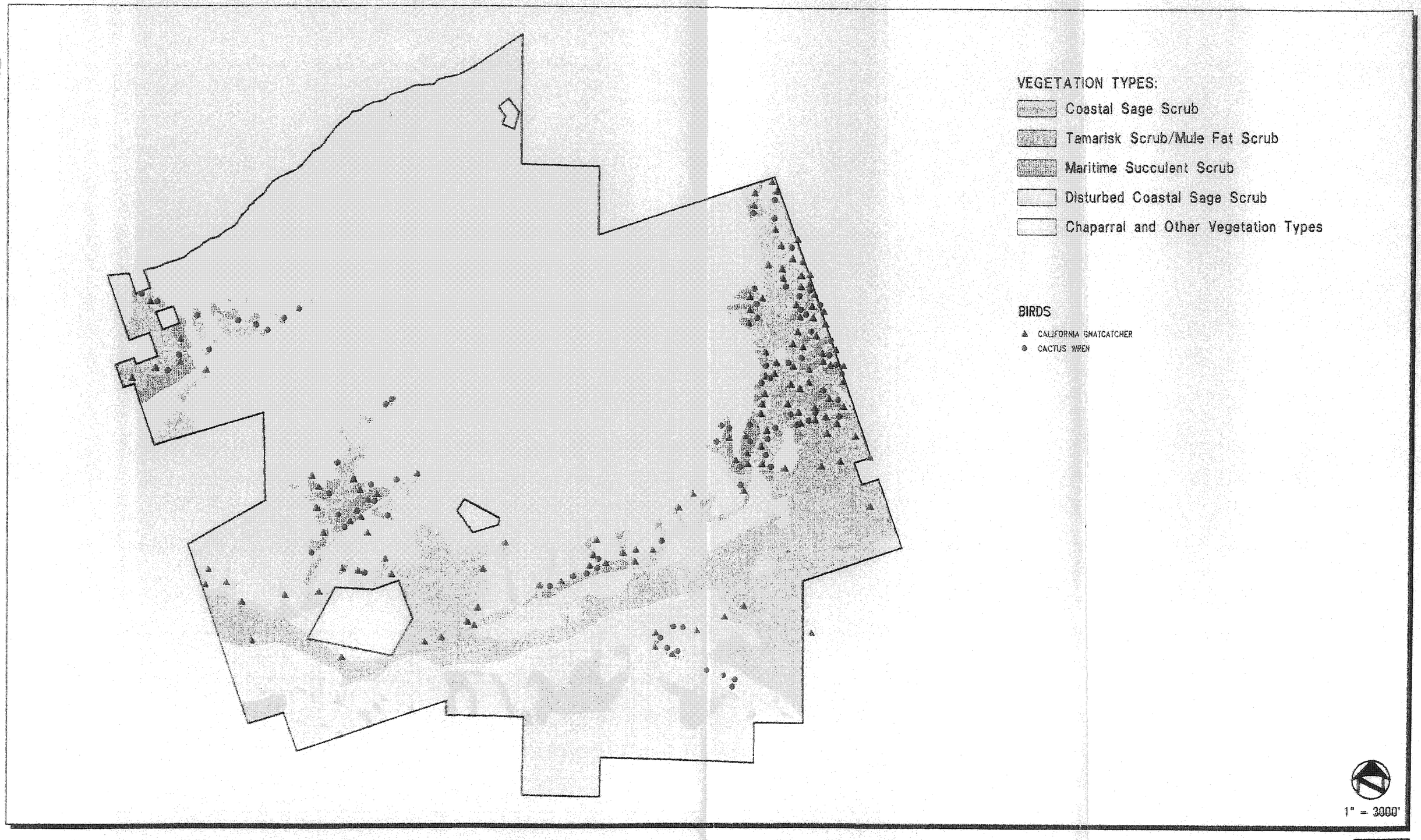
A total of 101 pairs of California gnatcatchers plus an additional 29 single males were observed on the parcel (Figure 3). The number of pairs per polygon ranged from 0 to 14; the highest concentrations were observed in the Salt Creek area in the eastern portion of the parcel. California gnatcatchers were present in 24 of the 36 polygons; 12 polygons had none. Nine of the 12 polygons that lacked CAGN are situated to the south of the Otay River Valley where the CSS habitat is highly disturbed and represented by smaller isolated patches.

California gnatcatchers were observed within each of the seven different "dominant" shrub-types of CSS, i.e., *Artemisia californica, Eriogonum fasciculatum, Simmondsia chinensis, Rhus integrifolia, Opuntia prolifera, Baccharis sarothroides,* and *Viguiera laciniata.* In addition, they were present in the tamarisk scrub/riparian habitats in the drainage of the Otay River Valley. They also occurred on all slopes, aspects, and elevations within this parcel.

A total of 64 pairs of cactus wrens plus 16 single males were observed (Figure 3). The number of CAWR per polygon ranged from 0 to 12; the highest concentrations of birds were in the Salt Creek area in the eastern portion of the parcel. Cactus wrens were present in 16 of the 36 polygons; 20 had none. To no surprise, CAWR always were associated with large patches of coastal cholla (*Opuntia prolifera*).

In 1988, based on the surveys conducted by ASI, the Otay River Parcel supported an estimated 73 pairs of CAGN. Based on studies conducted by RECON in 1989, the population was estimated at 60 to 65 pairs. The distribution of the earlier surveys has been reproduced in this report (Figure 4). The comparison of the earlier survey results with the number of pairs of CAGN observed during the 1992 survey is indicative of the population rise that has occurred since the cessation of the drought. The rise in population of CAGN has been noted in other areas of San Diego County as well. The distribution of CAGN from the earlier surveys and that of the 1992 survey compares very favorably. Generally, birds that were observed during the earlier surveys were also observed in the 1992 survey unless the suitable habitat was no longer present. Examples of this are seen in the eastern end of Poggi Canyon where a CAGN was recorded by ASI but not by RECON or DUDEK due to the disturbance of the CSS habitat.

In 1988, based on the surveys conducted by ASI, the Otay River Parcel supported an estimated 30 pairs of CAWR. Based on studies conducted by RECON in 1989, the population of CAWR was estimated at 26 pairs. The distribution of the earlier surveys has been reproduced in this report (Figure 4). The comparison of the earlier survey results with the number of pairs of CAWR observed during the 1992 survey is indicative of the population rise that has occurred since the cessation of the drought. The distribution of CAWR from the earlier surveys and that of the 1992 survey compares very favorably. Generally, birds that were



Ongoing Biological Studies of Sensitive Species on Otay Ranch

1992 Scientific Review Panel Study -- Distribution of California Gnatcatchers and Cactus Wrens (Otay Valley Parcel)

FIGURE 3

VEGETATION TYPES:

- Coastal Sage Scrub
- Tamarisk Scrub/Mule Fat Scrub
- Maritime Succulent Scrub
- Disturbed Coastal Sage Scrub
- Chaparral and Other Vegetation Types

BIRDS

- ▲ CALIFORNIA GNATCATCHER
- ● CACTUS WREN

1" = 3000'

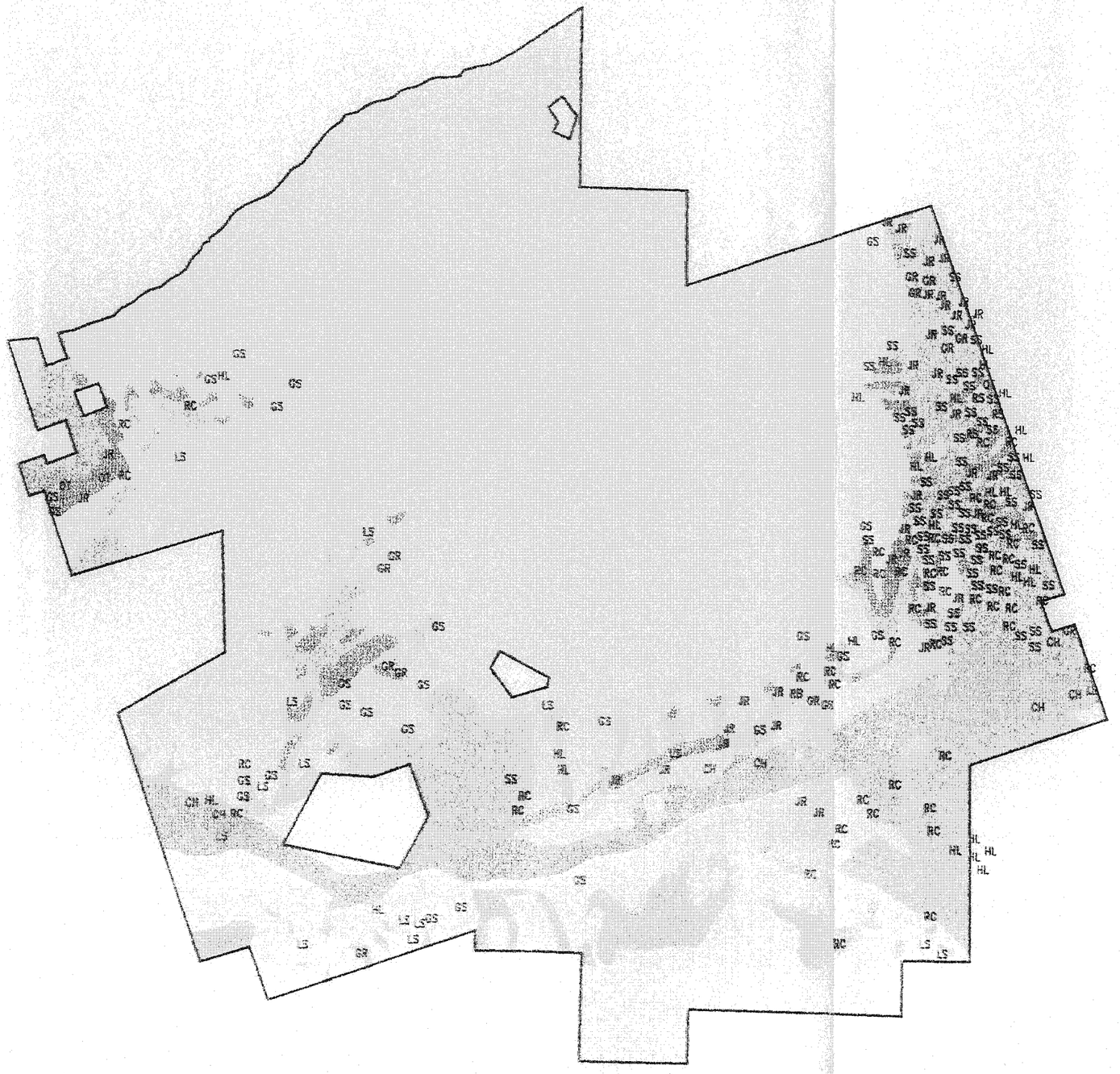
Ongoing Biological Studies of Sensitive Species on Otay Ranch

1988-89 Studies -- Distribution of California Gnatcatchers and Cactus Wrens (Otay Valley Parcel)

FIGURE 4

observed during the earlier surveys were also observed int he 1992 survey unless the suitable habitat was no longer present. An example of this is seen in the western side of Salt Creek where discing has narrowed the suitable habitat area to a line east of the earlier habitat. Salt Creek was observed to contain significant populations of CAGN and CAWR during all of the previous surveys (1988, 1989, and 1992). A fire in Salt Creek in 1994 burned significant portions of CSS and MSS habitat on the slopes of Salt Creek, particularly south of the County Water Authority aqueduct that traverses the drainage in a northwest to southeast direction. Vegetation surveys conducted in Spring 1995 in the burned area revealed that CSS habitat has been substantially altered by the 1994 fire. Decline in populations of CAGN and CAWR in the Salt Creek area that may have resulted from the 1994 fire are expected but have not been quantified.

Other sensitive species observed during the 1992 survey were also recorded and mapped (Figure 5). One wildlife species listed as endangered by the U. S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Game (CDFG) was detected onsite (i.e., least Bell's vireo, *Vireo bellii pusillus*). In addition, several species recognized as federal Category 2 candidates by USFWS and/or "Species of Special Concern" by CDFG were observed onsite, including southern California rufous-crowned sparrow (*Aimophila ruficeps canescens*), Bell's sage sparrow (*Amphispiza bellii bellii*), California horned lark (*Eremophila alpestris actia*), loggerhead shrike (*Lanius ludovicianus*), San Diego black-tailed jackrabbit (*Lepus californicus*), orange-throated whiptail (*Cnemidophorus hyperythrus*), coastal rosy boa (*Lichanura roseofusca trivirgata*), northern red-diamond rattlesnake (*Crotalus ruber ruber*). Other bird species recognized as sensitive or declining observed onsite included grasshopper sparrow (*Ammodramus savannarum*), yellow-breasted chat (*Icteria virens auricollis*), blue grosbeak (*Passerina caerulea salicaria*).



VEGETATION TYPES:

- Coastal Sage Scrub
- Tamarisk Scrub/Mule Fat Scrub
- Maritime Succulent Scrub
- Disturbed Coastal Sage Scrub
- Chaparral and Other Vegetation Types

BIRDS

- CH YELLOW-BREASTED CHAT
- GR BLUE GROSSBEAK
- GS GRASSHOPPER SPARROW
- HL HORNED LARK
- LB LEAST BELL'S VIREO
- LS LOGGERHEAD SHRIKE
- RC RUFOUS-CROWNED SPARROW
- SS SAGE SPARROW

MAMMALS

- JR BLACK-TAILED JACKRABBIT

REPTILES

- OT ORANGE-THROATED WHIPTAIL
- RS RED DIAMOND RATTLESNAKE
- RB ROSY BOA

Ongoing Biological Studies of Sensitive Species on Otay Ranch

1992 Scientific Review Panel Study -- Distribution of Other Sensitive Wildlife Species (Otay Valley Parcel)

FIGURE 5

2

Otay Ranch

Phase 2
Resource Management Plan

Appendix F2
Report on the Flora of the Otay Ranch Vernal Poools 1990-1991, San Diego County, California

APPENDIX F2

Report on the Flora of the Otay Ranch Vernal Pools 1990-1991, San Diego County, California

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1992

This report was adopted by the Chula Vista City Council and San Diego County Board of Supervisors in conjunction with adoption of the Otay Ranch General Development Plan/Subregional Plan on October 28, 1993. The report is available at the City of Chula Vista, Otay Ranch Project Team office (422-7157).

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Otay Ranch

Phase 2
Resource Management Plan

Appendix F3
Baldwin Otay Ranch
Wildlife Corridor Study

APPENDIX F3

Baldwin Otay Ranch Wildlife Corridor Study

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1992

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Otay Ranch

Phase 2
Resource Management Plan

Appendix F4
Otay Ranch
Raptor Management Study

APPENDIX F4

Otay Ranch Raptor Management Study

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Otay Ranch

Phase 2
Resource Management Plan

Appendix F5
Otay Valley Parcel
Cultural Resources Systematic Survey

APPENDIX F5

Otay Valley Parcel
Cultural Resources Systematic Survey

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To be completed.

Otay Ranch

Phase 2
Resource Management Plan

Appendix F6
Vernal Pool Management Plan For
Otay Ranch,
San Diego, County, California

APPENDIX F6

VERNAL POOL MANAGEMENT PLAN
FOR OTAY RANCH
SAN DIEGO COUNTY, CALIFORNIA

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31 August 1995

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1.0 INTRODUCTION

The 23,297-acre Otay Ranch is the largest private undeveloped landholding in San Diego County. It includes three large ownership areas surrounding the San Diego City-owned Otay Lakes: the Otay Valley parcel, the Jamul Mountain parcel, and the San Ysidro Mountains parcel (*Figure 1*). As part of the environmental review process leading to the approval of the General Plan Amendment/General Development Plan (GPA/GDP) for Otay Ranch, the Otay Ranch Resource Management Plan (RMP) was prepared. The primary purpose of the RMP is to serve as the functional equivalent of the County Resource Protection Ordinance for Otay Ranch. In order for the development of Otay Ranch to proceed under the GPA/GDP, it must move forward in conformance with the RMP. The RMP set forth policies and recommendations for the preservation and management of biological, cultural, paleontological, and recreational resources on the Ranch. One of the requirements of the RMP is the preparation of a vernal pool management plan to ensure the long-term preservation and management of this sensitive habitat type.

Policy 2.9 of the RMP deals specifically with vernal pools on the Ranch, and requires that the following goal be met:

Policy 2.9

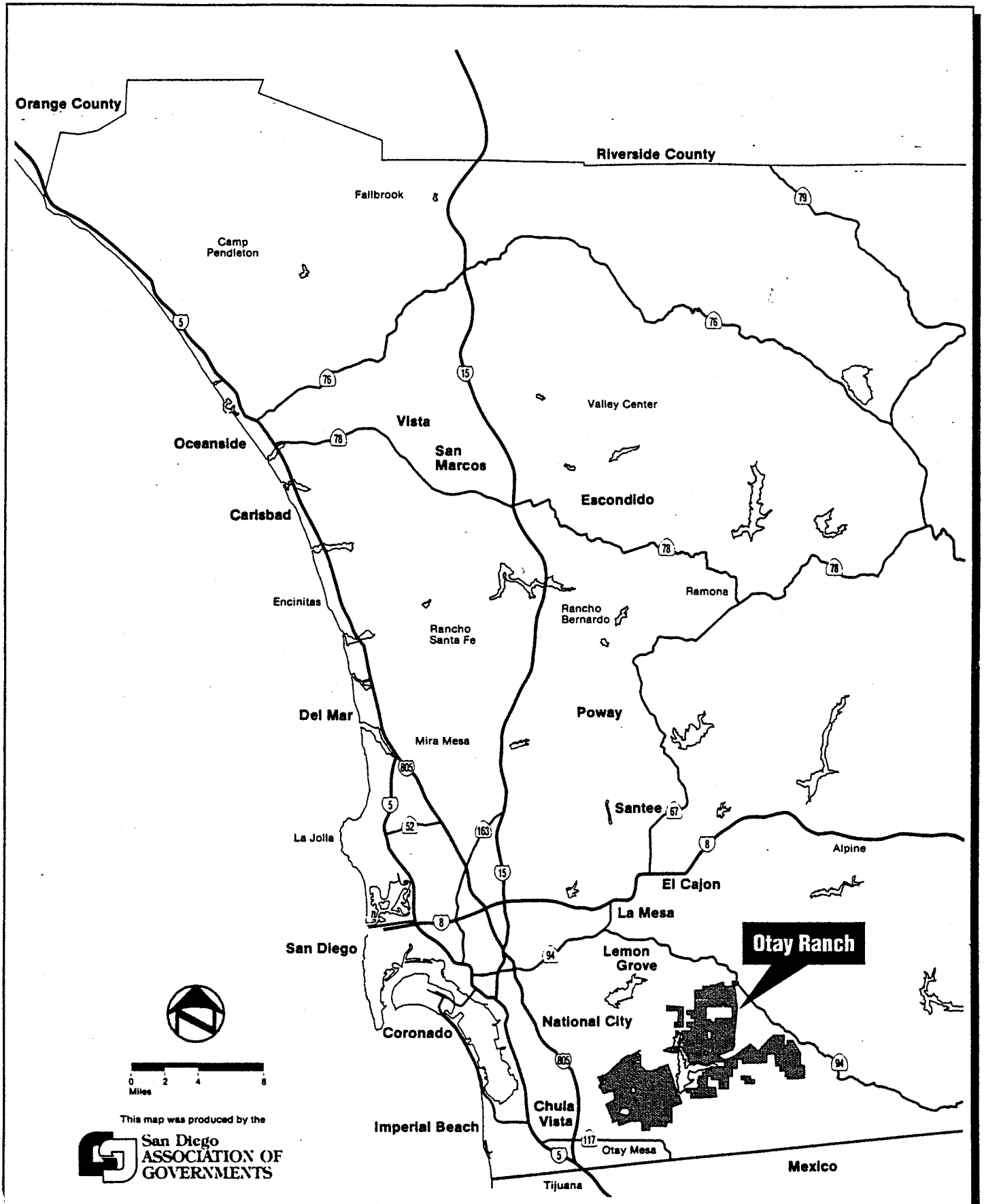
Preservation of a minimum of 95% of the vernal pool habitat on the Ranch supporting vernal pool indicator species (as defined in the vernal pool report). Necessary State and/or federal permits would be obtained in accordance with Section 404 of the Clean Water Act, the U.S. Fish and Wildlife Service, and the California Department of Fish and Game implementing Section 1600 of the California Fish and Game Code.

Standards:

1) In conjunction with the first SPA in the Phase 2 RMP, develop a Vernal Pool Preservation and Management Plan.

2) Establish a vernal pool preserve of no less than 330 acres on Otay Mesa south of the Otay River to include all vernal pools identified by the California Department of Fish and Game (Bauder 1986) as J23, J24, J25, J30, and identified sensitive portions of J29.

3) Preserve a minimum of 95% of the Otay Ranch distribution of the State- and federally-listed endangered San Diego button-celery (*Eryngium aristulatum* var. *parishii*), and 100% of the State- and federally-listed Otay Mesa mint (*Pogogyne nudiuscula*) in locations identified in the vernal pool report (DUDEK 1992).



Otay Ranch Vernal Pool Management Plan

Regional Map

FIGURE 1

4) Assure the continued survival of little mousetail (*Myosurus minimus* var. *apus*) and spreading naverretia (*Navarretia fossalis*) on Otay Ranch through preservation of present known localities for these species on the Ranch plus a combination of enhancement, restoration, and management efforts.

5) Develop a vernal pool restoration plan to achieve the following:

- -- restore the biota of individual, badly degraded vernal pools;
- -- increase diversity and frequency of native biota in all disturbed vernal pools;
- -- preserve and enhance vernal pools on K-6 where little mousetail occurs;
- -- reduce effect of alien plants;
- -- enhance the populations of sensitive species;
- -- stabilize soils on mounds and in watershed areas;
- -- provide research and educational opportunities.

The Vernal Pool Management Plan will provide the Manager/Owner of the Otay Ranch Preserve with a practical framework for the overall preservation of vernal pool habitat and specific management measures to protect and enhance vernal pool habitat, to ensure the survival of associated endangered and candidate species, and to manage vernal pool habitat in conformance with and in support of the biological goals of the RMP. The plan is intended to be updated as needed to reflect new information regarding vernal pool enhancement and management techniques, additions to the biological data base of Otay Ranch, modifications in laws and policies regarding the protection of wetlands, and changes in status of listed and unlisted sensitive species.

1.1 BACKGROUND

In San Diego County, vernal pools are found on coastal terraces and in some inland valleys. Historically, they ranged from Otay Mesa on the Mexican border through the central San Diego mesas to present-day Peñasquitos and Rancho Bernardo. Smaller pool groupings occurred in inland valleys such as San Marcos, Poway, Ramona, and Proctor Valley. Lake Cuyamaca was a vernal lake prior to the construction of Cuyamaca Dam.

Extensive residential, commercial, agricultural, and infrastructure development has led to the loss of most of San Diego's vernal pools and the endemic plants that grow in this specialized habitat. In a report to the California Department of Fish and Game, Bauder (1986) estimated that 93 percent of the original watershed acres of vernal pools had been lost. Her estimate was based on Beauchamp and Cass' (1979) estimate of the historical distribution of pools. Oberbauer (1990), using a higher estimate for the original amount of vernal pool habitat, concluded that 97 percent of the pool habitat had been lost. In a report prepared at the request of the California Senate Committee on Natural Resources and Wildlife, Jones and Stokes (1987)

stated that "The severity of habitat loss and species endangerment makes the San Diego vernal pools one of the natural communities most urgently in need of site protection in California."

Efforts to preserve vernal pool habitat generally have been unsuccessful (Bauder 1986). Between 1979 and 1986, approximately 68 percent of the privately owned pools under City of San Diego jurisdiction were lost. Of the San Diego County pools remaining in mid-1986, 70 percent (1,871) were on U.S. Navy land. A current reliable estimate of the number of extant pools cannot be made because additional pools have been destroyed in the interim and continued field surveys have discovered pools that previously were unmapped. In addition to outright loss of vernal pools, overall habitat quality of many vernal pools has declined -- partly from continuing disturbances, but also from fragmentation (Bauder 1986). Fragmentation has led to edge effects and altered hydrology (Bauder pers. obs., Wier and Bauder 1990). The impact of fragmentation on animals associated with vernal pools is unknown.

Otay Ranch possesses a significant amount of vernal pool habitat. These pools and basins support regionally significant populations of several sensitive plant and animal species, including San Diego button-celery (*Eryngium aristulatum* var. *parishii*), Otay Mesa mint (*Pogogyne nudiuscula*), spreading navarretia (*Navarretia fossalis*), little mousetail (*Myosurus minimus* var. *apus*), Riverside fairy shrimp (*Streptocephalus wootton*i), and San Diego fairy shrimp (*Branchinecta sandiegonensis*), as well as a variety of rare and/or unusual non-sensitive species endemic to vernal pool habitat. The Ranch also possesses large and strategically positioned tracts of land that are essential to the persistence of biological diversity in the region. Vernal pool habitat, which is found only in the California Floristic Province, has been reduced dramatically throughout southern California, and particularly in San Diego County, where an estimated 7 percent of the original acreage remained in 1986 (Bauder 1986), and only 3.5 percent by April 1990 (Oberbauer 1990). This habitat is essential to the survival of several native plant and animal species, some of which have been accorded endangered species status by the U.S. Fish and Wildlife Service and/or the California Department of Fish and Game.

Vernal pool habitat on Otay Ranch suffers from problems common to other natural areas surrounded by or adjacent to incompatible land uses (e.g., agriculture, grazing) or subject to off-road vehicle use. These include direct habitat loss through degradation of the habitat, and indirect impacts through fragmentation. Although a wide range of habitat conditions exists on Otay Ranch, little of the remaining vernal pool habitat is without disturbance and/or artificial isolation from other vernal pool areas.

1.2 RESPONSIBILITIES FOR MANAGEMENT AND ENHANCEMENT

The general management and monitoring duties outlined in this plan will be the responsibility of the Preserve Owner/Manager. These include a variety of tasks related primarily to the passive management of vernal pools, such as inhibiting additional degradation, establishing protocols for the use of pools for research and education, development of specific monitoring strategies for determining changes in flora and fauna of the pools, and a minimal amount of general enhancement activities (e.g., trash removal).

The Baldwin Company (or any other entity that implements the development of a SPA within Otay Ranch) will be responsible for the active restoration and enhancement of vernal pool habitat only in association with impacts to vernal pools. These activities will be undertaken as mitigation for impacts to vernal pools outside of the vernal pool preserve and will be directed primarily toward increasing the quality (or possibly quantity) of pools within the preserve. Under the approved GDP, it is estimated that approximately 37 vernal pools encompassing 0.38 acre of surface area scattered over approximately 14 acres of vernal pool (or Mima mound) habitat would be loss permanently through implementation of development on Otay Ranch. Vernal pool restoration and enhancement, as mitigation for these impacts, will include the reconfiguration of pools disturbed by roads and other unnatural topographic alterations, removal of exotic, non-native vegetation, provision of funding for experimental vernal pool creation and/or plant propagation, and installation of permanent fencing or other forms of protection.

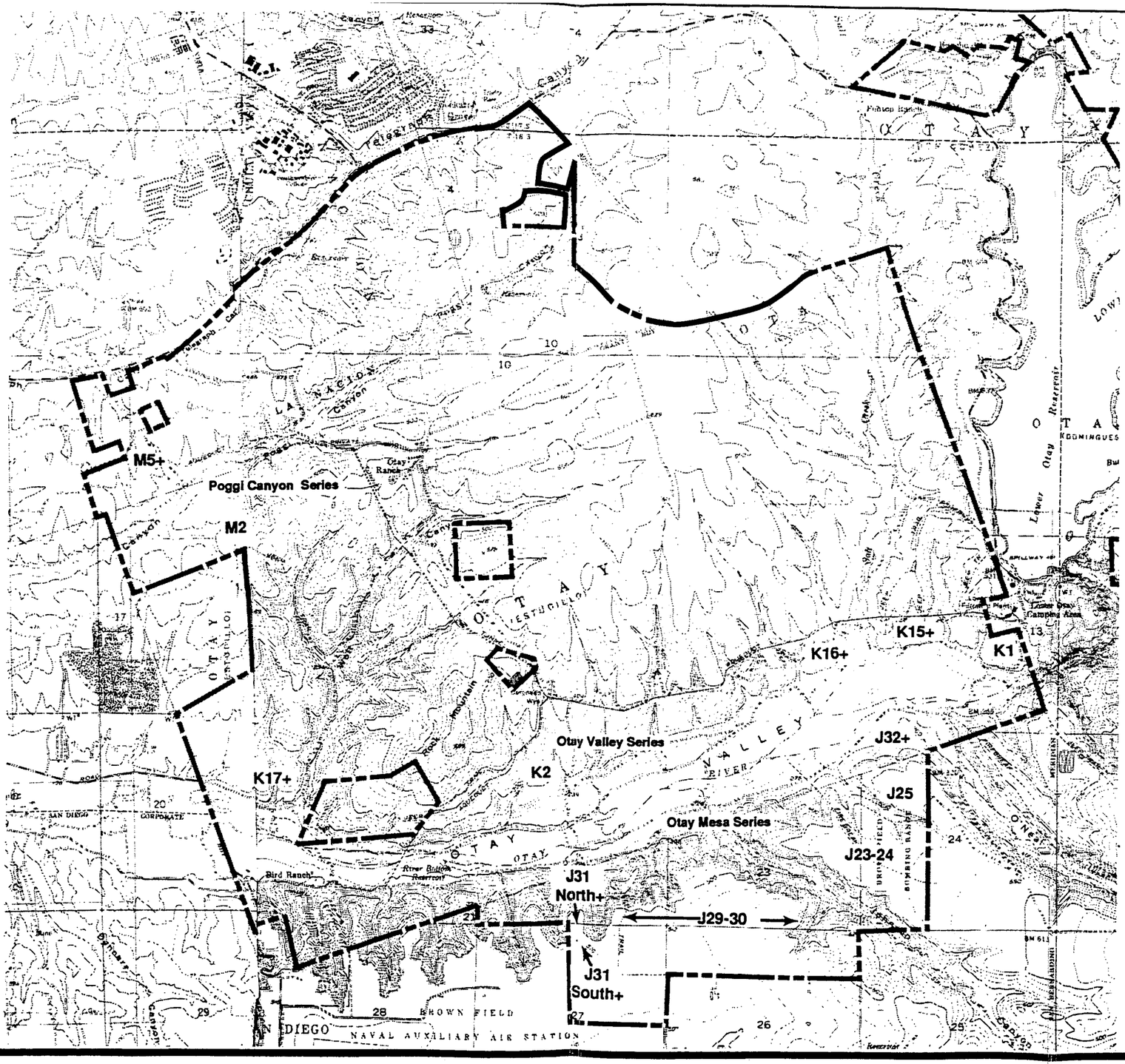
Restoration opportunities, above and beyond that needed for mitigation for impacts associated with the GDP for Otay Ranch, shall be available as a "mitigation bank" for impacts to vernal pools that occur within the subregion but outside of Otay Ranch. Mitigation for these impacts will include the same features described above, including reconfiguration of pools disturbed by roads and other disturbance, removal of exotic plant species, provision of funding for experimental purposes, and installation of permanent barriers.

2.0 DESCRIPTION OF OTAY RANCH VERNAL POOL HABITAT

For purposes of this management plan, vernal pool habitat on Otay Ranch is divided into 7 "series" (*Table 1; Figures 2 and 3*) whose boundaries are based on geography and are designed to facilitate efficient management and promote preservation and protection of the pool complexes. Pools with similar problems or management needs are grouped together. Individual clusters or groups of pools are referred to as pool complexes and are identified by a code employing numbers and letters (e.g., J25), following the system established by Bauder (1986) and followed by DUDEK (1991).

TABLE 1
VERNAL POOL SERIES ON OTAY RANCH BY LOCATION

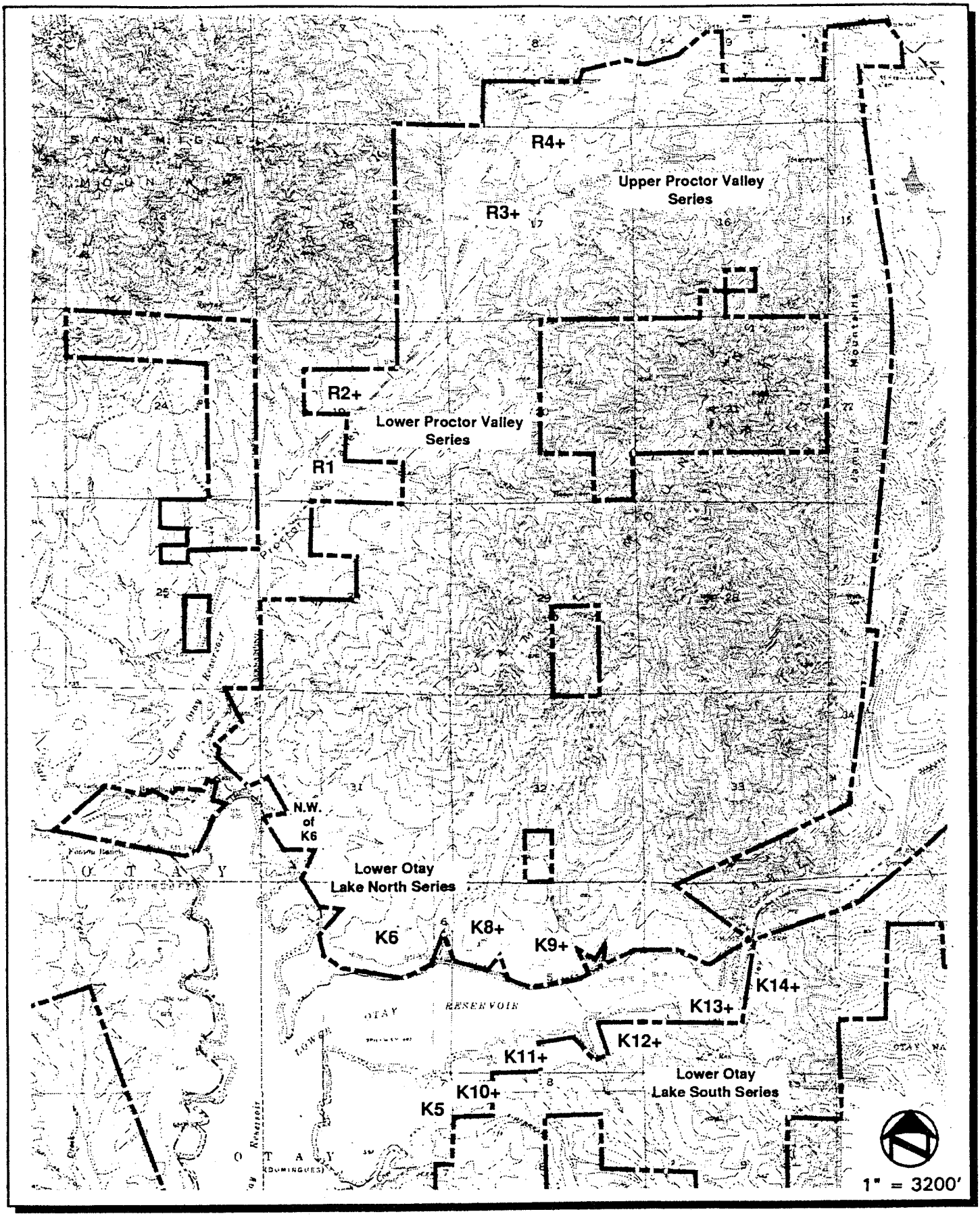
Series Name	Complexes Included
Otay Mesa Series	J23-24, J25, J29-30, J31, J32+
Otay Valley Series	K1, K2, K16+, K15+, K17+
Poggi Canyon Series	M2, M5+
Lower Otay Lake - South Series	K5, K10+, K11+, K12+, K13+, K14+
Lower Otay Lake - North Series	K6, K8+, K9+
Lower Proctor Valley Series	R1,R2+
Upper Proctor Valley Series	R3+, R4+



Otay Ranch Vernal Pool Management Plan

Otay Valley Parcel Vernal Pool Groups

FIGURE 2



Otay Ranch Vernal Pool Management Plan

Jamul Mtns & San Ysidro Mtns Parcels Vernal Pool Groups

FIGURE 3

2.1 THE VERNAL POOL PRESERVE

In conformance with Policy 2.9 of the Otay Ranch Resources Management Plan, the boundaries of the conceptual Vernal Pool Preserve must be refined and formalized. The preserve must be located on Otay Mesa south of the Otay River, include greater than 330 acres, and include all vernal pools identified by the California Department of Fish and Game (Bauder 1986) as J23, J24, J25, J30, and sensitive portions of J29.

Two alternatives designs/configurations for the vernal pool preserve have been developed, one of which will be incorporated in to the final Vernal Pool Preservation and Management Plan. Both alternatives are based on modifications of the boundary proposed in the GDP and the RMP.

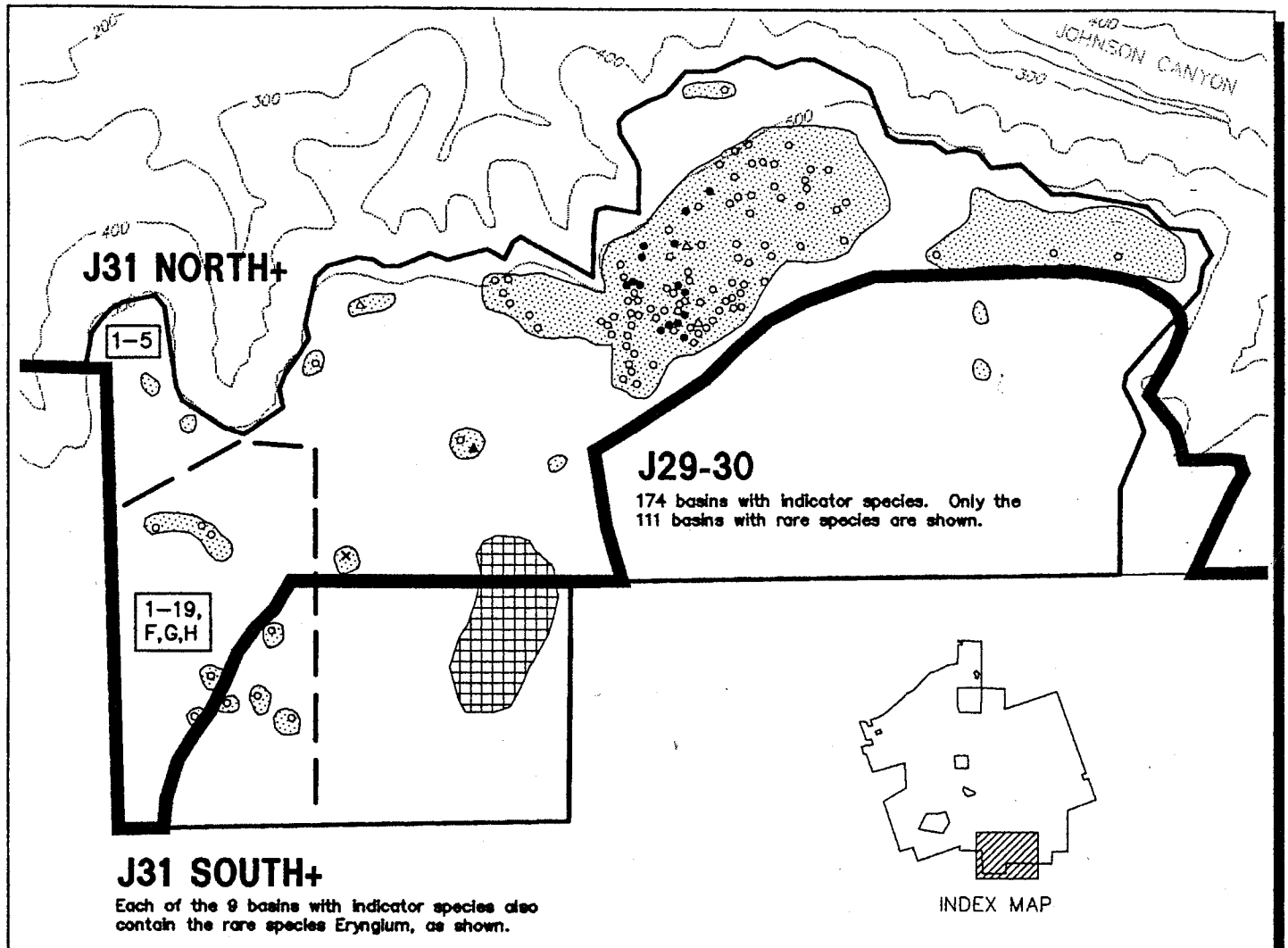
Alternative 1

Alternative 1 (*Figure 4*) includes preserve boundary modifications based solely on the existing cumulative data base. The boundaries of this alternative conform reasonably well with those identified in the Otay Ranch GDP and the RMP, with two minor modifications. The narrow, linear portion of the preserve that formerly extending north-south along the western edge of La Media Road would be eliminated from the Vernal Pool Preserve, and the northern portion of an area formerly identified for industrial development would be added to the Vernal Pool Preserve.

Elimination of the linear area is recommended because following development it would represent a slender peninsula of highly degraded vernal pool habitat between La Media Road and the industrial development that would be highly subject to edge effects and other forms of indirect impacts. Hence, the benefits of protecting the area (i.e., a modest amount of highly degraded vernal pool habitat supporting no sensitive species) would be far outweighed by the cost of its preservation and management. The new area is recommended for inclusion in the Vernal Pool Preserve because it recently was documented to support considerable populations of spreading navarretia (*Navarretia fossalis*) and little mousetail (*Myosurus minimus*), both of which are exceedingly rare on the Ranch.

Alternative 2

Alternative 2 (*Figure 5*) includes preserve boundary modifications based on a more pragmatic assessment of the value of including specific areas within the Vernal Pool Preserve, focusing on existing conditions and future management needs. The boundaries of this alternative include three deviations from the GDP/RMP vernal pool preserve. The narrow, linear portion of the preserve that formerly extending north-south along the western edge of La Media Road would be eliminated; the northern portion the industrial development area is recommended to added (with a 50-foot buffer from the nearest pools); and the entire western edge of the conceptual preserve (from the RMP) is recommended to be deleted.



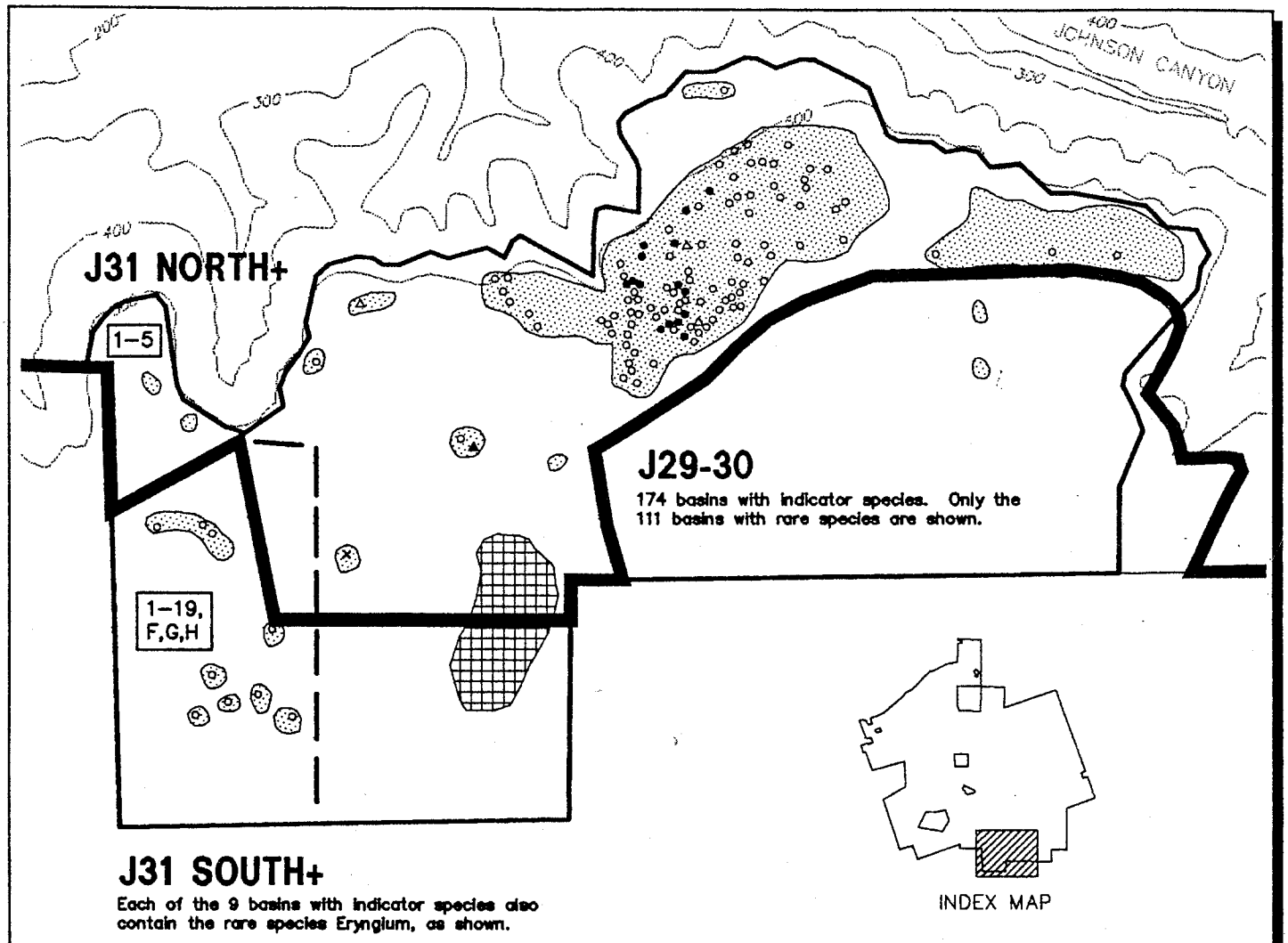
Legend

- Area surveyed for vernal pools
- Area of vernal pool habitat with indicator species
- *Lepidium latipes*
- ∘ Individual vernal pool with *Eryngium aristulatum*
- ▵ Individual vernal pool with *Pogogyne nudiuscula*
- × Individual vernal pool with *Navarretia fossalis*
- • Individual vernal pool with both *Eryngium* and *Pogogyne*
- ▴ Individual vernal pool with both *Eryngium* and *Navarretia*
- **K6** Vernal pool group code
- [18–21] I.D. numbers of all basins staked
- Preserve Alternative Boundary

Otay Ranch Vernal Pool Management Plan

Vernal Pool Preserve Alternative 1

FIGURE 4



Legend

- Area surveyed for vernal pools
- Area of vernal pool habitat with indicator species
- *Lepidium latipes*
- ∘ Individual vernal pool with *Eryngium aristulatum*
- ▵ Individual vernal pool with *Pogogyne nudiuscula*
- × Individual vernal pool with *Navarretia fossalis*
- • Individual vernal pool with both *Eryngium* and *Pogogyne*
- ▲ Individual vernal pool with both *Eryngium* and *Navarretia*
- **K6** Vernal pool group code
- 18–21 I.D. numbers of all basins staked
- Preserve Alternative Boundary

Otay Ranch Vernal Pool Management Plan

Vernal Pool Preserve Alternative 2

FIGURE 5

Under this alternative, highly degraded areas (previously farmed and lacking vernal pool topography) would be excluded because the high cost of management and enhancement would far exceed the value of preservation of the small populations of sensitive plants. Exotic plant removal would require extensive work, and re-creation of vernal pool topography may be impossible.

Under either preserve design, the Vernal Pool Preserve would include over 400 acres of vernal pool landscape and would capture 100% of the known distribution of Otay Mesa mint, 95% of the Otay Ranch distribution of San Diego button-celery, the only known extant populations of spreading navarretia on the Ranch, a large population of little mousetail (the only known locations for this species outside the preserve is K6), the single historical Otay Ranch location for California Orcutt grass, the single known Otay Ranch location of Riverside fairy shrimp, and numerous pools that support San Diego fairy shrimp.

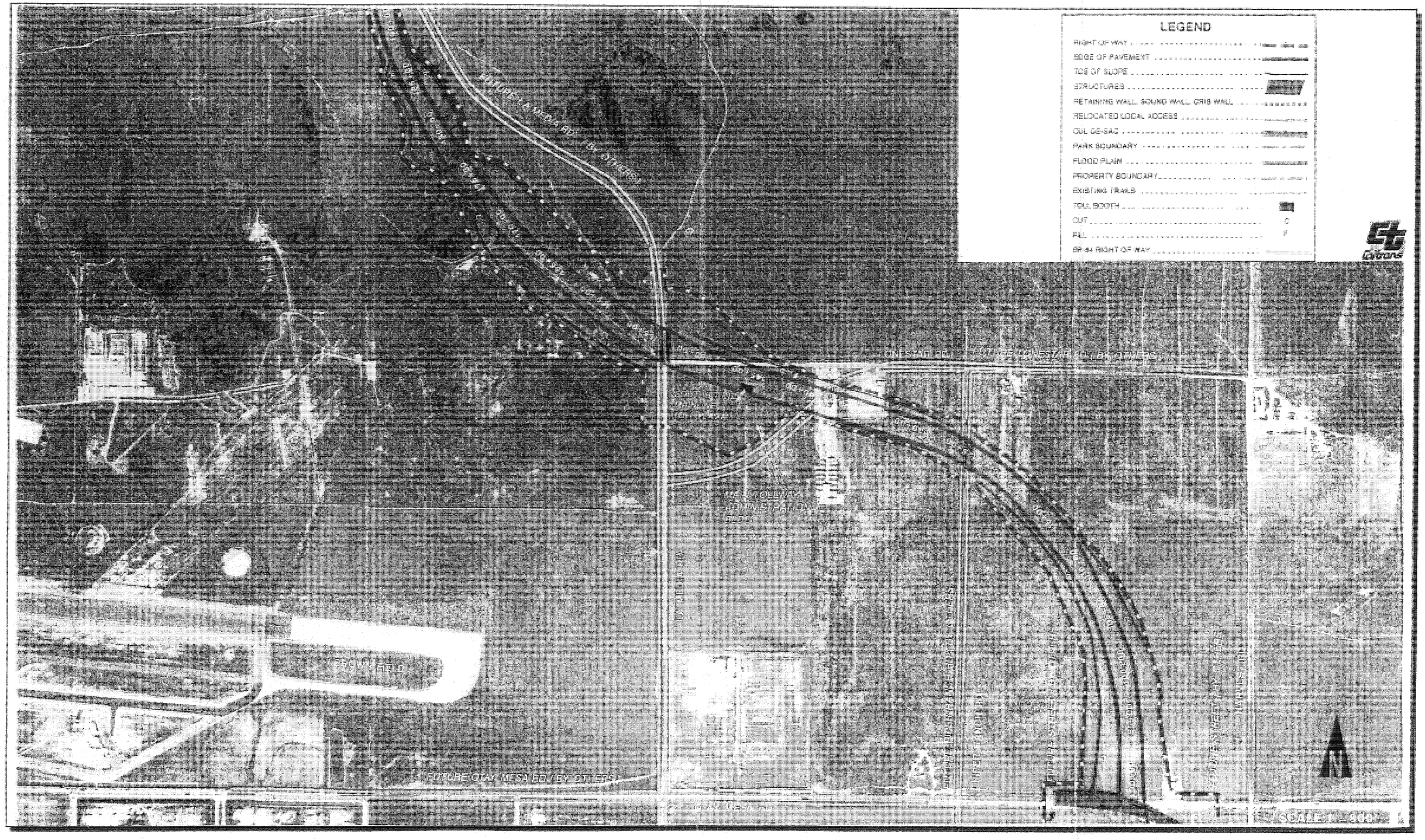
Potential Impact of SR-125

The boundaries of the conceptual vernal pool preserve identified in the RMP and refined above were based on the assumption that SR-125 would extend through Johnson Canyon and thus would not affect vernal pool habitat. However, only two alternatives for SR-125 currently are under consideration (Brown Field Alternative and Brown Field Modified Alternative), both of which would effect the boundary of the vernal pool preserve. Under these alternatives, SR-125 would extend along existing La Media Road and curve northwestward across the western edge of J30 (*Figures 6 and 7*). If either of these alternatives is adopted, the vernal pool preserve should include the degraded vernal pool habitat to the west of the proposed industrial development area (Alternative 1) in order to increase the capture of San Diego button-celery (4 or 5 small populations) and little mousetail (1 population).

2.2 CHARACTERISTICS OF VERNAL POOLS

Temporary ponds occur worldwide, but those most similar to California's vernal pools develop in regions of similar climate (Thorne 1984, Zedler 1987b). They occur on a variety of soils, but usually those underlain by an iron-silica hardpan. The hardpan prevents rainwater from entering the water table, hence ponding occurs in depressions on the soil surface. The hardpan is a discontinuous layer that occurs from near the soil surface to up to 1.2 m below. The upper soil layers of the hardpan are composed of up to one-third expandable clays that swell when hydrated. This contributes to the impermeability of the surface soils and promotes saturated soil conditions and ponding.

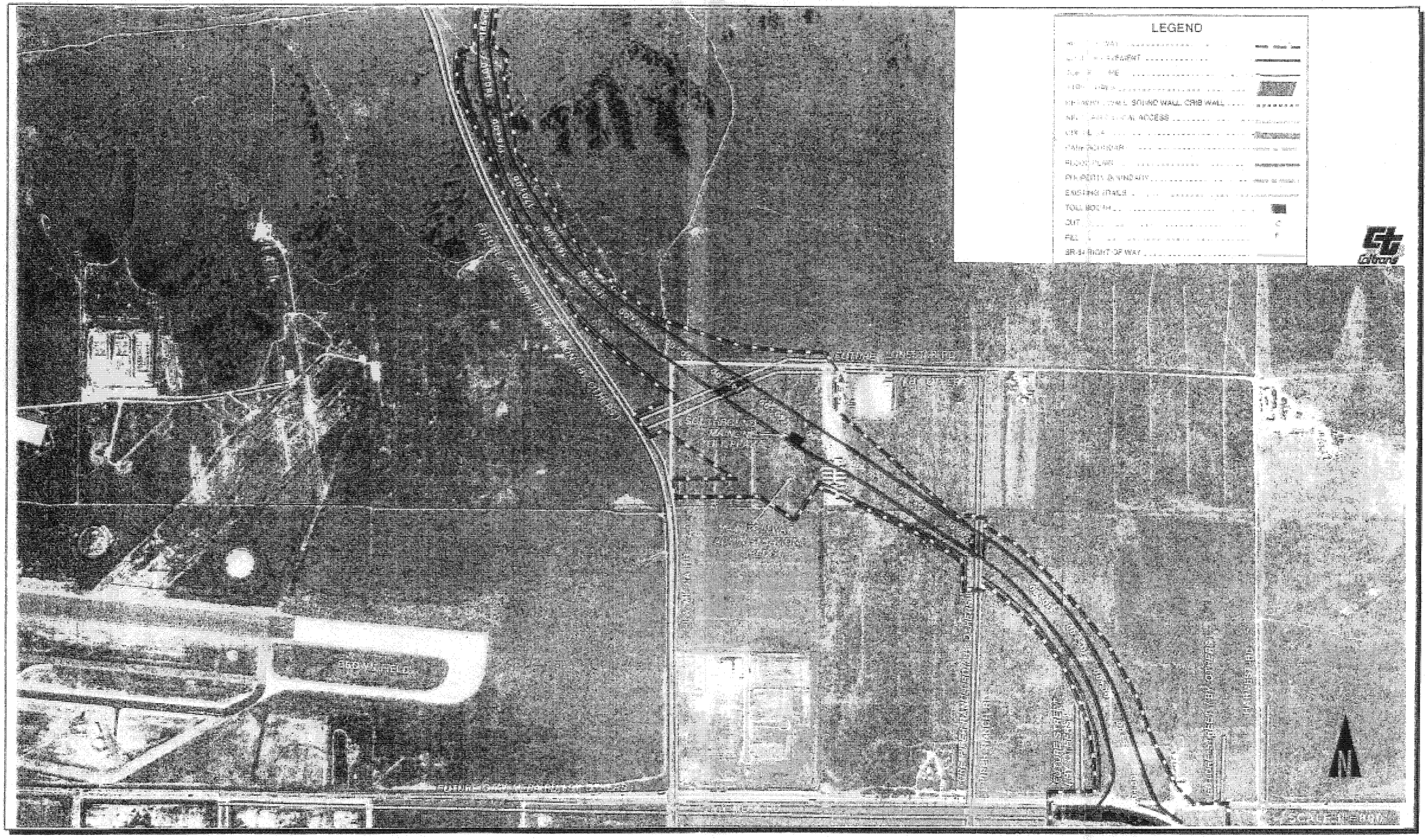
Pools develop during the seasonal rainy period that begins in late fall or early winter and extends into the spring. The pools are generally small (< 20 m across) and shallow (< 35 cm deep). Water rarely ponds before December 1 or remains after May 1. Year-to-year variation in the length and pattern of precipitation affects the depth and duration of standing water. Even in very wet years most pools drain completely several times during the season. After a heavy rainfall, pools may become interconnected either because of the high water level or shallow surface water flow. In dry years many pools do not fill.



Otay Ranch Vernal Pool Management Plan

SR-125 Brown Field Alternative Alignment

FIGURE 6



Otay Ranch Vernal Pool Management Plan

SR-125 Brown Field Modified Alternative Alignment

FIGURE 7

While temporary ponds are not unusual, the plant community, which Thorne (1976) called "vernal-pool ephemeral," is unique. Over three-quarters of the species characteristic of the pools are found only in the California Floristic Province (Thorne 1976), an area west of the Sierra Nevada and stretching from southern Oregon to northern Baja California, Mexico. Even within the California Floristic Province, some of the plant species' distributions are exceedingly restricted. *Pogogyne abramsii* is found exclusively on the central mesas of San Diego County; *Pogogyne nudiuscula* occurs only on the southern mesas, extending south into Baja California, Mexico; and *Brodiaea orcuttii* is found only in San Diego County and Baja California. *Eryngium aristulatum* var. *parishii* and a possible undescribed subspecies of *Downingia cuspidata* are restricted to southern California. On a local scale, distributions of many vernal pool species are patchy within pool clusters or "complexes."

In contrast to the endemic vernal pool species, there are a number of species, such as *Elatine brachysperma, Pilularia americana,* and *Lythrum hyssopifolia,* that belong to the subcosmopolitan aquatic flora (Thorne 1984), occurring worldwide as well as in these ephemeral pools.

Pools on Otay Ranch occur mostly on nearly level marine terraces in characteristic Mima mound topography. They are on Stockpen, Huerhuero, Olivenhain, Redding, and Friant soils. (Bowman 1973). These soils possess a claypan or hardpan that supports ponded water and the associated hydrophytic vegetation, with an inter-pool vegetation matrix of coastal sage scrub and native grassland. Most of the pools are dominated by *Psilocarphus brevissimus* and support a rich variety of vernal pool indicator species, including four plant taxa recognized as sensitive: *Eryngium aristulatum* var. *parishii, Navarretia fossalis, Pogogyne nudiuscula,* and *Myosurus minimus* var. *apus.* In most of the basins, the duration of inundation is long enough to inhibit the growth of upland species.

2.3 DESCRIPTIONS OF OTAY RANCH VERNAL POOLS BASED ON CUMULATIVE SURVEY WORK

The purpose of this section is to describe and define the *Vernal Pool Series on Otay Ranch* and provide a brief overview of the existing conditions of each one. The circumscription of Vernal Pool Series was based primarily on geography, but pools within a series typically share numerous features, including flora, topography, soils, and access. Hence, pools of a series are likely to have similar problems and/or management needs. The primary sources of information used in this section are data presented by Bauder (1986) and DUDEK (1991). Numbering of individual pool groups follows the system established by Beauchamp and Cass (1979) and updated by Bauder (1986). All of the mapped vernal pool groups have been assigned to one of 7 Vernal Pool Series (*Table 1*). The boundaries of the series have been drawn to maximize the biological integrity of the area, reduce edges, limit access, increase security, and facilitate management efficiency. Pools with similar problems or management needs have been grouped together, usually based on geographic proximity. Data regarding the number of pools, plant species present, characteristics of pools, and other qualities are presented in descriptive paragraphs below. *Figures 8-18* illustrate the distribution of pool complexes and sensitive vernal pool plant species in each series.

Vernal pools were first reported from Otay Ranch in a study of San Diego County vernal pools prepared by Beauchamp and Cass (1979) for the California Department of Fish and Game. Pools were designated as the "J," "K," "M," and "R" series, as a means of defining geographically uniform areas of vernal pool habitat. Bauder (1986) provided specific data and maps of the localities of these series.

The results of the most recent vernal pool survey work conducted exclusively on Otay Ranch are reported in DUDEK (1991). The DUDEK report represents the compilation of all previous documentation and provides detailed information on plant species and pool size for all pools. For each pool, the presence or absence of 16 vernal pool taxa and 32 facultative hydrophytic species was noted, and pool size was estimated. Recent survey work has focused on determining the presence/absence of fairy shrimp in pools throughout the Ranch.

The exact number of vernal pools present on the Ranch cannot be estimated reliably for a variety of reasons: (1) no precise definition for "vernal pool" is acceptable to all regulatory agencies, hence, some pools under the jurisdiction of the ACOE as ephemeral wetlands may not support "typical" or characteristic vernal pool vegetation; (2) pools that are contiguous forming large complexes during wetter years are represented by disjunct, individual pools in drier years; and (3) following consecutive drought years, vernal pools that are nearly topographically indistinguishable may be totally undetectable.

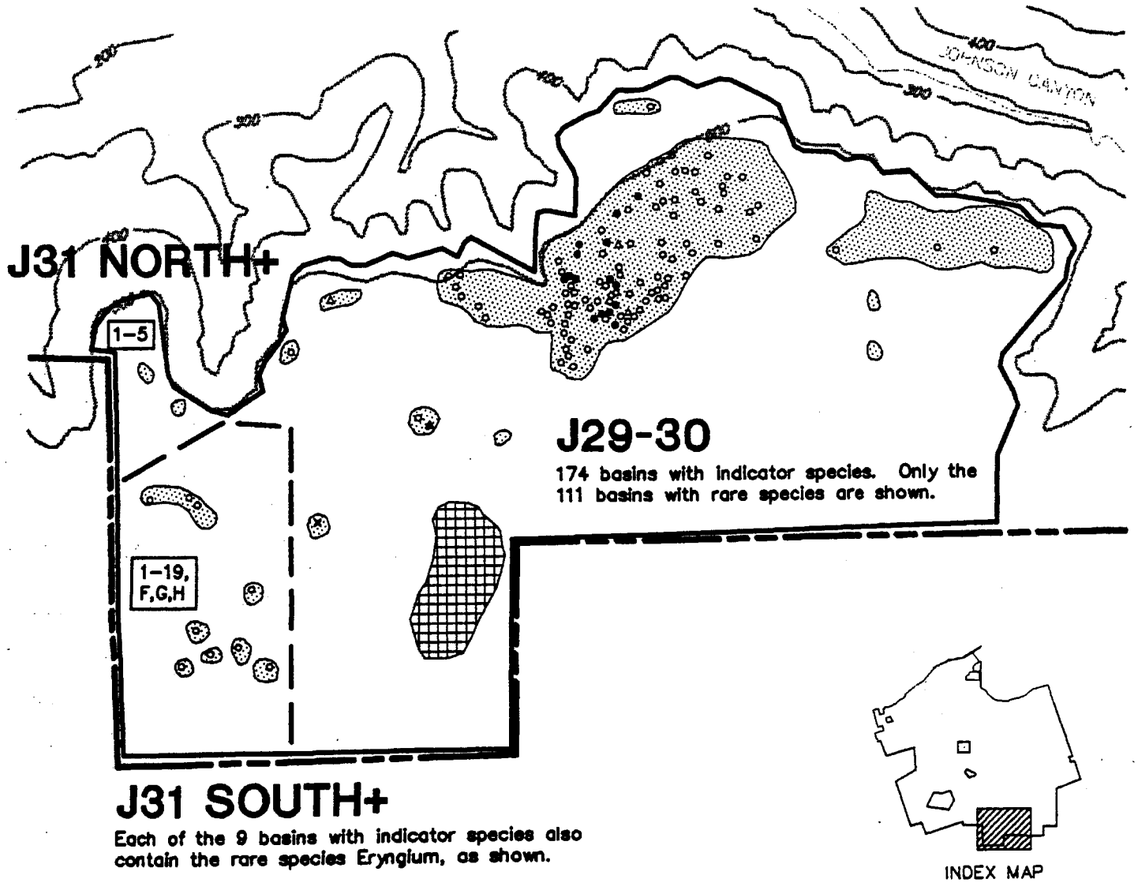
2.3.1 Otay Mesa Series

Otay Mesa lies on the U.S.-Mexican border, east of San Ysidro, west of the San Ysidro Mountains, and south of Otay Valley (*Figures 8 and 9*). The three largest groups of vernal pools within the Otay Ranch property are found on Otay Mesa - J29-30, J23-24, and J25. The pools in this series occur on marine terraces within Mima mound topography with gray clay soils. The soils are from the Stockpen series and are classified as gravelly clay loam with 0 to 2 percent slopes (Bowman 1973).

The predominant vegetation within the Otay Mesa Series (J) is disturbed valley needlegrass grassland or annual grassland, with a sparse scattering of coastal sage scrub. The dominant species include slender wild oats (*Avena barbata*), long-beak filaree (*Erodium botrys*), fascicled tarweed (*Hemizonia fasciculatum*), coastal sagebrush (*Artemisia californica*), San Diego barrel cactus (*Ferocactus viridescens*), English ryegrass (*Lolium perenne*), and coast goldenbush (*Isocoma menziesii*).

J29-30 Vernal Pool Complex

The northern portion of the J29-30 mesa has large intact Mima mounds and the densest grouping of vernal pools on the Ranch. In contrast, the southern part of the mesa has been plowed in the past, lacks conspicuous Mima mounds, and has only a few scattered pools. During survey work in 1990, 323 basins were staked in J29-30; 170 of these were identified as vernal pools based on the presence of at least one vernal pool indicator species (per DUDEK 1994). Sensitive vernal pool plant species present in this



Legend

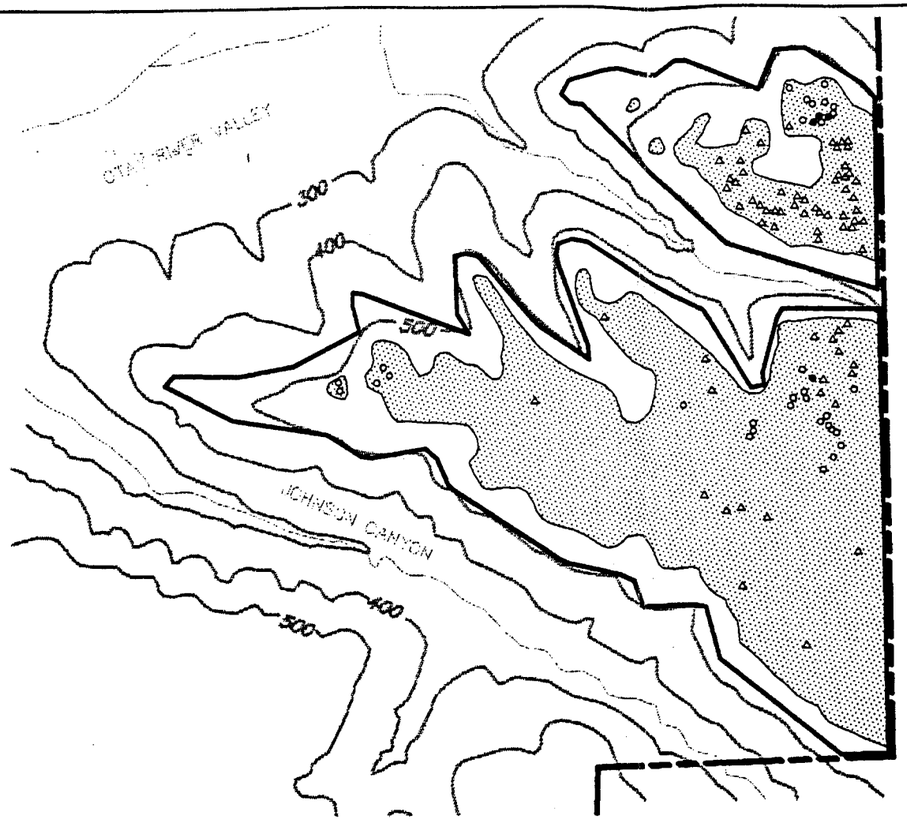
- Area surveyed for vernal pools
- Area of vernal pool habitat with indicator species
- *Lepidium latipes*
- ◦ Individual vernal pool with *Eryngium aristulatum*
- ▵ Individual vernal pool with *Pogogyne nudiuscula*
- × Individual vernal pool with *Navarretia fossalis*
- • Individual vernal pool with both *Eryngium* and *Pogogyne*
- ▲ Individual vernal pool with both *Eryngium* and *Navarretia*
- **K6** Vernal pool group code
- [18-21] I.D. numbers of all basins staked

1" = 1000'

Otay Ranch Vernal Pool Management Plan

Otay Mesa Vernal Pool Group: J29-30, J31 South+, J31 North+

FIGURE 8

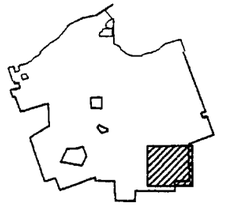


J25

151 basins with indicator species. Only the 59 basins with rare species are shown.

J23-24

533 basins with indicator species. Only the 45 basins with rare species are shown.



INDEX MAP

Legend

- Area surveyed for vernal pools
- Area of vernal pool habitat with indicator species
- ◦ Individual vernal pool with *Eryngium aristulatum*
- ▵ Individual vernal pool with *Pogogyne nudiuscula*
- • Individual vernal pool with both *Eryngium* and *Pogogyne*
- **K6** Vernal pool group code
- [18–21] I.D. numbers of all basins staked

1" = 1000'

Otay Ranch Vernal Pool Management Plan

Otay Mesa Vernal Pool Group: J23-24, J25

FIGURE 9

complex include San Diego button-celery (*Eryngium aristulatum* var. *parishii*) (present in 108 pools), Otay Mesa mint (*Pogogyne nudiuscula*) (present in 17 pools), spreading navarretia (*Navarretia fossalis*) (present in 10-12 pools), little mousetail (*Myosurus minimus*) (present in 10-12 pools), and California Orcutt grass (*Orcuttia californica*).

The last is known only from a single historical sighting and has not been observed in recent years. Sensitive vernal pool animal species present in J29-30 include San Diego fairy shrimp (*Branchinecta sandiegonensis*) and Riverside fairy shrimp (*Streptocephalus wootton*i).

J31 South+ (Space Station) and J31 North+ Vernal Pool Complex

Just west of J29-30 is an area enclosed by a chain link fence that is leased to the Navy for use as a space surveillance station (Space Station). This area is contiguous with the J29-30 mesa and has been graded and plowed in the past and is mowed regularly. The area is designated as "J31 South+." Just north and outside of the Space Station is a lobe of the same mesa extending toward Otay Valley, supporting undisturbed Mima mound topography. This area has been designated "J31 North+." In general, pools in the J31 complex are of low quality; many are dominated by English ryegrass.

Surveys in 1990 recorded 6 basins in the J31 South+ complex with vernal pool indicator species; an additional 5 basins with at least one vernal pool indicator were recorded in 1991. The lobe north of the Space Station (J31 North+) had 2 basins with vernal pool indicators. The only sensitive vernal pool plant species known from the J31 complex is San Diego button-celery.

J23-24 Vernal Pool Complex

The J23-24 complex occupies a large mesa extending west from the California State Correctional Facility. This complex encompasses the greatest acreage and the largest number of vernal pools of any complex on the Ranch. The Mima mound topography is undisturbed except for a dirt road along the boundary with the prison and a scraped area running east to west across the mesa. A total of 533 basins support vernal pool indicator species; 95% of the pools support woolly marbles (*Psilocarphus brevissimus*). Sensitive plant species known from the J23-24 complex include San Diego button-celery (present in 28 pools) and Otay Mesa mint (present in 24 pools); only one pool has both species.

J25 Vernal Pool Complex

The J25 mesa is bound by Otay Valley on the northwest, O'Neal Canyon on the north, and a smaller canyon that separates J23-24 on the south. The mesa was used as a bombing range in the 1940s. A dirt road, cattle tracks, and a large circular scraped area are additional disturbances present on the mesa. During the 1990 survey, a total of 151 basins had vernal pool indicator species. Otay Mesa mint is more abundant in this complex than anywhere on the Ranch; it is present in 55 pools. Other sensitive species present include San Diego button-celery and San Diego fairy shrimp.

2.3.2 Otay Valley Series

The Otay Valley is situated north of Otay Mesa. It drains westward from the watersheds of both Upper and Lower Otay Reservoirs, originating at Lower Otay Dam. Pools occur on several small, disjunct, elevated mesas along the north rim of the valley (*Figures 10, 11, and 12*) that are remnants of the same marine terrace that comprises Otay Mesa (Bowman 1973). These vernal pool groups are numbered J32+, K1, K15+, K16+, K2, and K17+. The soils associated with the first three (eastern) pool complexes are of the Huerhuero series; the latter two (western) pool complexes have soils of the Olivenhain series. Pool groups K16+, and K2, and K17+ were disced and seeded in about 1989, but formerly supported scattered shrubs of coastal sage scrub and plants common to valley needlegrass grassland. Most of the valley bottom historically has been farmed and utilized for surface materials mining; therefore, pools also may have occurred more extensively on Salinas soils or Riverwash alluvium. The Otay Valley series pools lack all of the rare species found on pools in other portions of the Ranch.

J32+ Vernal Pool Complex

The J32+ complex is situated on the south side of the Otay River. It includes 3 disjunct vernal pools that support vernal pool indicator species. Two of the pools are road pools and one is a relatively large, pristine pool. No sensitive vernal pool species have been documented from this complex.

K1 Vernal Pool Complex

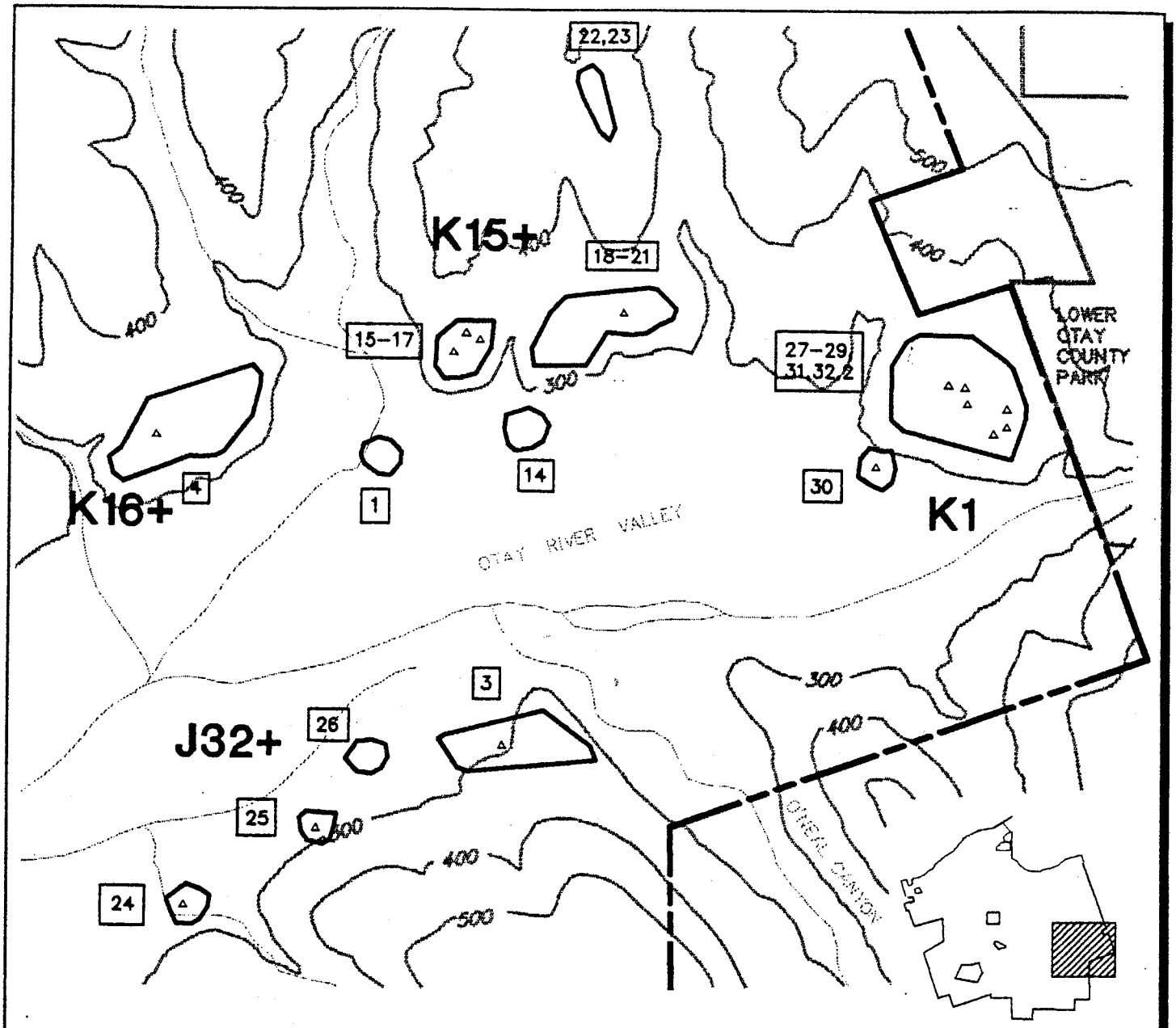
The K1 complex is located at the extreme eastern end of the Otay Valley parcel on a mesa at the north side of the Otay River. It includes 7 vernal pools that support indicator species: six on the mesa and one in the valley. No sensitive vernal pool plants or animals have been reported from this complex.

K15+ Vernal Pool Complex

The K15+ complex is located on the north side of the Otay River. It includes 4 vernal pools that support indicator species. No sensitive vernal pool plants or animals have been reported from this complex.

K16+ Vernal Pool Complex

The K16+ complex is located on the north side of the Otay River. It includes 1 highly disturbed road pool that supports indicator species. No sensitive vernal pool plants or animals have been reported from this complex.



INDEX MAP

Legend

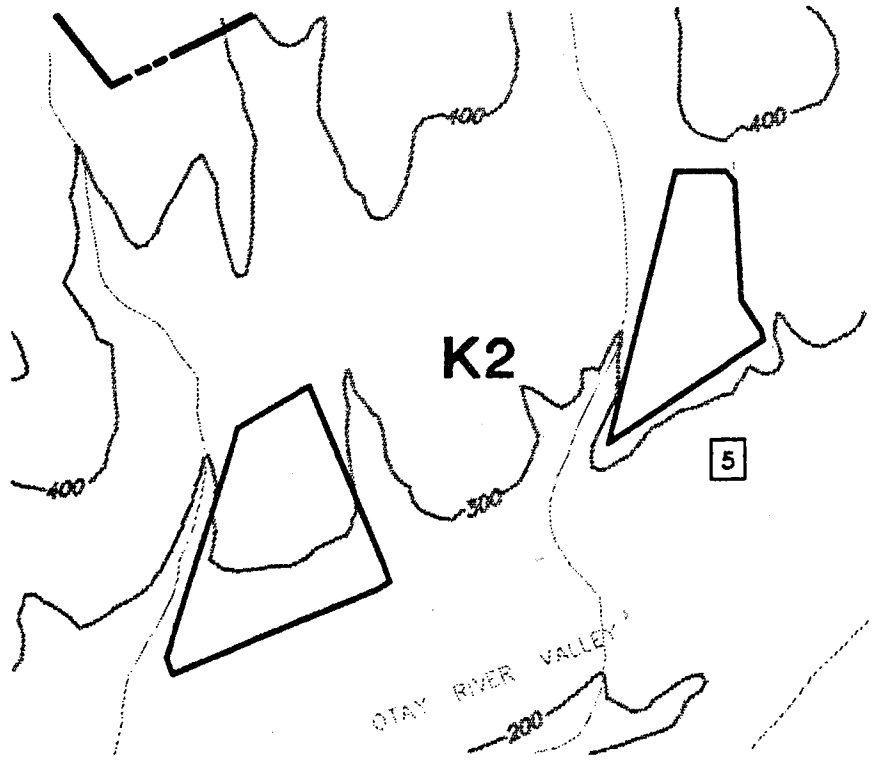
- Area surveyed for vernal pools
- ▵ Individual vernal pool with indicator species
- **K6** Vernal pool group code
- 18–21 I.D. numbers of all basins staked

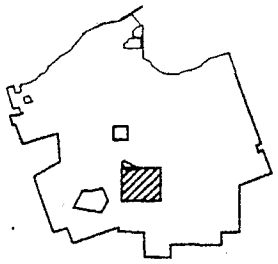
1" = 1000'

Otay Ranch Vernal Pool Management Plan

Otay Valley Vernal Pool Group: J32+, K1, K15+, K16+

FIGURE 10





INDEX MAP

Legend

Area surveyed for vernal pools

K6 Vernal pool group code

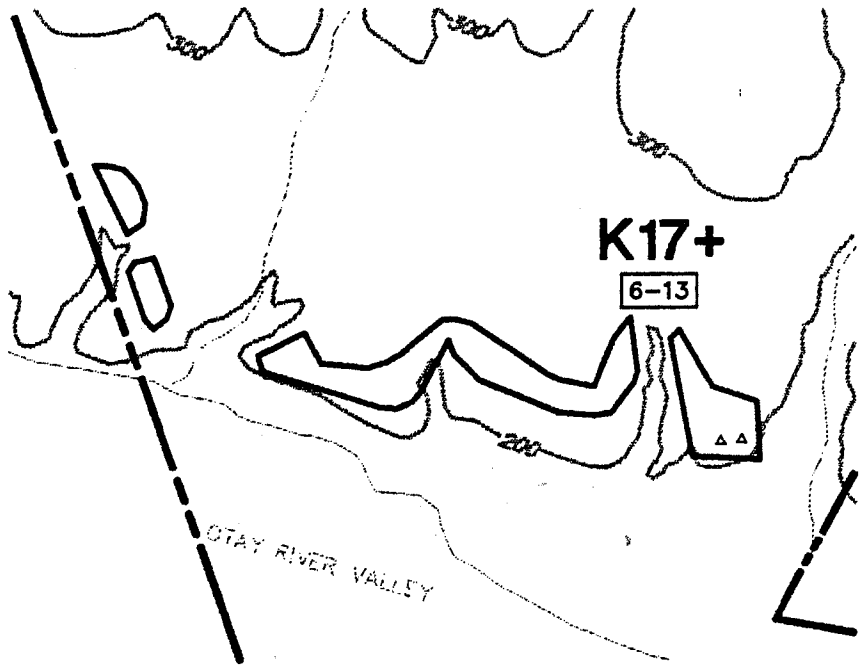
18–21 I.D. numbers of all basins staked

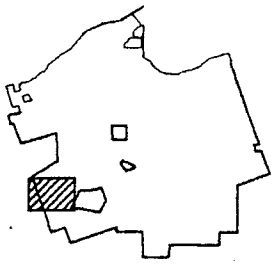
1" = 1000'

Otay Ranch Vernal Pool Management Plan

Otay Valley Vernal Pool Group: K2

FIGURE 11





INDEX MAP

Legend

- Area surveyed for vernal pools
- ▵ Individual vernal pool with indicator species
- **K6** Vernal pool group code
- [18-21] I.D. numbers of all basins staked

1" = 1000'

Otay Ranch Vernal Pool Management Plan

Otay Valley Vernal Pool Group: K17+

FIGURE 12

K2 Vernal Pool Complex

The K2 complex is located near the middle of the southern third of the Otay Valley parcel, on the north side of the Otay River. No vernal pools could be identified by DUDEK (1992) in this historical vernal pool complex (Bauder 1986).

K17+ Vernal Pool Complex

The K17+ complex is located at the edge of a mesa at the extreme western end of the Otay Valley parcel on the north side of the Otay River. It includes 2 vernal pools that support indicator species. Both have been disturbed by plowing of the mesa. No sensitive vernal pool plants or animals have been reported from this complex.

2.3.3 Poggi Canyon Series

Poggi Canyon lies south of Telegraph Canyon and north of Otay Valley. It empties to the west, draining some low rolling clay hills south of Telegraph Canyon and north of Wolf Canyon. Vernal pools in this area (*Figure 13*) are located on ridges north of Poggi Canyon (M5+) and immediately south (M2). Both of these vernal pool complexes occur on remnants of highly dissected alluvial marine terraces on soils of the Olivenhain series (Bowman 1973).

M5+ Vernal Pool Complex

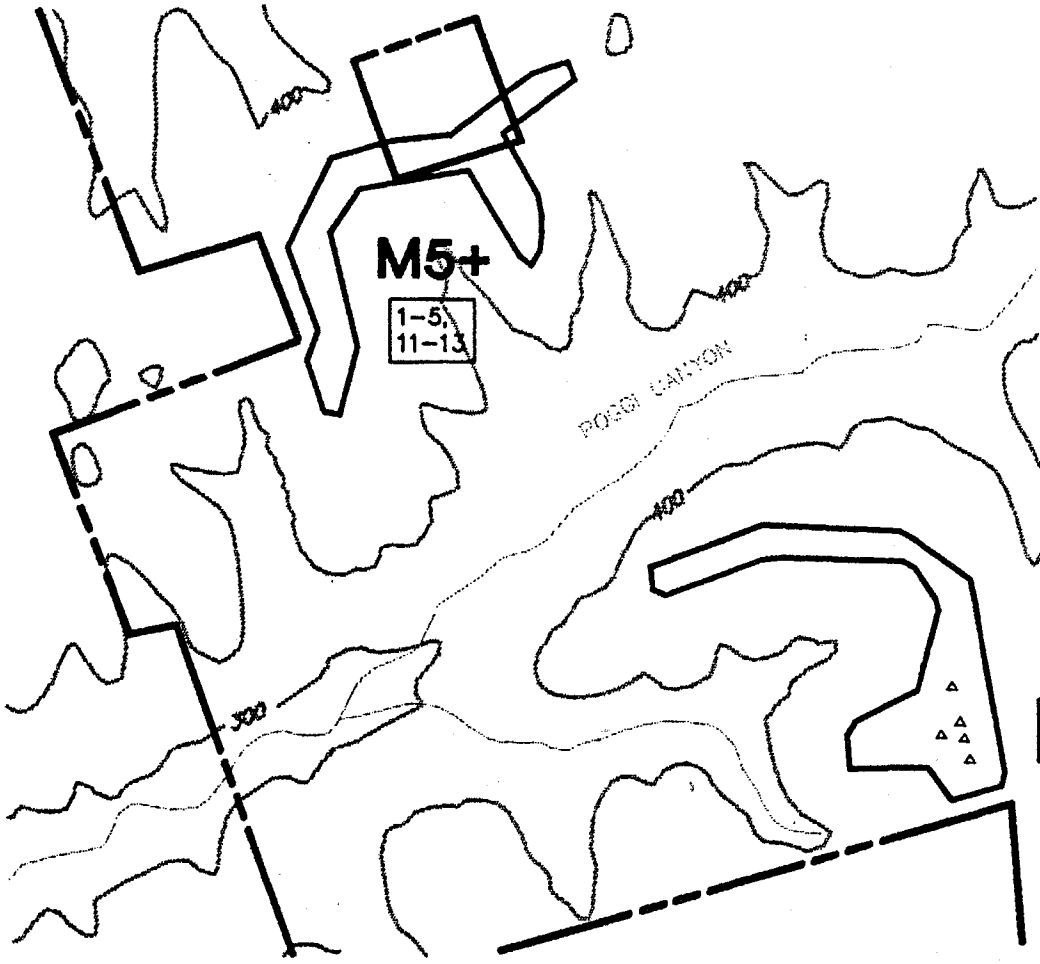
The M5+ complex is situated on the mesa north of Poggi Canyon. One vernal pool was identified in this complex in 1991, and 3 pools (with *Psilocarphus brevissimus*) were found in 1991. The area was brushed and disced in 1989, so all the vernal pools present are highly disturbed. Dominant plants in the basins include *Hemizonia fasciculatum, Erodium botrys,* and *Calandrinia ciliata*. No sensitive species have been reported from the M5+ complex.

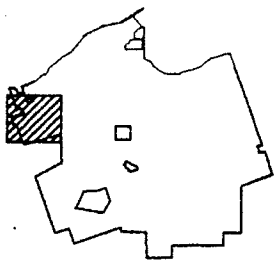
M2 Vernal Pool Complex

The M2 complex is situated on the mesa south of Poggi Canyon. Five vernal pools were found there in 1990, and 1 disturbed pool supporting *Psilocarphus brevissimus* was found in 1991. Dominant plants in the basins include *Hemizonia fasciculatum, Erodium botrys,* and *Vulpia myuros*. No sensitive species have been reported from the M2 complex.

2.3.4 Lower Otay Lake - South Series

A series of low terraces that support vernal pools occurs south of the east arm of Lower Otay Reservoir (*Figures 14 and 15*) within and adjacent to the San Ysidro Mountains parcel of Otay Ranch. The terraces





INDEX MAP

Legend

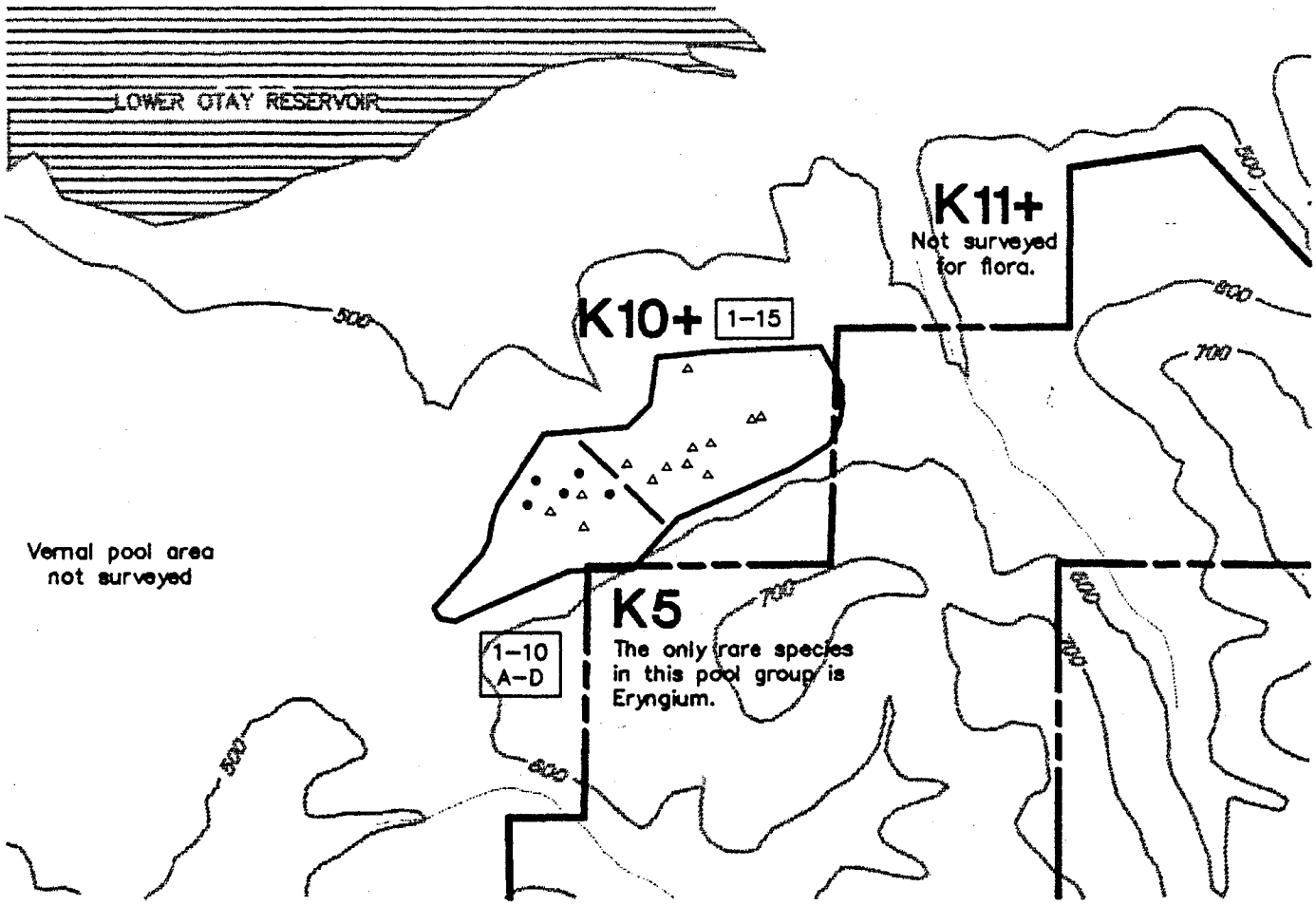
- Area surveyed for vernal pools
- ▵ Individual vernal pool with indicator species
- **K6** Vernal pool group code
- [18–21] I.D. numbers of all basins staked

1" = 1000'

Otay Ranch Vernal Pool Management Plan

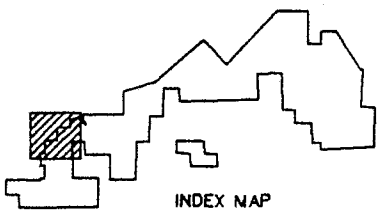
Poggi Canyon Vernal Pool Group: M2, M5+

FIGURE 13



Legend

- Area surveyed for vernal pools
- • Individual vernal pool with rare species
- ▵ Individual vernal pool with indicator species
- **K6** Vernal pool group code
- 1–15 I.D. numbers of all basins staked

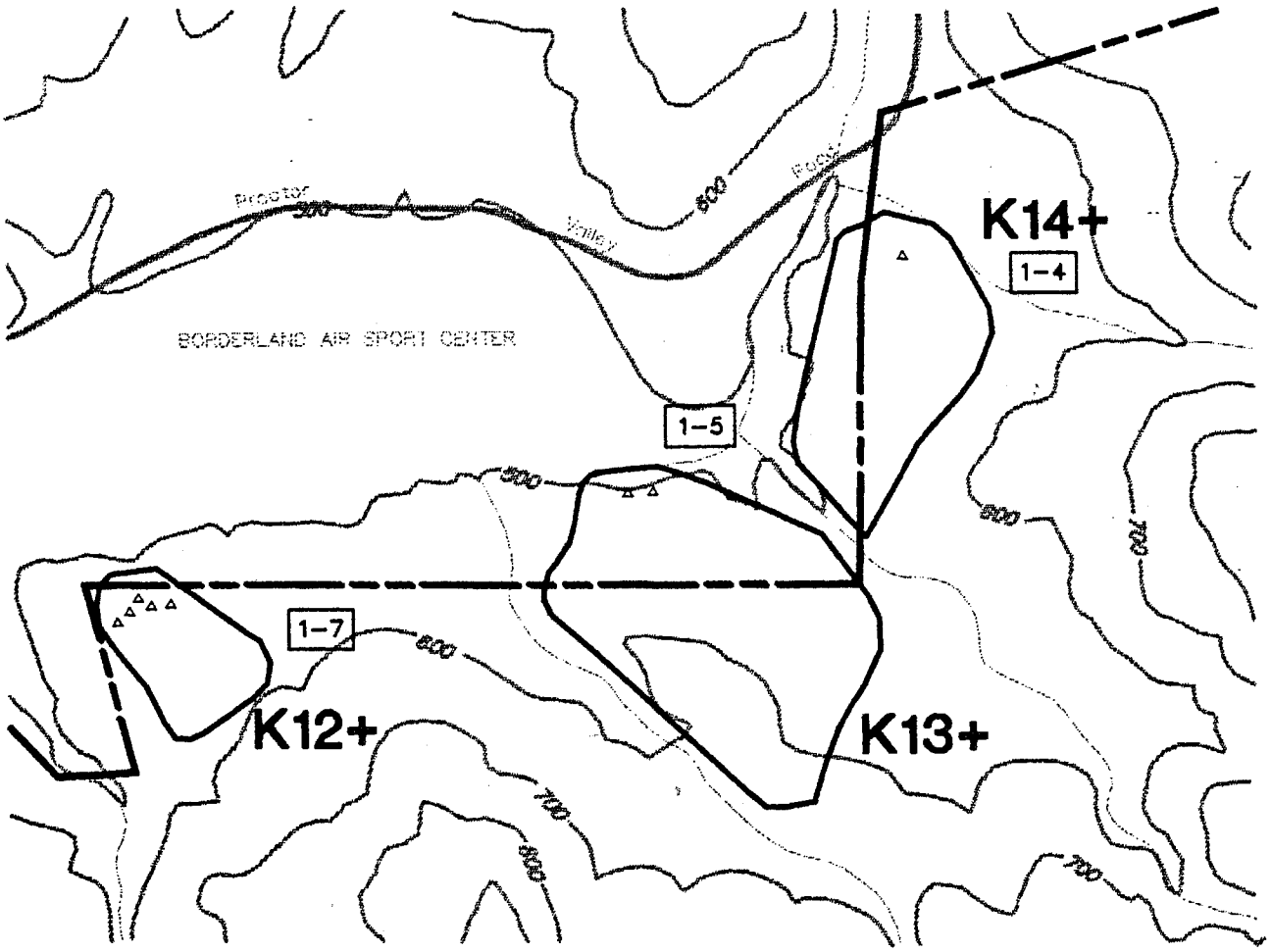


1" = 1000'

Otay Ranch Vernal Pool Management Plan

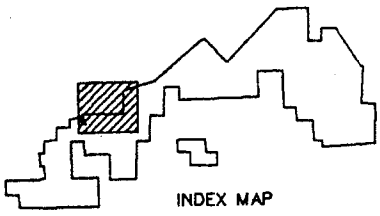
Lower Otay Lake - South Vernal Pool Group: K5, K10+, K11+

FIGURE 14



Legend

- Area surveyed for vernal pools
- ▵ Individual vernal pool with indicator species
- **K6** Vernal pool group code
- 1-15 I.D. numbers of all basins staked



1" = 1000'

Otay Ranch Vernal Pool Management Plan

Lower Otay Lake - South Vernal Pool Group: K12+, K13+, K14+

FIGURE 15

are mostly continuous, although they have been numbered in six separate groups (K5, K10+, K11+, K12+, K13+, and K14+). These pool groups are on alluvial marine terrace deposits with Olivenhain and Redding soils.

These pools occur among perennial grasslands that support San Diego needlegrass (*Achnatherum diegoensis*) and scattered shrubs typical of coastal sage scrub. The dominant surrounding vegetation is chaparral, composed of chamise (*Adenostoma fasciculatum*), Munz's sage (*Salvia munzii*), and some Ramona lilac (*Ceanothus tomentosus*). Most of the pools are relatively undisturbed.

K5 Vernal Pool Complex

The K5 complex includes 7 vernal pools situated immediately northwest of the Otay Ranch boundary. Dominant plant species within the basins include *Hemizonia fasciculatum, Erodium botrys,* and *Psilocarphus brevissimus; Eryngium aristulatum* was a co-dominant in several of the pools. The K5 complex (along with the K12 complex) supports the greatest diversity of vernal pool species among the Lower Otay Lake - South pools.

K10+ Vernal Pool Complex

The K10+ complex is located immediately east of K5 and is also just outside the boundary of Otay Ranch. In 1990, 10 vernal pools with indicator species were found on the K10+ complex; vehicle tracks are a disturbance to four of the pools. No sensitive vernal pool species were observed in this complex.

K11+ Vernal Pool Complex

The K11+ complex also is offsite of Otay Ranch, and the flora of this complex was not surveyed.

K12+ Vernal Pool Complex

The K12+ complex is located east of K11+ and is nearly entirely within the boundary of Otay Ranch. The complex includes four main pools that are unique in their possession of several vernal pool "fringe" species, including common goldfields (*Lasthenia californica*), pygmy stonecrop (*Crassula connata*), dot-seed plantain (*Plantago erecta*), and ashy spike-moss (*Selaginella cinerascens*). The complex has the greatest diversity of vernal pool species among the Lower Otay Lake - South pools. The pools support *Psilocarphus brevissimus, Callitriche* sp., *Psilocarphus tenellus,* and *Deschampsia.* No sensitive vernal pool species are present.

K13+ Vernal Pool Complex

The K13+ complex is located east of K12+, and although the boundary of the complex is mostly within Otay Ranch, the two pools present are outside of the Ranch ownership. The two pools are bisected by the

main dirt road along the south side of the Borderland Air Sport Center. No sensitive vernal pool species are present in either of the pools.

K14+ Vernal Pool Complex

The K14+ complex is situated northeast of K13+ and is mostly within the boundary of Otay Ranch. The complex includes a single pool with indicator species. In contrast to most of pools in Lower Otay River - South series, early onion (*Allium praecox*) was a co-dominant in this pool. No sensitive vernal pool species are present.

2.3.5 Lower Otay Lake - North Series

A series of disjunct terraces is divided by the eastern arm of Lower Otay Lake. Otay Lakes Road forms the southern border to the terraces. This area supports to Lower Otay Lake - North Series, which includes the K6, K8+, and K9+ complexes (*Figure 16*). The mesas are derived from the same marine terrace substrate as Otay Mesa, featuring soils of the Olivenhain series and Mima mound topography. Plants dominating the basins in this series include fascicled tarweed (*Hemizonia fasciculatum*), long-stemmed filaree (*Erodium botrys*), purple needlegrass (*Nassella pulchra*), a few introduced grasses, and a few vernal pool indicators.

K6 Vernal Pool Complex

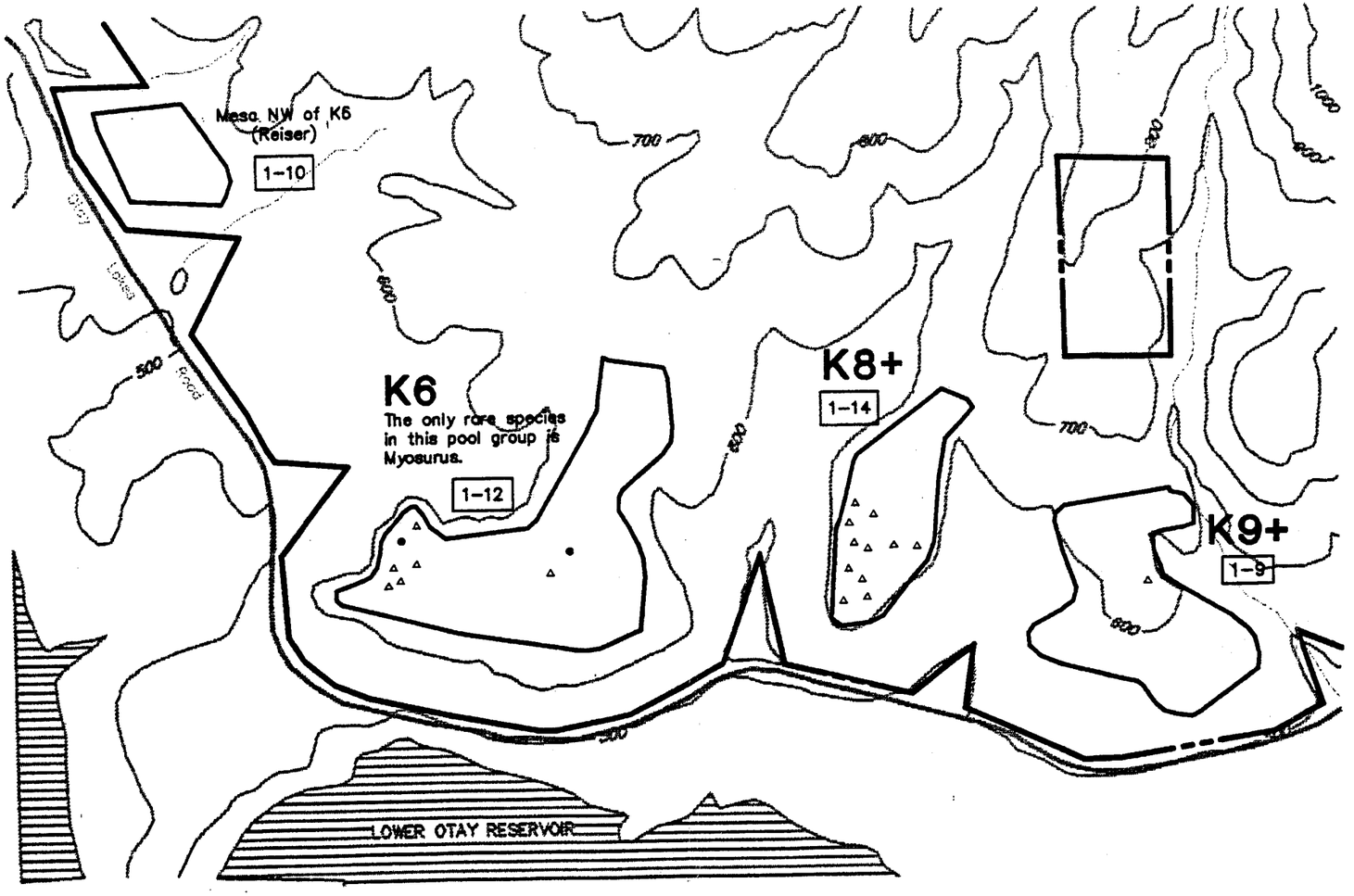
The K6 complex has been burned and heavily grazed, and much of the original shrub cover is depleted. The predominant plants are native bunchgrasses and forbs such as purple needlegrass (*Nassella pulchra*), coast goldenbush (*Isocoma menziesii*), and introduced annual grasses (e.g., *Avena, Bromus*). Three vernal pools were identified on the K6 mesa in 1990, and 5 additional pools were found in 1991. Little mousetail (*Myosurus minimus* var. *apus*), a rare vernal pool species known from only a few localities in the U.S., was found in one pool in 1990 and 2 pools in 1991. No other sensitive species have been reported from this complex.

K8+ Vernal Pool Complex

The K8+ complex, likewise, has been burned and heavily grazed historically, resulting in a highly disturbed landscape. Eleven pools have been identified on the K8+ mesa, supporting a total of six vernal pool indicator species. The only sensitive vernal pool species recorded from this complex is the San Diego fairy shrimp (*Branchinecta sandiegonensis*).

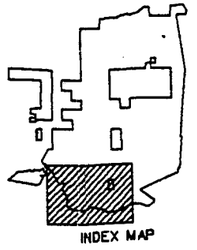
K9+ Vernal Pool Complex

The K9+ complex is dominated by chamise chaparral, although the southern rim has large grassy openings with perennial grasses and some elements of coastal sage scrub. The main plant species of the basins on



Legend

- Area surveyed for vernal pools
- • Individual vernal pool with rare species
- ▵ Individual vernal pool with indicator species
- **K6** Vernal pool group code
- 1-15 I.D. numbers of all basins staked



1" = 1000'

Otay Ranch Vernal Pool Management Plan

Lower Otay Lake - North Vernal Pool Group: K6, K8+, K9+

FIGURE 16

the K9+ mesa was *Psilocarphus tenellus.* Although Zedler (1987) considers *P. tenellus* an indicator species, DUDEK (1991) did not "because it seems to grow more frequently in depressions that do not have other characteristics of wetlands." One of the basins in the K9+ complex (disturbed by a road) is dominated by *P. tenellus,* but also supports adobe popcorn flower (*Plagiobothrys* cf. *acanthocarpus*) and toad rush (*Juncus bufonius*), both of which are considered vernal pool indicators. Hence, this one basin is considered to be a vernal pool. No sensitive species have been documented from this complex.

2.3.6 Lower Proctor Valley Series

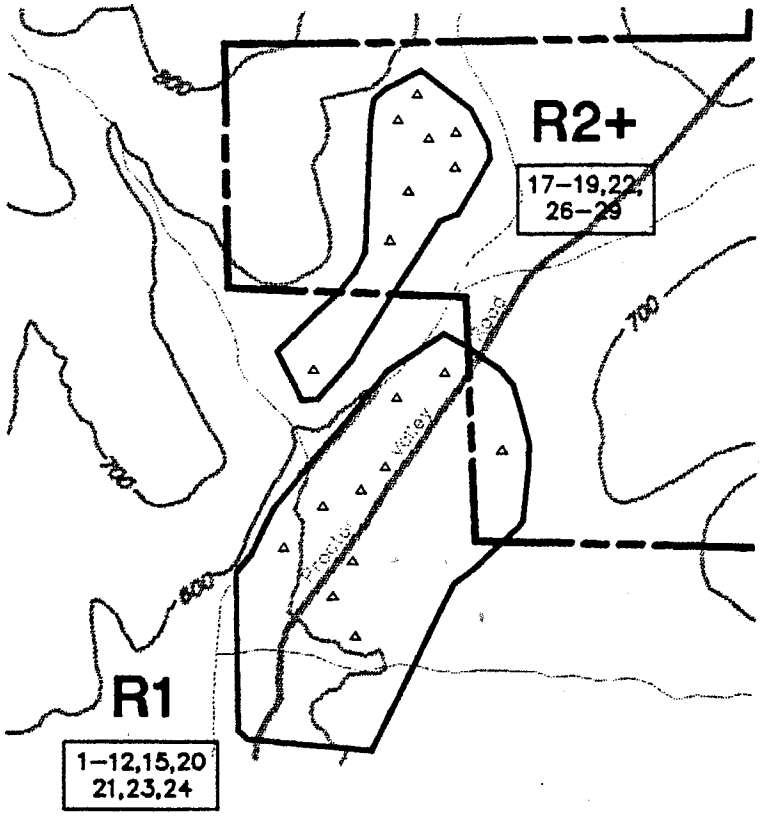
Lower Proctor Valley is located upstream of Upper Otay Lake and southwest of Jamul. It is bounded by the Jamul Mountains on the east and San Miguel Mountain on the northwest (*Figure 17*). Vernal pools in the lower portion of the valley occur on old, highly weathered benches and in the valley bottom, mostly on Olivenhain soils. The Upper Proctor Valley Series includes the R1 and R2+ complexes. The dominant vegetation in the vicinity of these complexes is coastal sage scrub and valley needlegrass grassland. However, a locally unique chaparral association, composed primarily of Munz's sage (*Salvia munzii*), flat-top buckwheat (*Eriogonum fasciculatum*), and San Diego County viguiera (*Viguiera laciniata*), borders these complexes. Vernal pool species present in the Lower Proctor Valley Series included woolly marbles (*Psilocarphus brevissimus*), water starwort (*Callitriche longipedunculata*), pygmy stonecrop (*Crassula aquatica*), and *Deschampsia danthonioides.* Other wetland species present included toad rush (*Juncus bufonius*), *Lythrum hyssopifolia,* and Australian brass-buttons (*Cotula coronopifolia*).

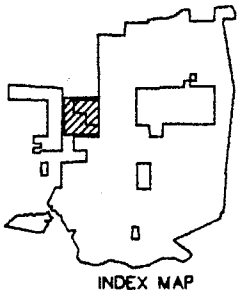
R1 Vernal Pool Complex

The R1 complex is mostly on property owned by the City of San Diego and includes 14 basins with vernal pool indicator species. All of the basin have been disturbed by vehicular traffic. The only sensitive species currently known to occur in this complex is the proposed endangered San Diego fairy shrimp (*Branchinecta sandiegonensis*). Little mousetail (*Myosurus minimus* var. *apus*) and spreading navarretia (*Navarretia fossalis*) were reported historically from the R1 complex, but the identification of the *Navarretia* was considered questionable (Bauder 1986). Neither of these rare plants was observed in Proctor Valley during the 1990 or 1991 vernal pool surveys.

R2+ Vernal Pool Complex

The R2+ complex is on a bench on the opposite (west) side of Proctor Valley from the R1 complex; it is entirely within the boundaries of Otay Ranch (*Figure 17*). The complex includes nine basins with indicator species. The R2+ complex also has a unique assemblage of vernal pool fringe species; there are some large shallow basins dominated by *Allium praecox* and *Plantago erecta.* This complex has unusually stable, undisturbed soil surfaces, and is one of the only vernal pool areas on the Ranch that is not characterized by introduced grasses and weeds. No sensitive vernal pool species have been recorded from the complex.





Legend

- Area surveyed for vernal pools
- ▵ Individual vernal pool with indicator species
- **K6** Vernal pool group code
- 1–15 I.D. numbers of all basins staked

1" = 1000'

Otay Ranch Vernal Pool Management Plan

Lower Proctor Valley Vernal Pool Group: R1, R2+

FIGURE 17

2.3.7 Upper Proctor Valley Series

Vernal pools in Upper Proctor Valley occur on old weathered benches and in the valley bottom, mostly on Friant soils (*Figure 18*). As with the Lower Proctor Valley Series, the dominant vegetation in the vicinity is coastal sage scrub, valley needlegrass grassland, and the unique Munz's sage chaparral association. The Upper Proctor Valley Series includes the R3+ and R4+ complexes.

R3+ Vernal Pool Complex

The R3+ complex includes three basins with vernal pool indicator species, including *Callitriche, Deschampsia, Psilocarphus brevissimus, Eryngium,* and *Lythrum hyssopifolia.* The endangered San Diego coyote-thistle (*Eryngium aristulatum* var. *parishii*) was present in all three basins in 1990 and in 1991. Although one of the pools was disturbed by trash dumping and vehicular activity, the pool may be restored easily by removal of the trash, smoothing of the ruts, and prevention of further degradation by fencing.

R4+ Vernal Pool Complex

The R4+ complex is northeast of the R3+ complex and has only one basin that supports indicator species. The only vernal pool indicator species present in the complex was pygmy stonecrop (*Crassula aquatica*).

3.0 EXISTING CONDITIONS

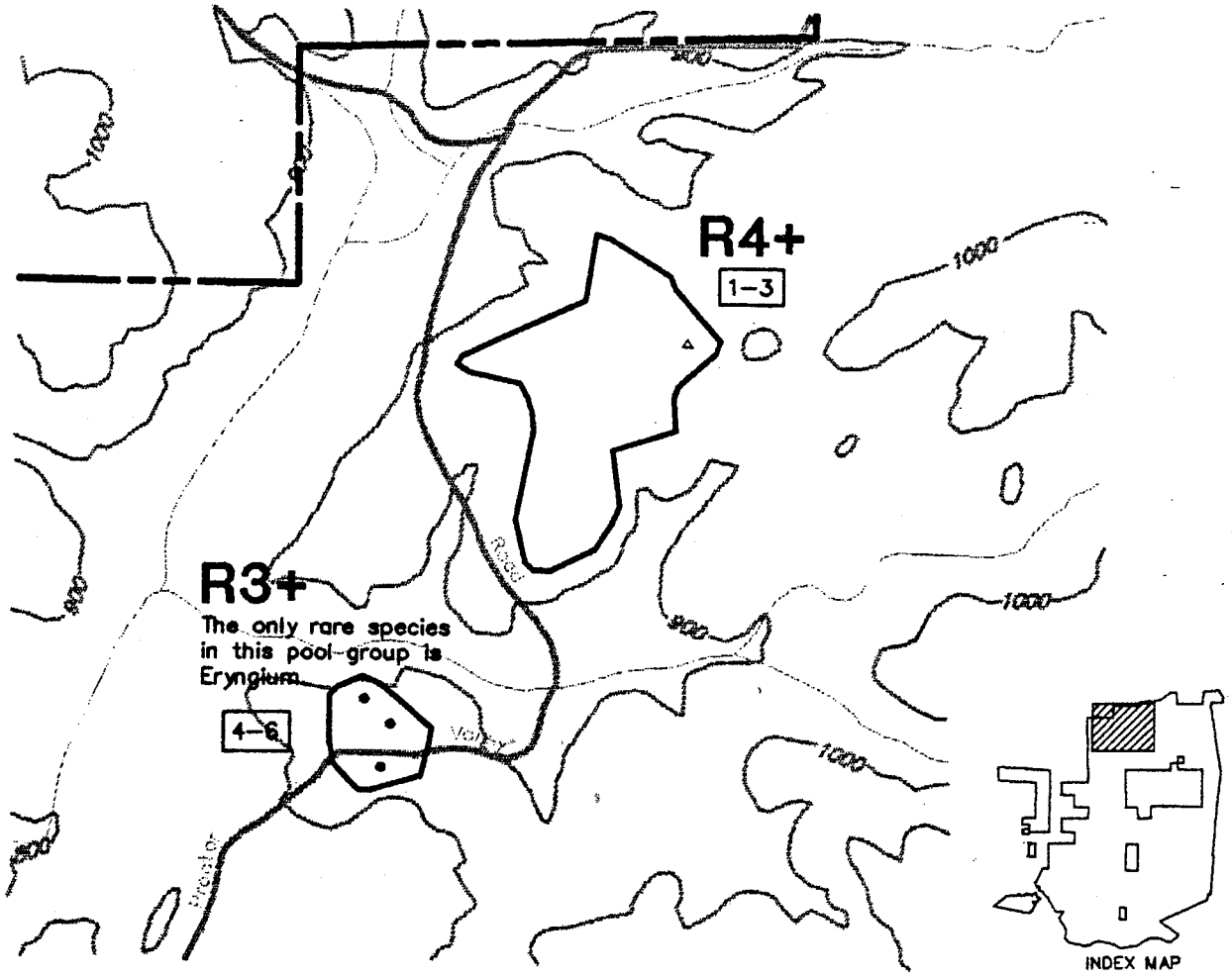
3.1 VERNAL POOL SERIES

3.1.1 Otay Mesa Series

Most of the area occupied by the Otay Mesa series receives little or no active use. The major potential sources of degradation of the series are cattle grazing and off-road vehicle use. The effects of cattle grazing are minor, for the most part, but may have a cumulative effect. During surveys conducted in the spring when the soil is wet and when the topography of the basins may be most vulnerable, it is not unusual to find pools with conspicuous, deep hoof prints from cattle. A dirt road along the eastern edge of the J23-24 and J25 complexes represents a potential source of disturbance from off-road vehicles. However, owing to the adjacency of the R. J. Donovan prison, vehicular use of the area is inhibited for security reasons. Nonetheless, Border Patrol vehicles frequent utilize the road.

Although portions of the 31+ South complex and possibly J30 complex have been subject to historical agricultural activities, at present, there is no agricultural use of this area.

Most of the Otay Mesa Series is included in the Vernal Pool Preserve, and hence will receive a high level of protection in the future.



Legend

- Area surveyed for vernal pools
- • Individual vernal pool with rare species
- ▵ Individual vernal pool with indicator species
- **K6** Vernal pool group code
- [1–15] I.D. numbers of all basins staked

1" = 1000'

Otay Ranch Vernal Pool Management Plan

Upper Proctor Valley Vernal Pool Group: R3+, R4+

FIGURE 18

3.1.2 Otay River Series

As with the preceding series, most of the area occupied by the Otay River series receives little active use. The major source of potential degradation of the series is cattle grazing. Dirt roads along the valley floor also represents a potential source of disturbance.

Although most of the Otay River Valley is included within the open space preserve identified in the RMP, for the present, these pools will continue to be degraded by cattle grazing and use of dirt roads by the rancher and Border Patrol.

3.1.3 Poggi Canyon Series

Pools of the Poggi Canyon Series have been subject to considerable historical agricultural use and other discing and plowing activities, and at present, are considered highly disturbed.

3.1.4 Lower Otay Lake - South Series

Pools of the Lower Otay Lake South - Series are most undisturbed. The only potential disturbance may be from cattle grazing.

3.1.5 Lower Otay Lake - North Series

The Lower Otay Lake - North Series has been subject to intensive grazing by cattle, goats, and sheep. At present, only cattle graze the mesas. Although the topography of the basins are intact, the flora of the pools is extremely depauperate, possibly as a cumulative result of fairly intensive historical grazing.

3.1.6 Lower Proctor Valley Series

Pools of the R1 complex are on City of San Diego property, on either side of Proctor Valley Road - a well-traveled dirt road that extends northeast to southwest through the valley. Although well isolated from development, these pools are subject to off-road vehicle use and illegal dumping of trash. The R2+ complex is far enough from Proctor Valley Road to avoid disturbance associated with users of the road.

3.1.7 Upper Proctor Valley Series

Owing to the adjacency of Proctor Valley Road, pools of the Upper Proctor Valley Series receive abuse from off-road vehicle traffic and dumping of trash.

3.2 EASEMENTS AND INFRASTRUCTURE

The Baldwin Company has granted easements to a variety of jurisdictional and private entities for roads, power lines, sewers, and gas lines on Otay Ranch. Regular use of certain of these easements and maintenance activities has the potential to adversely affect vernal pool resources and the surrounding habitat.

3.3 POTENTIAL FUTURE CHANGES TO OTAY RANCH VERNAL POOLS

3.3.1 Introduction

This section discusses potential causes of damage to vernal pool habitat on Otay Ranch and demonstrates that events that could damage vernal pools are diverse. Those events that have a low probability of occurrence (toxic spills) have a high potential for inflicting serious, perhaps, irreversible damage. On the other hand, dumping or mowing may have a high probability of occurrence, but result in little irreversible damage. Categories of "damage types" are somewhat arbitrary, and they overlap considerably. Although hydrology may be altered by a variety of activities, hydrology is so important to the vernal pool ecosystem that it has been considered separately. Vehicle damage may occur in connection with fire suppression or as an act of ignorance or vandalism. Disturbance in general will result in increased abundance and distribution of exotic plants and animals. It can be assumed safely that the greater the disturbance from the other agents, the greater the problem will be with exotics.

The proposed development of Otay Ranch, based on the approved GDP, will result in impacts to vernal pools, vernal pool habitat, and the associated vernal pool biota. These impacts will be allowed only within the context of, and in conformance with, the guidelines of the Otay Ranch RMP which states that a minimum of 95% of the vernal pool habitat on the Ranch will be preserved, along with 95% of the San Diego button-celery, 100% of the Otay Mesa mint, and viable populations of little mousetail and spreading navarretia.

As identified above in *Section 1.4, Responsibilities for Enhancement and Management,* impacts to vernal pools and vernal pool habitat that result from implementation of the GDP will be mitigated through restoration and enhancement activities directed toward the vernal pool preserve.

3.3.2 Potential Causes of Damage

3.3.2.1 Altered Hydrology

Altered hydrology of pool areas results primarily from the construction of roads and buildings that interrupt the normal surface and subsurface flow of water. Pool groups adjacent to roads are most vulnerable. Some areas receive increased flow due to storm drains and culverts, and berms and roads act as small dams.

Other areas may be deprived of the normal flow of water. It is well documented that vernal pool plants are tolerant of periods of inundation but suffer increased mortality with increased inundation; these plants are absent from ponds and lakes which have water most or all of the year (Zedler 1987). If pools rarely retain water or have water only for short periods of time, some pool species may be unable to persist, particularly during extended drought periods.

Ripping, grading, or plowing can, in addition to destruction of habitat, decrease the propensity for water to pond by interrupting the hardpan and removing layers of clayey soils, creating "leaky bottom" pools. Vehicles usually cause longer periods of water retention (Bauder 1989 a,b). The reason is not known, but it appears to be a combination of soil compaction and removal of soil that puts the hardpan closer to the surface.

Pools with altered hydrology have restoration potential ranging from high to very low, depending on the cause(s) of altered hydrology. Clearly, disruptions of the soil profile are more difficult to rectify than are misplaced culverts or berms.

3.3.2.2 Dumping/Trash

Dumping of trash refers to the accumulation of inert materials such as wood, metal, bricks, and household goods; chemically active materials are considered under toxics. The likelihood of dumping is directly related to the ease of access and generally is coupled with vehicle damage. Pools near dirt roads or other easy access points are most vulnerable to damage from dumping of trash. If trash remains in pools for a number of years, pool species could disappear (become locally extinct) in those pools. Restoration potential of pools with trash ranges from moderately high to high.

3.3.2.3 Fire/Fire Suppression

Wildfires and associated activities can affect vernal pool habitat in three ways: fire suppression (vehicles, grading, chemical fire retardants), fire risk reduction (discing, grading, brushing), and the actual burning of vegetation (controlled burns, wildland fires). Pools set in a matrix of dense vegetation (i.e., shrublands) have the highest risk of damage related to wildfires.

Because the vernal pool flora evolved in a landscape subject to periodic wildfires, it is likely to tolerate fires so long as their frequency and intensity do not differ markedly from the historical norm. Unfortunately, information is scanty on the historical nature of California's wildland fires. A recent study by Cox and Austin (1990) indicates fire can have at least a temporary adverse impact on species in the plant genus *Pogogyne*, which is typically associated with vernal pools. Disking and grading of pool basins or adjacent habitat for fire risk reduction could have serious, and in some cases, irreversible impacts on the distribution and abundance of pool species. Vehicles associated with fire suppression activities probably would do less damage than disking or grading because fires tend to occur when soils are dry and hard. Therefore,

restoration potential of areas with fire effects alone probably would be high, but in areas affected by fire suppression or prevention, potential could range from moderately high to very low, depending on the type of damage.

3.3.2.4 Future Projects

Proposed projects or altered land uses that will result in the destruction of vernal pool habitat represent a threat with very high probability of damage. These projects cause irreversible changes, and there is no restoration potential for the destroyed habitat. Projects that will affect nearby land may impact pools via altered hydrology, toxic spills, increased disturbance, or some other effect associated with the juxtaposition of incompatible land uses. In general, there is a direct relationship between the proximity of the proposed land use change and the likelihood of damage to pool habitat. Also, changes in land use within higher elevations of a watershed increase the probability of impacts to pools as does the creation of long edges or boundaries.

3.3.2.5 Grading

The threat of damage due to grading, defined as soil disturbance well below the surface, includes that of approved land uses as well as grading incidental to other activities. If grading or ripping pierce the hardpan or fill pool basins with soil, pool hydrology may be altered permanently. Restoration potential in these situations is very low.

3.3.2.6 Mowing and Discing

Mowing and clipping are known to alter the competitive relationships of species, but their effect on vernal pool species is unknown. If mowing is done when soils are dry and annuals have set seed, damage could be low to moderate and restoration potential high.

Discing is defined as surface soil disturbance. The damage of such disturbances could be substantial. Even ruts in road pools differ from immediately adjacent habitat in the length of the period of inundation and the frequency of occurrence of pool species (Bauder 1989a, b). Restoring the microtopographic and hydrologic properties of the affected soils could be difficult. Restoration potential of disced areas is estimated to be medium to very low.

3.3.2.7 Pedestrians

Although the effects of foot paths are not as detrimental as motorized vehicles, humans can have substantial negative impacts on vernal pool habitat. Some foot paths may become as wide as roads when pedestrians detour low spots in the trail during rainy periods. Depending on the width and depth of the trail, restoration potential would range from high to medium. The continued use of Otay Ranch by illegal aliens will continue to have an adverse affect on the biota.

3.3.2.8 Toxics

Toxics are differentiated from trash in that they are chemically active, can directly kill vernal pool flora and fauna, and may persist in soil and water for long periods of time. Toxics include oil, lubricants, cleaning agents, herbicides, pesticides, heavy metals, fire suppression compounds, solvents, paints, and many others. The risk of damage from toxics is greatest to pools near high use vehicle areas. Dumping or accidental spills could cause the most damage if materials directly entered pools. The next greatest impact would be if toxics entered a drainage and traveled through soil and water. The restoration potential for impacted areas would depend on the type and amount of the toxic substance.

A number of areas within Otay Ranch are potential recipients of chemical pest control measures. Vernal pool flora or fauna could be affected by the application of herbicides and pesticides targeted for ground squirrels, gophers, mosquitoes, and plant weeds.

Specifically, within Otay Ranch, gophers may be controlled using zinc phosphide and strychnine. Mosquito larvae occurring in standing water around buildings, ditches, and ponds are likely to be controlled using Malathion. However, because Malathion is toxic to a wide variety of animal species, its application in or near vernal pools could affect sensitive vernal pool species such as Riverside fairy shrimp, western spadefoot toad, and two-striped gartersnake. Non-sensitive vernal pool fauna also could be affected, including species that may be important to pollination and dispersal. Any spraying for mosquitos near vernal pools should be done with BT (*Bacillus thuringiensis*), a bacterium used for biological control.

Roundup, Fusilade, Garlon 4, Embark 25, Oust, and Rodeo are likely to be applied in many areas for weed control. Where vernal pool species occur in areas that be considered "ditches and ponds," this flora would be vulnerable.

3.3.2.9 Vehicles

Other than destruction of habitat by conversion to buildings, parking lots, and roadways, vehicles pose the greatest threat to vernal pool habitat. Current information evident in aerial photos and field surveys on the ground suggests that vernal pool habitat on Otay Ranch may be degraded unless the potential for this type of damage is reduced. The larger the vehicle, the greater the damage, although repeated use of motorcycles over a period of years can have just as serious an impact as a large vehicle. If the vehicles pass through pools when soils are saturated, ruts up to 0.5 m deep can develop; this is deeper than most natural pools (Zedler et al. 1979). Ruts alter the hydrology and distribution of species (Bauder 1989 a,b). Furthermore, vehicle tires remove the clayey soils on pool bottoms, reducing the soil volume available to plant roots and in some cases exposing the hardpan. Restoration of vehicle damage can be very difficult to impossible. Vehicle tracks probably will be evident many decades into the future, just as disc furrows from over 40 years ago can still be seen clearly on the Miramar Mounds National Natural Landmark (Wier and Bauder 1990).

Vehicles have access to vernal pool areas by a number of means. Authorized entry on established and unestablished routes may impact vernal pools in many areas of the Ranch. Continued use of dirt roads by Border Patrol vehicles undoubtedly continue to indirectly and less often directly impact vernal pool habitat.

3.3.2.10 Cattle

Livestock can damage pools in a number of ways: (1) they may alter the micro-topography of the basins when the soil is wet, thereby potentially altering the hydrology; (2) they may consume sensitive plant species; (3) they may drink water from the pools depleting the amount available for developing fairy shrimp or spade-foot toads; (4) they may defecate or urinate in the pools thereby altering the water quality. In contrast, cattle grazing may have the positive effect of reducing the standing crop of non-native vegetation, thereby minimizing competition for native vernal pool plant species.

The timing of cattle grazing is critical for the avoidance of impacts to vernal pools. Cattle should be excluded from vernal pool habitat from winter, when water begins to accumulate in the pools following seasonal precipitation, until summer, when all of the sensitive vernal pool plant species have set seed. The intensity and timing of grazing activities are being more clearly defined in the Range Management Plan.

4.0 ENDANGERED AND SENSITIVE SPECIES

Presently, there are three state- and federally-listed endangered plant species (i.e., *Eryngium aristulatum* var. *parishii*, *Pogogyne nudiuscula*, and *Orcuttia californica*), one federally proposed endangered species (*Navarretia fossalis*), one federal Category 2 candidate for listing (*Myosurus minimus*), and at least six other sensitive upland plant species that occur in habitat surrounding pools, documented from Otay Ranch.

Among the large number of sensitive animals known from Otay Ranch, only three are specifically associated with vernal pool habitat: the Riverside fairy shrimp (*Streptocephalus woottoni*) is listed as endangered by the USFWS, the recently described San Diego fairy shrimp (*Branchinecta sandiegonensis*) is proposed to be listed as endangered, and the western spade-foot toad (*Scaphiopus hammondii*) is a federal candidate for listing.

Additional listings of vernal pool species are possible in the future. Future listings would not affect implementation of the management plan as outlined below, with the exception that an endangered species permit would be required for collection of endangered species.

4.1 DISTRIBUTIONS OF SENSITIVE VERNAL POOL PLANT SPECIES ON OTAY RANCH

Five sensitive vernal pool plant species have been documented from the vernal pools on Otay Ranch: *Eryngium aristulatum* var. *parishii*, *Pogogyne nudiuscula*, *Navarretia fossalis*, *Orcuttia californica*, and *Myosurus minimus* var. *apus*. In addition, the upland areas surrounding the vernal pools support at least

six species recognized as sensitive by the U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Game (CDFG), or the California Native Plant Society (CNPS). Sensitive species that have been documented within the vernal pool series are discussed below. An explanation of agency status and listing categories is presented in Appendix B.

4.1.1 *Eryngium aristulatum* var. *parishii*

Eryngium aristulatum var. *parishii* - San Diego button-celery
USFWS: Endangered
CDFG: Endangered
CNPS: List 1B, 1-3-2

San Diego button-celery is a prostrate or decumbent biennial or perennial species that occurs in or near vernal pools in Riverside and San Diego counties and in northern Baja California, Mexico. It blooms from March through July. In San Diego County it is found on Camp Pendleton, San Marcos, the northern mesas in the City of San Diego, and Otay Mesa. While not as narrowly restricted to vernal pools as many pool-associated species, *Eryngium* is more patchy in its distribution than other rare species such as *Pogogyne*. Because of its patchiness, it is more easily eliminated from an area than more evenly distributed species. *Eryngium* seems to be less sensitive to disturbance than many of the other vernal pool species, perhaps because of its perennial habit and large tap root. It reestablishes well where the duration of water has been extended by altered drainage, trenching, and grading.

On Otay Ranch, San Diego button-celery is most common in the Otay Mesa Series (J23-24, J25, J29-30, J31+), but it also is present in the K5 and R3+ complexes.

4.1.2 *Pogogyne nudiuscula*

Pogogyne nudiuscula - Otay Mesa mint
USFWS: Candidate (Category 1)
CDFG: Endangered (CE)
CNPS: List 1, 3-3-2

Otay Mesa mint is a small, late spring-summer (May-June) blooming, aromatic annual species that occurs only in vernal pools on Otay Mesa in southern San Diego County, and adjacent Baja California, Mexico (Wiggins 1980). It apparently reaches its northern limit on Otay Mesa and does not occur north of Otay River. According Smith and Berg (1988), Otay Mesa mint is seriously threatened by the urbanization of San Diego' mesas.

Otay Mesa mint is restricted to the J23-24, J25, and J29-30 complexes of the Otay Mesa Series.

4.1.3 *Orcuttia californica*

Orcuttia californica - California Orcutt grass
USFWS: Candidate (Category 1)
CDFG: Endangered
CNPS: 1B, 2-3-2

California Orcutt grass is a low annual with short leaf blades. It is a rare species restricted to vernal pools on coastal mesas below about 200 m. In San Diego County, it has been recorded from Miramar Naval Air Station, south of San Clemente Canyon, Otay Mesa (Beauchamp 1986), and Carlsbad (Poinsettia rail station). According to Smith and Berg (1988), California Orcutt grass is seriously threatened by agriculture and overgrazing.

On Otay Ranch, California Orcutt grass is known only from a single historical sighting by Tim Cass in the J29 complex.

4.1.4 *Navarretia fossalis*

Navarretia fossalis - San Diego navarretia
USFWS: Candidate (Category 2)
CDFG: None
CNPS: List 1B, 2-3-2

This diminutive, white-flowered annual occurs in western Riverside and southwestern San Diego Counties, as well as in northwestern Baja California, Mexico. It generally occurs in vernal pools or roadside depressions below 450 m (1476 feet) elevation. Historically, *N. fossalis* occurred in relatively few of the San Diego County vernal pools. In Baja California it is established in a few vernal pools and to a greater extent in several widely scattered artificial depressions.

This is the most problematic of the sensitive vernal pool species found on the Otay Ranch. Taxonomic confusion makes an assessment of this species' distribution difficult. Three similar taxa have been reported from coastal San Diego County (Beauchamp 1986) -- *Navarretia fossalis, Navarretia intertexta,* and *Navarretia prostrata.* The white-flowered *Navarretia* found in pools on Otay Ranch appear to represent *Navarretia fossalis.*

On Otay Ranch this species is rare, documented only from the J29 complex. It apparently is highly susceptible to seasonal weather patterns; for several years it could not be found in the historical location. In the 1993 it was rediscovered in moderately large numbers.

4.1.5 *Myosurus minimus* var. *apus*

Myosurus minimus var. *apus* - little mousetail
USFWS: Candidate (Category 2)
CDFG: None
CNPS: List 3, 2-3-2

Little mousetail is a small (1-3 cm), spring-blooming (February-April) annual that occurs in vernal pools and alkaline marshes in Riverside, San Bernardino, and San Diego counties, as well as Baja California, Mexico (Munz 1974, Smith and Berg 1988). This species is threatened by the loss and degradation of vernal pool habitat. In San Diego County, little mousetail has been reported from vernal pools in National City, Proctor Valley, Otay Mesa (Beauchamp 1986), and Camp Pendleton (PSBS 1990, RECON 1988). It is one of the rarest vernal pool taxa in San Diego County. Loss of habitat for this plant constitutes a serious threat to its survival. It is therefore important to preserve extant populations and potential habitat where this plant has been known to occur.

Little mousetail was known historically from a single pool in the J29 complex (Otay Mesa/Space Station pools) and from the R1 complex in Proctor Valley. It has not been observed in R1 since 1986, and had not been observed in J29 from 1979 until its rediscovery in 1993. During the 1990 vernal pool surveys, two individuals were found in a single pool on the K6 mesa, and these were the only sightings on the entire Ranch. In 1991, hundreds of individuals were observed in two pools on the K6 mesa.

4.1.6 *Lepidium latipes* var. *latipes*

Lepidium latipes var. *latipes* - dwarf pepper-grass
USFWS: None
CDFG: None
CNPS: Considered but rejected: Too common

Dwarf pepper-grass is low, erect annual that blooms from March to May. Although relatively widespread in California, it is rare in San Diego County. It occurs primarily in ephemeral ponds and vernal pools in coastal areas below about 150 m. Although formerly considered sensitive by the California Native Plant Society, recent information regarding its distribution indicate that it is unlikely to be vulnerable or sensitive.

This species is known from the disturbed, non-native grassland in the vicinity of the J29 complex.

4.1.7 Sensitive Upland Plant Species Within Vernal Pool Series

Dudleya variegata - variegated dudleya
USFWS: Candidate (Category 2)
CDFG: None
CNPS: List 4, 1-2-2

Variegated dudleya is an low, ephemeral, herbaceous succulent that grows from a corm. It is restricted to southern San Diego County and northwestern Baja California, Mexico, and typically occurs near the coast on level mesas with clay soils. It is found primarily in open coastal sage scrub and native grasslands. In San Diego County it ranges from about Lake Hodges south to the international border. According to the Smith and Berg (1988), it occurs in sufficient numbers so that immediate threat of extinction or extirpation is unlikely.

Variegated dudleya is present in the J29-30 complex.

Selaginella cinerascens - ashy spike-moss
USFWS: None
CDFG: None
CNPS: List 4, 1-2-1

This tiny, prostrate, whitish gray, moss-like plant occurs in San Diego County and adjacent northwestern Baja California, Mexico. In San Diego County it ranges from about Rancho Bernardo south to the international border. It is relatively abundant in coastal areas, occurring on flat mesas below 300 m that are prime locations for housing. Development of these areas has caused massive reduction of the habitat of the ashy spike-moss. This plant is one of the most common understory plants in coastal sage scrub and coastal chaparral communities, but has a restricted geographical range in southern California.

Ashy spike-moss is present in the J23-24, J25, and J29-30 complexes.

Ferocactus viridescens - San Diego barrel cactus
USFWS: Candidate (Category 2)
CDFG: None
CNPS: List 2, 1-3-1

San Diego barrel cactus is a low, dome-like, perennial cactus, limited in distribution to San Diego County and adjacent Baja California, Mexico. In San Diego County it occurs commonly on dry slopes in Diegan coastal sage scrub and chaparral communities. Although relatively widespread in the county, San Diego barrel cactus is continuing to decline in numbers as its habitats are reduced. San Diego barrel cactus is threatened primarily by urbanization, off-road vehicles, and commercial exploitation.

San Diego barrel cactus is present in the J23-24, J25, and J29-30 complexes.

Salvia munzii - Munz's Sage
USFWS: Candidate (Category 2)
CDFG: None
CNPS: List 2, 2-2-1

Munz's sage is a medium-sized aromatic shrub that occurs infrequently in coastal sage scrub in the southern foothill and coastal region of San Diego County below about 500 m (1,640 ft) elevation. Where it occurs, it often is the dominant shrub. Reported localities for this species include the San Miguel, Jamul, and Otay Mountains, Dictionary Hill, Proctor Valley, and lower Otay Lake (Beauchamp 1986). Many of the low hills or level areas where this plant is known to occur have high potential for development, hence, urban development represents the greatest threat to this species.

Munz's sage is present in the K8+ and K9+ series.

Achnatherum diegoensis - San Diego County needlegrass
USFWS: None
CDFG: None
CNPS: List 2, 3-1-1

This perennial bunchgrass occurs locally along washes and on clay soils between 300 and 700 m (984 to 2,297 ft) elevation. It is known to occur on the upper slopes of Jamul and McGinty Mountains, as well as Proctor Valley, Lee Valley, Otay Mountain (Beauchamp 1986), and along the south rim of Mission Valley (W. Tyson, personal communication). Wiggins (1980) indicates that *S. diegoensis* occurs in chaparral and coastal sage scrub habitats in adjacent northern Baja California, Mexico.

San Diego County needlegrass is present in the K8+ and K9+ series.

Viguiera laciniata - San Diego County viguiera
USFWS: None
CDFG: None
CNPS: List 2, 1-2-1

San Diego County viguiera is a moderate-sized (0.8-1.2 m), yellow-flowered, perennial shrub, that blooms from about January to July. It is restricted to coastal sage scrub habitat below about 400 m from southern San Diego County to northwestern Baja California, Mexico (Wiggins 1980). In San Diego County, it is locally common south of Mission Valley; it ranges from the international border north to about Scripps Ranch, and extends east from the Pacific coast to Dulzura, Potrero, and Crest. Although many of the former sites of this plant have been lost to development, it is found in sufficient numbers and distributed widely enough that the potential for extinction or extirpation is low at this time.

San Diego County viguiera is present in the J23-24, J25, and J29-30 complexes.

4.2 DISTRIBUTIONS OF SENSITIVE VERNAL POOL ANIMAL SPECIES ON OTAY RANCH

Three sensitive animal species are present in vernal pools on Otay Ranch - Riverside fairy shrimp (*Streptocephalus woottoni*), San Diego fairy shrimp (*Branchinecta sandiegonensis*), and western spade-foot toad (*Scaphiopus hammondii*). These sensitive animals are discussed below. An explanation of agency status and listing categories is presented in Appendix B.

4.2.1 *Streptocephalus woottoni*

Streptocephalus woottoni - Riverside fairy shrimp
USFWS: Endangered
CDFG: None

The Riverside fairy shrimp is an exceedingly rare species known from only three localities in southern California: five pools in the vicinity of Temecula and Rancho California, Riverside County (Eng, Belk & Eriksen 1990); two pools on NAS Miramar (Simovich and Fugate 1992); and a single pool on Otay Ranch in the southern San Diego County. It also has been collected in Baja California, Mexico (Brown, Wier & Belk 1993). According to Eng, Belk and Eriksen (1990), the Riverside fairy shrimp occupies pools in which the water persists into April or May and reaches a minimum depth of 30 cm (about 1 foot) at filling; Simovich (1990) describes it as a "warm weather hatcher." Pools in which this species occurs are more similar to small ponds than to typical ephemeral vernal pools. In at least two localities where this species occurs, the occupied pool is artificially enhanced by an earthen berm, creating a pond for stock-watering.

The Riverside fairy shrimp is known from a single large pool on Otay Ranch in the J29 complex. The pool appears to have been artificial enhanced by an earthen beam to create a stock-watering pond.

4.2.2 *Branchinecta sandiegonensis*

Branchinecta sandiegonensis - San Diego fairy shrimp
USFWS: Proposed Endangered
CDFG: None

The San Diego fairy shrimp was described only recently by Fugate (1993). This species is closely related to the widespread *Branchinecta lindahli*, the species to which all previous records of *B. sandiegonensis* had been assigned. Only after a reexamination of material from San Diego County was it discovered that all specimens from the coastal areas represented the new species.

Based on survey work, the San Diego fairy shrimp is known to occur from the coast (e.g., Del Mar Mesa, Carmel Mountain, and La Jolla) as far east as Ramona (Simovich and Fugate 1992), and from San Marcos south to Bajamar and Valle de las Palmas in northern Baja California, Mexico (Brown, Wier and Belk 1993).

It was reported from all of eight vernal pool areas surveyed by Simovich and Fugate (1992). It is by far the predominant shrimp found of San Diego County vernal pools.

Although widespread in San Diego County, the San Diego fairy shrimp has a rather unpredictable distribution: it may be present in road-ruts and in depressions in grassland situations that support ponded water during years of exceptionally high rainfall, and absent from typical undisturbed vernal pools (even entire complexes). On Carmel Mountain it occurs in vernal pool-like depressions and road-ruts that support few, if any, typical vernal pool plants. On Camino Park it occurs in seasonal puddles on the flat, excavated mesa top, in the virtual absence of other native plants and animals. On NAS Miramar and on Otay Ranch, it occurs in large natural vernal pools that support a variety of rare plants and typical vernal pool indicator species.

On Otay Ranch, the San Diego fairy shrimp has been documented from the J23-24, J25, J29-30 complex, R1, and K8+ complexes. It is likely to be present in at least one pool within each vernal pool complex.

4.2.3 *Scaphiopus hammondi* - western spade-foot toad

Scaphiopus hammondi - western spade-foot toad
USFWS: None
CDFG: Species of Special Concern

According to Stebbins (1985), the western spade-foot toad is primarily a species of lowlands, frequenting washes, floodplains of rivers, alluvial fans, playas, and alkali flats, but also ranges into the foothills and mountains. It prefers areas of open vegetation and short grasses where the soil is sandy or gravelly. It breeds during the winter (January-May) in quiet streams, ephemeral ponds, and vernal pools. During the unfavorable, dry portion of the year, the toads live beneath the soil surface in burrows. Owing to widespread loss of habitat, this species is considered a "species of special concern" by the CDFG.

On Otay Ranch, western spade-foot toad has been observed in the R3+, R1, K6, and K8+ complexes, as well as near the M5+ complex and in puddles west of K16+.

5.0 MANAGEMENT RECOMMENDATIONS

5.1 DEVELOPMENT OF THE PLAN

5.1.1 Preserve Design - Theory and Rationale

Land use managers and scientists agree that a broad approach is necessary to preserve America's natural heritage, and the focus of conservation efforts has shifted from particular species to habitats and ecosystems. Norton (1986) stresses that the ecosystem approach is directed toward solving long-range problems, thus

avoiding last-ditch efforts to save species in crisis situations. Such last-ditch efforts are expensive and usually unsuccessful. According to Slobodkin (1986), "Organisms can be more readily preserved in natural, or nearly natural, habitats than in artificial ones, because the latter require a much higher level of managerial effort and expertise." The subtle and not-so-subtle necessary interactions among organisms in a functioning ecosystem cannot always be accommodated by management.

Ecosystem protection is a sensible approach, too, because of our serious lack of knowledge. We do not know enough about the biology of many species to feel comfortable predicting their responses to changes in their habitat or to environmental extremes. We know even less about the interactions of species and the "cascading" or domino effects that the loss of one or a few species may have on the others that traditionally coexisted with them. Norton (1986) states that "In the absence of knowledge.., the best course is... to set aside as large a preserve as possible, allowing natural processes not properly understood by humans to serve the need of threatened species." Murphy (1989) adds that "No real conservation context exists in which losses from intact habitats would enhance the persistence times of species targeted for preservation... and no competent biologist has ever suggested that reserves should not be as large as possible."

Because scientists face difficulties in understanding how species react to changes within several decades, they are less able to predict the long-term consequences of habitat reduction and fragmentation. Little is known of the cumulative effects land use changes will have on evolutionary processes and the ability of species to adapt to a changing world. Clearly a species' presence is proof of its ability to adapt to an incredible range of natural disturbances, climatic changes, and catastrophes. Will reduced populations living in fragmented habitats have what it takes to deal with increased air pollution or CO_2 concentrations? Or respond to new viral or fungal pathogens? What if the climate changes and San Diego experiences much greater or lesser annual precipitation? Will the preserved habitat be varied enough to insure proper water durations for the specialized vernal pool species? If tectonic events change the landscape or topography, will enough suitable pool habitat still be available for pool species to persist and evolve? Obviously, we cannot know the answers to these questions. However, informative data can be collected in long-term studies to provide insight into the affects of change.

Paleoecology is the study of prehistoric distributions of plants and animals. If we have learned one thing from this discipline, it is that "Nature reserves should contain a range of environments to allow organisms to adjust their local distributions in response to long-term environmental change [and] today's distribution of species and communities represents one frame from a movie whose previous frames record continuously changing distributions and associations of taxa" (Hunter *et al.* 1988).

From a more practical and less theoretical standpoint, habitat reduction and fragmentation lead to day-to-day difficulties in managing what remains. Most of the threats to a biological preserve come from outside of the preserve (Jensen 1987) via the edges or boundaries that interface with incompatible or inhospitable land uses. A long, narrow piece of land has a high ratio of edge to area. Irregular borders, particularly those with long fingers or indentations into the center of a parcel, greatly increase the threat

from incompatible uses. A road across an area can increase dramatically the amount of boundary or edge subjected to disturbance.

"Edge effects" are many and varied (Jensen 1987). Long edges increase the probability of illegal trespass and disturbance from altered drainage and pollutants. Edges usually promote the invasion of "weedy" plants and animals and may alter animal behavior. Consequently, where all else is equal, preserves should be circular to reduce the ratio of edge to area (Jensen 1987, Simberloff and Cox 1987, Ehrlich and Murphy 1987). This is rarely possible. Oftentimes a natural feature such as a hill or watershed will determine a preserve's configuration. Roads or buildings already in place may limit options. Nonetheless, a more circular preserve is a goal worth striving for.

In summary, biological preserves should be as large as possible, with a small edge to area ratio. They should encompass not only a variety of habitats for the particular species of interest, but large portions of the ecosystems in which the species evolved. All these principles have been incorporated into the development and design of the Otay Ranch Vernal Pool Preserve.

5.1.2 Priorities of the Vernal Pool Management Plan

The highest priority of this plan is to prevent further degradation and destruction of vernal pool habitat while conforming with approved development plans. "The degree of urgency required for sensitive species management is quite often different from that of other natural resource values" (Dawson 1987). Thus, actions which prevent a significant decline in species population/habitat quality have a high priority in recovery plans for endangered and threatened species (Knudsen 1987). The situation might be compared to the triage system in medical emergencies. Patients who are hemorrhaging or not breathing are cared for before those with broken bones. Minor bruises and cuts are dealt with last. Plastic surgery is a luxury. And so it is with the vernal pools. The steady decline in numbers and habitat quality must be arrested promptly. The primary methods for achieving this goal are:

- Plan and design future projects to avoid impacts to vernal pool habitat.
- Limit access to areas with vernal pools.
- Increase awareness of leaseholders and easement holders of the sensitivity and value of the resource.
- Develop contingency plans for emergencies such as fires.

Procedures to implement these goals should be developed as soon as possible because achieving the goals of each method may require considerable time. If hard choices are to be made, prevention of additional losses and disturbances must have the highest priority. Of secondary importance are restoration and enhancement and research and monitoring.

5.2 IMPLEMENTATION OF THE PLAN

In this section, methodologies and responsibilities for implementation of the plan are defined. Implementation guidelines are presented in four sections based on priority of importance: 1) Avoidance of Habitat Degradation and Destruction; 2) Protection, Enhancement, and Restoration; 3) Research and Monitoring; and 4) Education and Public Awareness. Each section discusses its topic in general terms; site-specific recommendations for each Vernal Pool Series are presented below in Section 7.3. Descriptions of methods and techniques are presented in Appendix A.

Definition of the Boundaries of the Vernal Pool Preserve

As described in *Section 2.1* of this document, two alternatives configurations for the vernal pool preserve have been identified. Both alternatives are based on modifications of the boundary proposed in the GDP and the RMP, incorporating biological information that has accumulated since approval of the GDP. Under either alternative, the Vernal Pool Preserve would include over 400 acres of vernal pool habitat, and would capture 100% of the known distribution of Otay Mesa mint, 95% of the Otay Ranch distribution of San Diego button-celery, the only known extant populations of spreading navarretia on the Ranch, a large population of little mousetail (the only known locations for this species outside the preserve is K6), the single historical Otay Ranch location for California Orcutt grass, the single known Otay Ranch location of Riverside fairy shrimp, and numerous pools that support San Diego fairy shrimp. The major factor that will determine the selection of one of the two alternatives is the final alignment of SR-125. Hence, the final boundaries of the vernal pool preserve cannot be identified until a final determination of the alignment of SR-125 has been made by Caltrans. Once the alignment has been determined, the vernal pool boundary will be surveyed and marked in the field.

Definition of Restoration and Enhancement Responsibilities

Restoration, enhancement, management, and research opportunities within the Otay Ranch vernal pool preserve are likely to provide more mitigation opportunities than will be required to mitigate impacts associated with implementation of the Otay Ranch GDP. Implementation of enhancement and restoration activities beyond those necessary to mitigate direct impacts of development within Otay Ranch may be viewed as a contribution to a vernal pool "mitigation bank." The general management and monitoring duties outlined in this plan will be the responsibility of the Preserve Owner/Manager. These include a variety of tasks related primarily to the passive management of vernal pools, such as inhibiting additional degradation (through fencing, elimination of cattle grazing, and access control), establishing protocols for the use of the pools for research and education (e.g., who is permitted and what activities are allowed), development of specific monitoring strategies for determining changes in the flora and fauna of the pools (e.g., when, why and who), and a minimal amount of general enhancement activities (e.g., trash removal).

Mitigation Associated with Development

The Baldwin Company (or any other entity that implements the development of a SPA within Otay Ranch) will be responsible for the active restoration and enhancement of vernal pool habitat only in association with impacts to vernal pools. The Final Program Environmental Impact Report for Otay Ranch (1992) indicated that a total of 14 acres of vernal pool habitat would be lost as a result of implementation of the Otay Ranch GDP. The EIR indicates that acreage of vernal pool habitat represents the circumscribed concentrations of vernal pools and the intervening Mima mound topography, and that this area is substantially greater than the vernal pool surface area. Because the circumscribed areas include the Mima mound topography for each potentially affected area, the 14-acre impact is interpreted to reflect the total amount of vernal pool watershed affected. Because mitigation for impacts to vernal pools will be based on a number of factors, including vernal pool surface area, area of watershed, and quality of the pools, there is a need to more accurately identify (both quantitatively and qualitatively) potential impacts in order to estimate future mitigation requirements, if only in a conceptual manner.

In the highest quality vernal pool areas on the Ranch, there are approximately 15-20 vernal pools per acre. Based on an average of 200 square feet of pool surface area per pool, each acre potentially could support about 0.07-0.09 acre of vernal pool surface area. However, in the more disturbed areas and areas of lower quality vernal pools, vernal pool surface area is significantly less per acre. In order to quantify the approximate impact acreage of vernal pool surface area potentially lost by implementation of the GDP, we utilized the following methodology: (1) a list was compiled of all vernal pool complexes on or adjacent to Otay Ranch (*Table 2*); (2) pools potentially directly impacted by implementation of the GDP were identified by overlaying the approved GDP on maps illustrating the locations of vernal pools; (3) vernal pool surface area of potentially impacted pools was calculated using the dimensions provided in the Hydrology and Flora of Otay Ranch Vernal Pools report (*Table 3*). For pools of the M2 complex, data accumulated for the biological analysis of SPA One were used to quantify potential impacts. For pools of the J30 complex, data collected for the SDG&E Pipeline 2000 project (DUDEK 1994) were used to quantify potential impacts.

Implementation of the Otay Ranch GDP potentially would result in the loss of 37 vernal pools encompassing 16,814 sq ft (0.38 acre) of vernal pool surface area scattered over approximately 14.0 acres of vernal pool habitat. The largest impacts to vernal pool surface area would be realized in the J30 (7,721 sq ft) and K8+ (6,296 sq ft) complexes. Together, these two areas encompass nearly 90 percent all the vernal pool surface area potentially lost. Modification of the boundary of the vernal pool preserve, in conformance with policy 2.9 of the RMP, would result in the preservation of all of the J30 pools (7,721 sq ft), leaving a total potential impact of 8,993 sq ft (0.21 acre) scattered over approximately 10-12 acres.

TABLE 2
ASSESSMENT OF POTENTIAL IMPACTS TO VERNAL POOL COMPLEXES BASED ON THE APPROVED GDP

Vernal pool Complexes	Impact Assessment
J23-24	Not affected
J25	Not affected
J29-30	A few pools taken south of vernal pool preserve line
J31 South+	Not affected
J31 North+	Not affected
J32+	Not affected
K1	Not affected
K2	Entire complex taken (no pools)
K5	Offsite, not affected
K6	Entire complex taken (8 pools) [Special Study Area]
K8+	Entire complex taken (11 pools) [Special Study Area]
K9+	Entire complex taken (1 pool)
K10+	Offsite, not affected
K11+	Offsite, not affected
K12+	Entire complex taken (5 pools) [Special Study Area]
K13+	Most of complex taken (no pools)
K14+	Most of complex taken (1 pool)
K15+	Not affected
K16+	Not affected
K17	Not affected
M2	Entire complex taken (2 pools)
M5+	Entire complex taken (no pools)
R1	Mostly offsite (1 pool onsite)
R2+	Not Affected
R3+	Not affected
R4+	Entire complex taken (1 pool)

TABLE 3
CALCULATIONS OF VERNAL POOL SURFACE AREA POTENTIALLY IMPACTED BY THE GDP

J30 - Total of 7,721 sq ft [All of this acreage would be preserved under the modified vernal pool preserve boundary.]
26 x 6 = 156
12 x 5 = 60
25 x 45 = 1125
51 x 10 = 510
50 x 48 = 2400
53 x 9 = 477
1 x 1 = 1
5 x 4 = 20
27 x 10 = 270
13 x 6 = 78
34 x 32 = 1024
40 x 40 = 1600

K6 - Total of 525 sq ft [Special study area]
24 x 9 = 216
15 x 11 = 165
12 x 12 = 144

K8+ - Total of 6,296 sq ft [Special study area]
29 x 15 = 435
42 x 11 = 462
12 x 13 = 156
100 x 22 = 2200
24 x 11 = 264
12 x 12 = 144
45 x 16 = 720
40 x 8 = 320
28 x 9 = 252
21 x 8 = 168
57 x 15 = 855
40 x 8 = 320

K9+ - Total of 20 sq ft
20 x 2 = 20

K12+ - Total of 834 sq ft
20 x 10 = 200
24 x 6 = 144
30 x 7 = 210
40 x 7 = 280

K14+ - Total of 441 sq ft
21 x 21 = 441

M2 - Total of 477 sq ft
288 sq ft
189 sq ft

R1 - Total of 250 sq ft

R4+ - Total of 250 sq ft

The loss of the K8+ complex (6,296 sq ft; 12 pools) constitutes approximately 70 percent of all potential vernal pool surface area loss on the Ranch (following modification of the vernal pool preserve boundary). Although designated as a Special Study Area, this complex supports no sensitive plant species and has been burned and heavily grazed historically, resulting in a highly disturbed landscape. The 12 pools identified in this complex support a total of six vernal pool indicator species; one pool was documented to support San Diego fairy shrimp. Of the remaining 30 percent of the vernal pool surface area potentially disturbed by the GDP, only K6 supports any sensitive species -- it supports a small population of little mousetail (*Myosurus minimus*).

In summary, the total anticipated impact is the loss of 25 vernal pools encompassing 0.21 acre of vernal pool surface area over approximately 10-12 acres of vernal pool habitat. The impacted pools are of low quality, for the most part. San Diego fairy shrimp, a widespread species in vernal pools on the Ranch, would be lost from one pool in the K8+ complex and little mousetail would be lost from the K6 complex. Potential mitigation measures available to The Baldwin Company for these impacts include the following:

- Restoration of the disturbed "circle" in J25, which represents 1.7 acres of highly disturbed vernal pool habitat. Restoration would require the reconfiguration and reconstruction of the Mima mounds and basins, removal of weedy vegetation, revegetation of the mounds with upland sage scrub species, and inoculation of the pools with vernal pool species. This location would represent an appropriate place in which to attempt "seed trials" to increase the area occupied by the critically endangered *Pogogyne nudiuscula*, which occurs in other intact pools on this mesa.

- Restoration of the scraped/disturbed swath that extends along the southern and southwestern perimeter of J25, which represents 2.75 acres (i.e., a length about 2,400 feet and a width of about 50 feet). Restoration would require the reconfiguration and reconstruction of the Mima mounds and basins, removal of weedy vegetation, revegetation of the mounds with upland sage scrub species, and inoculation of the pools with vernal pool species.

- Restoration of the scraped/disturbed swath that extends through the middle of the J23-24 series, which represents 5.85 acres (i.e., a length about 3,400 feet and a width of about 75 feet). Restoration would require the reconfiguration and reconstruction of the Mima mounds and basins, removal of weedy vegetation, revegetation of the mounds with upland sage scrub species, and inoculation of the pools with vernal pool species.

- Fencing of all the Proctor Valley vernal pools to inhibit inadvertent encroachment by county road crews and off-road vehicle use.

- An exclusion study on the K6 mesa to determine the biological value of these pools.

In the J23-24 and J25 mesas, there are approximately 15-20 vernal pools per acre. Based on an average of 200 square feet of pool surface area per pool, each acre includes 0.07-0.09 acre of vernal pool surface area.

Implementation of the measures described above would result in the restoration of approximately 10.3 acres of vernal pool habitat within the J23-24 and J-25 complexes, which likely would include a minimum of 153 individuals pools with a combined surface area of approximately 0.7-0.8 acre.

These efforts would be considered appropriate mitigation for the projected loss of approximately 25 individual, low quality vernal pools, encompassing 0.21 acre of vernal pool surface area, over approximately 10-12 acres of vernal pool habitat (=watershed).

Precise quantification of impacts to vernal pools and their associated watershed will be determined in the future as part of the environmental review of each SPA. Likewise, specific mitigation measures required to receive the appropriate permits will be negotiated with the resource agencies at the time of impacts. Nonetheless, the preliminary analyses presented above provide a general framework of anticipated impacts and identify appropriate prospective mitigation measures.

Potential Mitigation Banking Opportunities

Restoration opportunities, above and beyond that needed for mitigation for impacts associated with the GDP for Otay Ranch, shall be available as a "mitigation bank" for impacts to vernal pools that occur outside of Otay Ranch. Mitigation for these impacts will be determined based on individual permit requirements negotiated between individual applicants and the resource agencies on a case by case basis. Potential opportunities for this type of mitigation are presented below.

Mitigation opportunities include the following:

- Reconfiguration of pools disturbed by roads.
- Removal of exotic plant species.
- Installation of permanent barriers.
- Funding of research efforts.
- Revegetation of Mima mounds with coastal sage scrub and/or native grassland to reduce the amount of non-native vegetation in the vernal pool preserve.
- Increase the number of pools with *Pogogyne nudiuscula* on J23-24, J25, and J29-30 through seeding trials.
- Funding of research for a variety of projects:
  --- studies of vernal pool hydrology within the vernal pool preserve
  --- studies on the effect of weed removal (gradual vs. abrupt)
  --- taxonomic studies on species of unresolved systematic position

--- ecological and phenological studies on listed and candidate plant species
--- ecological studies on fairy shrimp (and other invertebrates)
--- ecological studies on pollinators of sensitive vernal pool plants
--- effects of grazing on vernal pools

- Design and implement a biota monitoring program for determining changes in flora and fauna of the pools.

- Provision of funds to identify and coordinate with all easement holders, landowners, lessees, government agencies, etc., that may obtain access provision on Otay Ranch. Inform these agencies of the sensitivity of vernal pool areas and monitor all activities through or within vernal pool habitat.

- Restoration of road pools in J23-24 and J25.

- Re-introduction of quino checkerspot (*Euphydryas editha quino*) into the vernal pool preserve.

- Contribution to signage and interpretive programs.

5.2.1 Avoidance of Habitat Degradation

5.2.1.1 Vehicles and Cattle

Throughout California, motorized vehicles and cattle grazing are two of the primary causes of degradation and destruction of vernal pools; the situation on Otay Ranch is no different. The most important step toward protection and preservation of vernal pools on Otay Ranch is the exclusion of vehicles and cattle from sensitive vernal pool habitat.

All grazing activities shall be coordinated among the Range Management Plan, the Coastal Sage Scrub and Maritime Succulent Scrub Habitat Replacement Master Plan, and this plan. Accordingly, grazing shall be eliminated from the vernal pool preserve during the winter and spring when standing water and/or saturated soils are present, beginning in Spring 1996. At a minimum, grazing should be restricted to September-February, regardless of hydrological conditions. Either fencing of the vernal pool preserve or elimination of grazing altogether on Otay Mesa will be required to implement this recommendation. Grazing should be eliminated entirely from the vernal pool preserve prior to implementation of restoration activities.

A vehicle policy shall be developed as an appendix to this document that classifies all roads within each Vernal Pool Series into one of three categories: 1) unregulated use, 2) use with permission, and 3) not to be used except in emergencies.

5.2.1.1.1 Signs

One of the most important recommendations of this plan is the liberal use of signs. A sign should be designed that contains two elements: an easily recognized symbol or design to signify a biologically sensitive area and a message which says, "Before entering or in any way disturbing this area call----" (followed by several telephone numbers).

Signs would address the problem where it happens, akin to point-of-purchase advertising displays. They would not require special training, orientation, or expertise for effective communication. Signs should be supplemented with posts and fences to route traffic to acceptable roads or to prevent access altogether. Roads that do not serve an important and clearly identified purpose should be closed.

5.2.1.1.2 Fences

Fences may be needed in situations where adequate security is not present or where the potential benefit would justify the cost. On-going monitoring may indicate the need for fences in areas where they are not currently being recommended. Because of the lower cost and lesser impact on wildlife movement, barbed wire fences are recommended over chain link fences when it is reasonable to assume they will afford protection for vernal pool habitat. As with unfenced areas, monitoring may reveal the need for more substantial protection in the form of chain link fence or additional posts and barriers. Chain-link fencing is preferred for vernal pools that are highly exposed to disturbance or in places where barbed wire fences prove inadequate to prevent disturbance.

5.2.1.2 Maintenance

Activities with a potential to impact vernal pool habitat include mowing, discing, ditching, and disposal of trash and chemicals. These activities should be evaluated to 1) determine their impacts to vernal pool habitats, and 2) identify procedures to reduce or eliminate impacts.

5.2.1.3 Leaseholders

All leaseholders should be contacted and alerted to pools within the vicinity of their operations. Signs, fences, and posts should be used to separate incompatible activities from vernal pool habitat and insure employee awareness of the sensitive habitat. Leaseholders should be made aware of the damage caused by grading, erosion from cut slopes, the use of herbicides or pesticides, and alterations to drainage patterns. Expanded or altered procedures with the potential to impact pool habitat should be subject to environmental assessments.

5.2.1.4 Easements

All easement holders should have in their possession a copy of the vernal pool maps pertaining to their easement(s). Activities related to the easements, both routine maintenance and emergency repairs, should be reviewed by the Preserve Owner/Manager to assess their potential impacts on pool habitat, and signs should be erected to alert maintenance personnel to the boundaries of the easement.

5.2.1.5 Contingency Plans for Emergencies

Although emergencies occur infrequently by definition, their effects could be devastating. Advance preparation is essential to insure prompt and effective response. It is important to identify the personnel who are charged with responding to each type of emergency considered below. These personnel should have in their possession the following information:

- Procedures to be followed
- Activities to be avoided
- Maps indicating the location of vernal pool habitat and the preferred and least damaging routes for vehicles
- List of people to call for additional information
- Introduction regarding the importance of the season to the risk of damage

5.2.2 Protection, Enhancement, and Restoration

Activities that would result in the long-term benefit to vernal pool habitat on Otay Ranch can be classified into three categories: protection, enhancement, and restoration. *Protection* is the least intrusive activity and includes inhibiting encroachment of incompatible uses into vernal pools areas, such as cattle grazing, off-road vehicles, etc. *Enhancement* includes beneficial activities performed on pools that currently retained their biological and hydrological integrity, but have been subject to invasion by weeds, trash dumping, or other relatively innocuous forms of disturbance. *Restoration* refers to the physical manipulation of the topography of basins and surrounding mounds in order to restore or re-create conditions in which water will pond following season precipitation and hydrophytic vegetation will predominate.

5.2.2.1 Protection

All areas of Otay Ranch that support vernal pools should receive protection commensurate with their location, accessibility, and vulnerability. Signs and fences are the first line of defense in protection and in most cases, are all that are required. As indicated above in section 5.2.1.1, fencing may be necessary to exclude cattle. Other forms of protection that may be appropriate, if compatible with other management

activities, include patrolling sensitive areas on a regular basis and coordination with adjacent land owners and the Border Patrol to ensure that they are aware of the sensitive nature of vernal pool habitat that may be effected by their activities.

5.2.2.2 Enhancement

All areas of vernal pool habitat that have been subject to the invasion of non-native plants or dumping of trash should be considered for enhancement activities. Removal of exotic plants can benefit pool species (Bauder 1989a, b), but no one has yet developed methods that are selective, effective, and inexpensive (Public discussion, Restoration and Creation of Vernal Pools Workshop, California Department of Fish and Game Sacramento 1989). Fire has been suggested, but in some circumstances it can promote rather than deter the establishment of exotic species (Zedler and Scheid 1988, but see Reiner 1990). Hand-weeding works, but is very labor intensive (Bauder 1989). If exotics invade because of increased water durations, hand removal coupled with improved drainage can lead to sustained improvement, as at Montgomery Field (Wood pers. comm.). Small scale weeding projects directed at species that are slow to disperse (*Cotula, Polypogon*) also could be successful. Removal of disturbance and the proper revegetation of disturbed or barren adjacent habitat will help limit populations of exotic, weedy species.

5.2.2.3 Restoration

Oftentimes, the most suitable management may be passive once sources of additional disturbance are removed. However, road pools in particular probably will not recover without intervention. Therefore, initial restoration efforts would be directed best toward recontouring and reseeding road pools, decompaction and reseeding of roads that have been closed, installation of culverts to prevent the widening of dirt roads during rainy periods, and the improvement of altered drainages. All seeding should be done with hand-collected seeds from adjacent areas. This will minimize the possibility of disrupting locally adapted gene complexes (Mulroy 1990).

In some areas, decompaction might be accomplished mechanically, but in others it should be done with hand labor to avoid impacts to the soils and vegetation. The method of decompaction should be decided on a case by case basis. Recontouring is most successful when coupled with reseeding (Bauder 1986, Scheidlinger et al. 1985).

In pools occupied by Riverside and San Diego fairy shrimp, restoration must be performed in a manner that will not adversely effect these species. Reseeding or recontouring may make these pools less suitable for fairy shrimp. Hence, prior to restoration activities, the presence/absence of fairy shrimp should be determined and the benefits of pool restoration should be weighed against the potential for disruption of these two fairy shrimp.

Artificial vernal pools are expensive to create and are a poor substitute for natural systems. Artificial pools typically show little propensity for being self-sustaining through the wide range of weather conditions in southern California (California Department of Fish and Game 1989, Zedler 1987a, Zedler and Black 1988, Zedler 1989, Black and Zedler 1988, 1989b, c, Scheidlinger 1988). Habitat creation is contrary to the official policy of the Botanical Society of America (1990) and the Canadian Botanical Association (Fahselt 1988), and according to the Botanical Society of America (1990), "... should be considered as the least desirable alternative." Only the most highly disturbed areas should be considered for this type of habitat manipulation. Native vernal pool species translocated, transplanted, or seeded in artificial pools are unlikely to achieve the standards applied to animals for minimum viable populations (i.e., 95 percent probability of surviving for 100 years) (Harris *et al.* 1987) because they are more susceptible to local extirpation resulting from variability in seasonal precipitation and the inability of the artificial pools to consistently maintain aquatic conditions for an appropriate duration. Over a 10 year period in San Diego County, it is likely that only 55 percent of the possible range of mean yearly precipitation values would be observed. Analysis of precipitation data was performed by Zedler and Black (1989) and is based on 138 years of precipitation records at Lindbergh Field.

5.2.3 Monitoring and Research

5.2.3.1 Monitoring

Monitoring is essential for assessing the success of habitat restoration projects (Hastey 1987). It also provides raw data for scientific analysis. Dawson (1987) asserts that "The lack of permanent reference points appears to be the single greatest hindrance to assessing change in species populations." The type, intensity, timing, and frequency of monitoring can be tailored to the particular objectives of the monitoring program (Noss 1990). Methods should be documented clearly and be as simple and repeatable as possible. Data sheets should be self-explanatory. The same form used repeatedly for each type of monitoring project would allow comparison of data between years and provide consistency even when personnel change. Two types of monitoring programs should be implemented as soon as possible, even if on a limited scale. These are photo monitoring of sites and quadrat sampling of plant populations.

5.2.3.1.1 Photo Monitoring

Photo monitoring can be done cheaply and quickly. First, permanent reference points need to be established. The Nature Conservancy (in California) has issued a set of methods for photo monitoring (Burley 1980, England 1981, Dremalas 1987). Methods of photo monitoring are discussed in Rogers (1982) and Rogers *et al.* (1984). In the case of vernal pools, frequency of photography could be as little as once or twice per year. If hydrology is of interest, photos could be taken within 24 hours of a major storm (2-5 cm of precipitation). Ideally, this would be the second or third major storm of the season because pool soils absorb large amounts of water before ponding occurs.

If the objective is to record the presence of sensitive taxa, photos should be taken at the time of peak flowering. Data on hydrology (pool surface area and surface drainage patterns), vegetative cover, and sensitive taxa could be collected simultaneously if the photographic effort were timed to coincide with the seasonal stages of vernal pool development as described by Zedler (1987b). Data so collected also could indicate the degree of disturbance in pools and the associated habitat. A representative selection of pools would include disturbed and restored pools as well as natural or relatively undisturbed pools of varying sizes and depths and located in different Vernal Pool Series. Where there are wide discrepancies between surveys in number of pools and species recorded, resurveys are recommended.

A minimum of five photo monitoring stations should be established within each Vernal Pool Series. The stations should include the range of diversity of natural pools within each series.
Aerial photos should be taken every 5 years to reveal vegetation and disturbance patterns at a larger scale. These would be particularly useful in monitoring the efficacy of the protection measures defined above (signing, fencing, etc.) in reducing access and disturbance. Unauthorized trails and roads, trenching, grading, and scraping are easily identified in aerial photos at a scale of 1"= 200'.

5.2.3.1.2 Quadrat Sampling and Demographic Data

Demographic data are important to determine the distribution, abundance, and population stability of vernal pool species in natural pools as well as in restored or disturbed pools. Procedures for collection of demographic data must be designed carefully to insure maximum information for the effort expended, because this is one of the most time-consuming types of ecological data to collect. Before such a monitoring program is established, basic questions must be answered. Which species are of interest? What stages of the life cycle should be sampled (i.e. adults, yearly seed crop, seeds stored in the soil)? Is species diversity a concern? How many sites should be monitored? How should the sites be chosen? How many quadrats should there be and of what size and shape? Within pools, should quadrats be chosen randomly, by a stratified random procedure, or along a gradient?

Because visible populations of many vernal pool species fluctuate widely from year to year, the number of adults of sensitive taxa should be monitored each spring in a limited number of quadrats in pools selected for diversity in size, depth, species composition, and past history of disturbance and/or restoration. Environmental variables such as water depth and quality, length of inundation, or soil properties should be measured with water depth and length of inundation period taking priority. Natural, undisturbed pools always should be included for purposes of comparison. Water depth could be monitored by the use of battery powered pen registers or similar equipment. Measuring water depth on scaled bars at fixed points is inexpensive in terms of equipment, but expensive in terms of person-hours required.

A minimum of sampling locations should be established within each vernal pool complex. The locations should include the range of diversity of natural pools.

5.2.3.1.3 Fairy Shrimp Monitoring

The Riverside fairy shrimp population should be monitored to ensure that it continues to do well through time. Both the distribution of the species on Otay Ranch and the size of the population are important. The frequency, timing, and type of monitoring should be determined in consultation with the USFWS. Presence or absence, and relative abundance could be determined easily; this species can be recognized easily in the field. Their long life cycle also makes it easy to determine whether or not they occupy a pool since the monitor is unlikely to sample during a period when they are not present.

5.2.3.2 Research

More information now is available on vernal pool species and their habitat than on most threatened or endangered biological systems. However, the vernal pool ecosystem, despite its diminutive size, is just as complex as larger systems; consequently, our knowledge is still inadequate to answer many questions. Funding of research projects that would provide insight into vernal pool dynamics and hence lead to the development of better management strategies could be considered as mitigation banking opportunities.

5.2.3.2.1 Invertebrates

Additional work needs to be done on insect pollinators. Do exotic insects such as the honey bee compete with native insect pollinators? What impact does this have on seed set or gene flow? Can or should exotic pollinators be removed? How do plantings of non-native, ornamental plants affect pollinators?

Information is needed on invertebrate taxonomy, distributions, longevity and viability in dry soil, population dynamics, and responses to changes in water quality. In particular, fairy shrimp are becoming an important issue - one species recently has been listed by USFWS as an endangered species and another has been proposed to be listed.

It is important to determine why fairy shrimp on Otay Ranch inhabit certain vernal pools and are absent from adjacent pools that seem to represent appropriate habitat. Water chemistry and/or dispersal mechanisms may be involved, and both of these topics require research.

5.2.3.2.2 Gene Flow and Genetics

Small scale genetic structure of vernal pool plant and animal populations is unknown except for a preliminary experiment conducted on *Pogogyne abramsii* by Bauder and Zedler in 1986 (Zedler 1987c). For rare vernal pool species present on Otay Ranch, such as *Eryngium aristulatum, Naverretia fossalis,* and *Myosurus minimus,* little or nothing is known of the genetic structure of populations.

5.2.3.2.3 Seed Ecology

The seed dispersal mechanisms and rates, germination requirements, and viability of seed in the soil need to be explored for most vernal pool taxa.

5.2.3.2.4 Effects of Pollution and Disturbance

Controlled experiments should be conducted on the effects of air and water pollution on germination, seedling establishment, survivorship, and seed production of vernal pool plant species. The effects of mowing (timing, height, and frequency) also should be examined.

5.2.3.2.5 Hydrology

Current data on the "water budget" (e.g., the amount of rainfall required to saturate the clay pan, relationship of rainfall and period of inundation, etc.) of pools should be augmented to develop a pool hydrology model. Such a model could be used to estimate the importance of variables such as precipitation, temperature, insolation, wind, soil texture, depth to hardpan, and plant cover within and adjacent to pools. Preliminary work conducted by DUDEK (1992) could provide the basis for continuing studies on the hydrology of Otay Ranch vernal pools.

5.2.3.2.6 Systematic Work

Systematic work should be conducted on *Callitriche* and *Navarretia*. Within each of these genera there are two (or more) species that are morphologically similar but exhibit differences in their ecology, distribution, and phenology. An important first step in any management plan is the accurate identification of the taxa with which you are concerned. The outcome of such research may determine the degree to which protection and management of species is required.

5.2.4 Education and Public Awareness

Education and heightened awareness of the resources' value are essential components of any management plan. With understanding and knowledge come appreciation and cooperation. Demonstration pools, information pamphlets, slide shows, field trips, and permanent outdoor displays all can be effective means of education and motivation. Both base personnel and the general public should participate in the educational opportunities.

The high quality pools on J29-30 have easy access and provide an opportunity for public viewing. A scaled rod placed at the deepest points of one or more pools would display the rising and falling water levels as the season progresses. Board walks would facilitate pool viewing up close without damage to the plants or soils. A permanent, weatherproof informational display could be constructed. Items to be included in the display are as follows: a map indicating the limited distribution of the vernal pool habitat and

highlighting the extent of losses, a brief history of the area's geology and a diagram and/or photograph of the soil profile, a chunk of the hardpan, photographs of plants with showy blooms or intriguing morphology and of animals such as fairy shrimp or tree frogs, photographs indicating the wide seasonal variation in pools from dry and barren to filled with water and lush green plants, and a summary outlining the global significance of San Diego's vernal pools, and the role of the Base as a vernal pool steward. A simple graph of the changing water levels might be posted each week. Small pamphlets reiterating the information in the display could be available in a covered box. Species lists giving scientific and common names also should be drawn up. At the time of orientation, the pamphlet could be given to new personnel whose duties bring them into contact with vernal pools. A short slide show could be kept on base and be available to interested groups. During the field season, field trips could offer recreational opportunities as well as impart information.

5.3 SPECIFIC MANAGEMENT RECOMMENDATIONS

At a minimum, each pool and its immediate surrounding watershed (outside of the Vernal Pool Preserve and vulnerable to degradation) should be identified with brightly colored flagging. Pools that support state- and/or federally-listed or candidate species should be fenced. Where pools occur in close proximity, the entire complex should be flagged or fenced. These activities should be undertaken immediately upon the identification on the POM.

5.3.1 Otay Mesa Series

The vast majority of the vernal pools in the Otay Mesa Series are included within the vernal pool preserve. This area should receive management efforts consistent with the remainder of the preserve. The most important management features are the inhibition of undesirable access by vehicles, removal of cattle grazing, and monitoring populations of rare species. Based on input from the POM, fencing of the perimeter of the series may be necessary to achieve these goals. At a minimum, all vehicles should be prohibited access except for the perimeter of the mesas where there are existing dirt roads. In addition, starting in spring 1996, cattle should be excluded according to the schedule and criteria identified below in *Section 5.4.*

5.3.2 Otay Valley Series

With the exception of the K2 complex, all of the pools in the Otay Valley Series will be included within the preserve. Because no sensitive species have been reported from this series, management efforts should be directed at maintaining the topographic integrity of the basins and mounds. Prior to construction activities on immediately adjacent areas, these complexes should be fenced to inhibit inadvertent encroachment, and construction crews should receive direction to avoid these areas.

5.3.3 Poggi Canyon Series

Pools of the Poggi Canyon Series will be eliminated by development associated with SPA 1; hence, management recommendations are inappropriate.

5.3.4 Lower Otay Lake - South Series

The K5, K10+, and K11+ complexes are entirely offsite of Otay Ranch. Prior to development of Otay Ranch in the immediate vicinity, these complexes should be fenced to avoid inadvertent encroachment by construction equipment. The portions of the K12+, K13+, and K14+ complexes onsite potentially will be lost to development; hence, management recommendations are inappropriate. [None of the latter three pool complexes support sensitive species.]

5.3.5 Lower Otay Lake - North Series

Based on the approved GDP, the entire Lower Otay Lake - North Series (i.e., K6, K8+, and K9+) would be lost to development; hence management efforts are inappropriate for all but the K6 complex. This complex historically supported little mousetail, although it is highly degraded at present, and supports no other sensitive species and few vernal pool indicators. Nonetheless, the topographic integrity of the Mima mounds has not been severely compromised by this disturbance. Because intensive grazing is suspected to have been an important factor in the degradation of these pools, it is recommended that a multiple-year (4-5 years) cattle exclusion study be conducted on portions of the mesa to determine whether the K6 pools have the ability to recover and whether incipient populations of vernal pool indicators and/or sensitive species are present but have been suppressed by grazing. These data shall be used to determine whether fragments of the K6 complex should be preserve or whether the preservation of these fragments is more costly in terms of management than the benefits of their preservation.

5.3.6 Lower Proctor Valley Series

Pools of the R1 series are vulnerable owing to their proximity to Proctor Valley Road. However, nearly all of these pools are offsite. It is recommended that the pools in this series be fenced to inhibit degradation from off-road vehicles, trash dumping, and road maintenance activities. The POM should coordinate with County of San Diego road crews to ensure that they are aware of the sensitive nature of this area and that inadvertent impacts should be avoided.

5.3.7 Upper Proctor Valley Series

Pools of the R3+ series also are vulnerable owing to their proximity to Proctor Valley Road. It is recommended that the 3 vernal pools in this series be fenced to inhibit degradation from off-road vehicles, trash dumping, and road maintenance activities. The POM should coordinate with County of San Diego road crews to ensure that they are aware of the sensitive nature of this area and that inadvertent impacts

may constitute a violation of the Federal Endangered Species Act because of the presence of San Diego button-celery. If deemed appropriate by the POM and the County of San Diego, these pools could be included in the Vernal Pool Preserve as a "satellite" preserve unit. Under this scenario, these pools would receive protection, management, monitoring, and enhancement consistent with other pools within the Vernal Pool Preserve south of the Otay River.

5.4 GENERALIZED PHASING AND COST

Although many elements of this vernal pool management plan can be implemented at any time (e.g., monitoring, research, public education, mitigation banking, etc.), other features require a specific chronological sequence in order to most effectively reach the target goals of the RMP. The following outline presents the recommended sequence of activities.

1. Reduction and Elimination of Grazing. Starting in 1996, grazing shall be prohibited in the proposed vernal pool preserve at a minimum from 1 February to 1 June. In addition, grazing shall be prohibited when the vernal pools support standing water, when vernal pool soils are saturated, or when "sensitive" vernal pool plant species (e.g., San Diego button-celery, Otay Mesa mint, etc.) are growing. In order to fulfill this requirement, either no cattle shall be allowed on Otay Mesa, or the vernal pool preserve shall be fenced to inhibit inadvertent encroachment by cattle grazing adjacent to the preserve.

   Upon initiation of vernal pool restoration activities anywhere on the ranch, cattle grazing will be prohibited entirely from those areas, unless deemed by the POM to be appropriate component for weed control or some other aspect of enhancement.

   Costs associated with cattle exclusion may be nil if fences or other physical barriers are not required to inhibit their use of the mesas. Otherwise, fencing will be necessary. If fencing is deemed appropriate, all areas of the mesa that allow access to cattle shall be fenced with barbed-wire. The estimated cost of this fencing is based on 5-strand barbed wire at $3.00 per foot, and is approximately $16,000.00.

2. Definition of Vernal Pool Preserve Boundary. The boundary of the vernal pool preserve shall be determined and staked in the field within three months following formal adoption of the SR-125 route location by the California Transportation Commission. The County of San Diego, City of Chula Vista, and Preserve Owner/Manager shall be responsible for tracking the road alignment adoption process. The estimated cost for staking the perimeter of the preserve by a biologist and surveying the staked line by a survey crew is approximately $15,000.00.

3. Ongoing Passive Management. Upon identification of the POM, an annual maintenance inspection shall be conducted to identify all vernal pool areas in need of trash removal, fence repair, or new signage. The estimate for the inspection and subsequent maintenance activities is approximately $5,000.00 per year.

4. Vernal Pool Restoration as Mitigation. As described in *Section 5.2*, a list of mitigation activities has been developed to offset potential impacts to vernal pools that would be realized through implementation of the GDP. These mitigation measures would be implemented in conjunction with the development each Village that affects vernal pools and in accordance with specific resource agency permit requirements negotiated for each vernal pool impact. Current information regarding the general location and extent of vernal pools to be affected by development are presented in *Table 4* below. The table illustrates the currently proposed sequence of development by Village and potential impacts to vernal pools that would result from each Village. Impacts to vernal pools will occur with the development of Village 1 (M5+), Village 2 (M2), Village 18 (the southern edge of J29-30), Village 15 (K12+, K13+, K14+), Village 13 (K6, K8+, K9+), Village 14 (R2+), and Village 16 (R4+). The cost of mitigation associated with these villages will be commensurate with the specific impact of the village and cannot be determined at present. It is anticipated that site-specific planning at the Village-level will minimize these projected impacts.

TABLE 4
PROPOSED VILLAGE DEVELOPMENT SEQUENCE ACCORDING TO THE APPROVED GDP AND PROJECTED VERNAL POOL IMPACTS

Proposed Sequence	Potential Vernal Pool Impacts
Village 5	none
Arterials	none
Village 1	M5+
SR-125	none per GDP (Caltrans will impact J29-30)
Village 2	M2
Village 6	none
Village 18	southernmost portion of J29-30
Village 3	none
Village 11	none
Village 4	none
Village 15	K12+, K13+, K14+
Village 13	K6, K8+, K9+
Village 17	none
Village 19	none
Public (EUC)	none

Proposed Sequence	Potential Vernal Pool Impacts
Village 7	none
Village 14	R2+
Village 10	none
Village 8	none
Village 9	none
Village 16	R4+
Village 12	none

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APPENDIX A

RESTORATION TECHNIQUES AND METHODS

APPENDIX A
RESTORATION TECHNIQUES AND METHODS

Prior to commencement of restoration projects, the proposed work should be reviewed by biologists and resource managers. A biologist or resource manager should supervise the projects in the field as they are carried out. Timing of the work is critical to success. In general, earth movement and use of vehicles should be done when soils are dry. Seeds are best collected in late spring and through the summer. Seeding is most successful if completed before the first rains of the fall.

Decompaction

Decompaction of abandoned dirt roads and trails must be accomplished with as little additional damage to the pools and associated habitat as possible. Use heavy machinery only where there is sufficient room to maneuver without damage; otherwise, work by hand. Cover non-basin areas and slopes with biodegradable erosion control fabric.

Sculpting, Recontouring

The goal is the restoration of the original topography and drainage patterns. In decompacted roads, earth movement may be accomplished using machinery. If this cannot be done without additional damage to the habitat, sculpting and recontouring should be done by hand. Berms alongside of dirt roadways should be smoothed out where they interrupt drainages or essentially have filled portions of pools. Between pools or basins, soil in berms can be used to reconstruct Mima mound topography. Within basins, ruts should be smoothed by hand.

Reseeding Pools

Seed should not be introduced to natural, undisturbed pools. A species can be reintroduced into a pool where it has been extirpated by disturbance, but not where it has gone locally extinct due to natural processes. In such cases, prior to reintroduction, pools should be monitored for 4 years so that the absence of the species in question has been verified.

Reseed only with hand collected seeds which have been gathered in immediately adjacent pools. Some species are difficult to collect by hand, and it may be necessary to collect them by a combination of plucking, raking, and vacuuming (Zedler and Scheidlinger 1986). These techniques would be most appropriate for reconstructed road pools which are often devoid of most of the vernal pool flora. The primary drawback of the raking and vacuuming techniques is that they are not selective, and many weed seeds also are gathered. This would be less of a problem if seeds were gathered after a year with greater than average precipitation. When water stands in basins for over a month, most weed species will die (Bauder 1987). Seed collections should not adversely impact the source pools by depleting the seed crop of any species and should conform to the current Fish and Wildlife restrictions on the collection of

Eryngium. All seed sources and destinations should be clearly marked on maps. Maps should be filed with 1) Fish and Wildlife Service (USDI), 2) Non-Game Heritage Division, Fish and Game (California), and 3) the San Diego Natural History Museum.

Non-Pool, Associated Habitat

Seeds should be collected by hand from adjacent areas and sown by hand. It some cases it may be necessary to prepare the seed bed by roughing the surface of the soil and/or mulching with weed-free material.

Creation

Habitat creation should be employed only where there are no other options. Prior to any efforts to develop artificial habitat, the area should be carefully surveyed for the existence of natural pools, whether disturbed or not. Artificial habitat should not supplant restorable natural vernal pool habitat nor adversely affect the associated habitat. Seeding protocol should be the same as for restoration. Before the commencement of an artificial habitat project, the location, methods, performance standards, and monitoring procedures should be reviewed by biologists, resource managers, and the general public.

The least radical method of creating additional vernal pool habitat is to start with depressions or swales which already exist and which share similar substrate with nearby areas that sustain vernal pools. It appears that these depressions or swales would be fully developed vernal pools if the mesa top were not tilted so that water flowed towards adjacent canyons. A pilot project near Sacramento used check dams to impound water in existing swales (Sugnet and Associates 1989).

A more costly and risky procedure is to create habitat *de novo*. A variety of methods which have been used was presented at the Restoration and Creation of Vernal Pools Workshop, held in February, 1989, under the auspices of the California Department of Fish and Game in Sacramento, California. The relative merits of this type of procedure are discussed in Subsection 7.2.2.2.3 in Section 7, Management Recommendations.

Exotic Removal

Exotic removal is one of the most difficult tasks to address. Once exotics become established, there are few selective methods of removal. If exotics have become established because of altered hydrology, they usually can be removed when the hydrological problems are resolved. Hand weeding can be successful if performed at the correct time of year (Bauder 1989, Wood pers. comm.), but it is very time-consuming and is best used for small areas. Weeding of annuals should be completed prior to seed set of the exotic to be removed and in a manner which disrupts the native plants the least.

Saturation of an area with seeds of native plants may help to improve the competitive stance of natives vis-a-vis exotics. Likewise, revegetating disturbed areas with natives ought to reduce the seed source of exotics.

The effects of fire are not well known, hence its use is controversial. In some cases fire may enhance exotics (Zedler and Scheid 1988), but The Nature Conservancy has had positive effects on native plants where controlled burns were used on a number of preserves (Reiner 1990).

APPENDIX B

SPECIES SENSITIVITY CATEGORIES

APPENDIX B
SPECIES SENSITIVITY CATEGORIES

Federal (1991)

Endangered. Taxa threatened throughout all or a significant portion of their range.

Threatened. Taxa likely to become endangered in the foreseeable future.

Category 1. Taxa for which the USFWS currently has on file substantial information on biological vulnerability and threat(s) to support the appropriateness of proposing to list them as endangered or threatened species.

Category 2. Taxa for which information now in possession of the USFWS indicates that proposing to list them as endangered or threatened is appropriate but for which substantial data on biological vulnerability and threat(s) are not known or on file to support the immediate preparation of rules.

Category 3. Taxa that were once considered for listing as endangered or threatened, but are currently not receiving such consideration. These taxa are included in one of the following three subcategories.

Subcategory 3A: Taxa presumed to be extinct.

Subcategory 3B: Taxa whose names do not meet the Endangered Species Act's legal definition of species.

Subcategory 3C: Taxa now considered to be more widespread that originally thought.

Note: The taxa in Categories 1 and 2 are candidates for possible addition to the list of endangered and threatened species. The USFWS encourages their consideration in environmental planning.

State of California (1990)

Endangered. Taxa which are in serious danger of becoming extinct throughout all, or a significant portion, of their range due to one or more causes including loss of habitat, change in habitat, over exploitation, predation, competition, or disease (Section 2062 of the Fish and Game Code).

Threatened. Taxa which, although not presently threatened with extinction, are likely to become endangered species in the foreseeable future (Section 2067 of the Fish and Game Code).

Rare. Taxa which, although not presently threatened with extinction, are present in such small numbers throughout their range that they may become endangered if the present environment worsens (Section 1901 of the Fish and Game Code).

Candidate. Taxa which the Fish and Game Commission has formally noticed as being under review by the Department in addition to the list of threatened and endangered species.

California Native Plant Society (1988)

Lists

1A: Presumed Extinct in California
1B: Rare or Endangered in California and Elsewhere
2: Rare or Endangered in California, More Common Elsewhere
3: Need More Information
4: Plants of Limited Distribution

Note: Plants on CNPS list 1B meet California Department of Fish and Game Criteria for Rare or Endangered listing.

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 at this time.
2- Occurrence confined to several populations or to 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 of California
2- Rare outside California
3- Endemic to California

APPENDIX C

REGULATORY FRAMEWORK

REGULATORY FRAMEWORK

Endangered Species Act of 1973

The Endangered Species Act provides that "take" of all federally-listed threatened and endangered species is illegal without the development of a habitat conservation plan pursuant to Section 10(a) of the Act. Pursuant to the Act, Otay Ranch is obligated to take the necessary measures to ensure that actions authorized, funded, or carried out on the Ranch are not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat.

Pursuant to the Act, the Secretary of the Interior creates lists of endangered and threatened species. Endangered species are those which are in danger of extinction throughout all or a significant portion of their range. Five vernal pool species on Otay Ranch are either listed or proposed for listing as endangered or threatened: San Diego button-celery (*Eryngium aristulatum* var. *parishii*), Otay Mesa mint (*Pogogyne nudiuscula*), California Orcutt grass (*Orcuttia californica*), spreading navarretia (*Navarretia fossalis*), Riverside fairy shrimp (*Streptocephalus woottoni*), and San Diego fairy shrimp (*Branchinecta sandiegonensis*).

Section 9 of the Act prohibits the "take" of an endangered species of fish or wildlife within the United States, its territory, or any territorial sea. A take includes the direct killing, harming, or harassing of a species, or destruction of habitat that may be important for the species' survival or recovery. *Pogogyne nudiuscula* is found exclusively in vernal pools on Otay Mesa. Because vernal pools have been reduced by 93 to 97 percent, remaining vernal pool habitat on Otay Mesa is likely to be considered by the Service to be critical for the survival and recovery of this species. On Otay Ranch, *Streptocephalus woottoni* is found only in the J29 complex, and this area is likely to be considered critical for the survival and recovery of this species.

Pursuant to Section 7 of the Act, Otay Ranch must consult with the U.S. Fish and Wildlife Service if proposed developments of the Ranch "may affect" a federally-listed endangered species. The Section 7 consultation process would be comprised of three steps:

1. Informal consultation between the applicant and the U.S. Fish and Wildlife Service;

2. Formal consultation between the applicant and the U.S. Fish and Wildlife Service; and

3. Identification of appropriate mitigation measures and the issuance of a Section 7 agreement.

The Clean Water Act

Section 404 of the Clean Water Act addresses the discharge of dredged or fill material into waters of the United States and delegates regulatory authority over such discharge from the promulgating agency, U.S. Environmental Protection Agency (EPA), to the U.S. Army Corps of Engineers (ACOE). Discharges, as

defined in ACOE regulations, include any material used for, or resulting in, changes in the bottom elevation of a waterbody or wetland. For example, this includes grading and discharges used as road fills, stream crossings, building pads, and flood and erosion control on stream banks.

ACOE jurisdiction under Section 404 of the Clean Water Act includes three categories of "Waters of the United States:"

1. Navigable waters of the United States (subject to past, present, and future ebb and flow of the tides);

2. All ocean and coastal waters within 3 nautical miles seaward of baseline ("The Territorial Seas"); and

3. Non-tidal waters of the United States.

Most ACOE permits granted in the United States are for the third category of waters of the United States. Vernal pools are considered non-tidal waters that are isolated wetlands and, as such, are subject to the Clean Water Act.

Nationwide Permits

The ACOE has developed a series of 27 nationwide permits (NWPs) that preauthorize minor discharges provided that the discharges meet specific conditions. Use of most NWPs does not require review by the ACOE or other federal agencies, providing the applicant meets conditions outlined in the regulations, and the proposed project does not conflict with other federal laws (i.e., Endangered Species Act, National Historic Preservation Act, and Coastal Zone Management Act). NWPs cover such activities as construction of outfall structures, backfill or bedding for utility lines, fill for bank stabilization, and minor road crossings.

Providing an action is in compliance with the nationwide permit conditions, an individual permit would not be required. If the discharge would cause the loss or substantial adverse modification of 1 to 10 acres of Waters of the United States, including adjacent wetlands, then the nationwide permit may not apply. Work cannot begin until the permittee (The Baldwin Company) is notified by the ACOE that the work may proceed under the nationwide permit. All work conducted under the nationwide permit must adhere to the conditions of the nationwide permit, including that the activity will not jeopardize a threatened or endangered species, or destroy or modify its habitat.

If the discharge would cause the loss or substantial adverse modification to more than 10 acres of waters of the United States, including wetlands, then the activity would not qualify for a nationwide permit, and authorization by an individual permit would be required.

Individual Permit Process

The individual permit process is much more complex and time consuming than the NWP program. Typically the application process involves a pre-application meeting (if requested), permit application

process, the posting of a public notice to allow for public comment, and a final decision by the ACOE in which the ACOE indicates its readiness to prepare its Environmental Assessment (EA), Public Interest Review, and 404(b)(1) Evaluation. If the conclusion is that the action will cause significant impacts, then the ACOE must prepare (or cause to be prepared) an Environmental Impact Statement (EIS).

Because vernal pools are considered wetlands, these regulations apply. However, the Los Angeles District Engineer requires notification of any fill of any quantity in any vernal pool regardless of the presence or absence of endangered species (D. Zoutendyk, pers. comm.). Depending upon circumstances, the ACOE may require an individual permit and an Environmental Assessment. The ACOE is attempting to formalize these requirements particular to vernal pools by publishing changes to its regulations in the Federal Register (Zoutendyk, pers. comm.).

A Memorandum of Agreement (MOA) was entered into by the ACOE and EPA on February 7, 1990 that explicitly states that all potential impacts on aquatic resource habitats must first be shown to have been avoided, minimized, and then compensated for to the maximum extent practicable. Two types of mitigation -- avoidance and minimization of impacts -- are, by far, the preference of the agencies. In cases where impacts cannot be avoided or significantly reduced, then compensation can be considered as appropriate mitigation.

Compensation is the creation of a habitat to replace a similar habitat unavoidably eliminated at the project site. The concerned agencies must be convinced that the proposed compensation will completely mitigate the lost habitat.

ROLE OF U.S. FISH AND WILDLIFE SERVICE

The USFWS Mitigation Policy (FR 46:157644-7663) establishes policy guidance to Service employees involved in making recommendations to protect or conserve fish and wildlife resources, and is intended to promote consistency in the mitigation recommendations of its field personnel. The policy reflects the goal that the most important fish and wildlife resources should receive the greatest level of mitigation when the environment of a particular area is changed. By designating four resource categories, the Service can vary the degree of mitigation it recommends according to the value and scarcity of the habitat at risk. Resource category 1 is habitat of "high value" for evaluation species and is "unique and irreplaceable" and specifies "no loss of existing habitat value" as the planning goal. Resource category 2 is "habitat of high value for evaluation species and is scarce or becoming scarce" and specifies "no net loss of in-kind habitat value." Resource category 3 is "habitat of high value to medium value for evaluation species and is abundant" and specifies "no net loss of habitat value, while minimizing the loss of in-kind habitat value." Evaluation species are defined as "those important fish and wildlife resources with high public interest or ecological significance, or both."

Vernal pools are unique wetland habitats that support endangered species and have been reduced by 93 to 97 percent of their former extent. Owing to historical disturbance and general habitat quality, probably about 95% of the vernal pools on Otay Ranch fall into resource categories 1 and 2, primarily those designated as J23-24, J25, J29-30, and R3+, all of which support listed species. Highly isolated or disturbed vernal pools that lack sensitive species will fall into lower categories.

The USFWS also has the legal mandate to manage endangered species pursuant to the Endangered Species Act (ESA) of 1973. Under the ESA, federal agencies are required to ensure that their actions are not likely to jeopardize the continued existence of endangered and threatened species or result in the destruction or adverse modification of critical habitat (50 CFR 402).

Formal consultation under Section 7 of the ESA concerning potential effects of a proposed action on listed species would be required if the action was likely to adversely affect those species. Because this Plan's actions will have a positive effect on endangered species, a formal consultation would not be required, and a Biological Opinion would not need to be prepared. However, it is advisable for The Baldwin Company to continue to consult informally with the USFWS prior to implementation of any general or specific development plan.

INTERAGENCY COORDINATION NECESSARY TO IMPLEMENT PLAN

The impacts associated with implementation of the Vernal Pool Management Plan as an element of the Otay Ranch Resource Management Plan will be assessed in the EIR for SPA One. During the public review period, input and comments will be solicited from the ACOE, EPA, and USFWS.

Implementation of the Management Plan would set forth actions that involve protection, restoration, policy review, and education. The Plan includes activities such as fence construction, road and trail closure, vernal pool restoration, revegetation and monitoring, and a very minor amount of facilities construction for educational purposes. Implementation does not require major construction of any kind; the Plan is totally compatible with the development of Otay Ranch in this respect. In no case would the plan require offsite impacts to natural resources. Implementation also would not cause significant effects to any native plant or animal species populations. The Plan addresses ecosystem restoration; hence, endangered as well as non-endangered species are expected to benefit.

Certain types of vernal pool restoration, such as removing tire ruts to recontour a pool basin, probably would be construed as a "fill" pursuant to Section 404 of the Clean Water Act, and would require notification to the ACOE, preparation of a specific mitigation plan, and possibly preparation of an EA or EIS (D. Noda pers. comm.; E. White pers. comm.). If the ACOE determined that the restoration project "may affect" an endangered species, a consultation with the USFWS pursuant to Section 7 of the Endangered Species Act would be required. Presently, there are three endangered plant species (i.e., *Eryngium aristulatum* var. *parishii*, *Pogogyne nudiuscula*, and *Orcuttia californica*) and one endangered invertebrate species (*Streptocephalus wootton*i) recorded from vernal pools on Otay Ranch. In addition, there is one plant species (*Navarretia fossalis*) and one invertebrate (*Branchinecta sandiegonensis*) proposed for listing as endangered, and one plant species recognized as a Category 2 candidate (*Myosurus minimus*).

Collection of seed material or whole plants of an endangered or threatened species for revegetation or monitoring purposes, or collection of an endangered or threatened invertebrate would require an endangered species collection permit from the USFWS.

Otay Ranch

Phase 2
Resource Management Plan

Appendix F7
Range Management Plan
For Otay Ranch,
San Diego, County, California

APPENDIX F7

THIRD DRAFT

RANGE MANAGEMENT PLAN
FOR OTAY RANCH
SAN DIEGO COUNTY, CALIFORNIA

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1 September 1995

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EXECUTIVE SUMMARY

The Range Management Plan identifies management goals and makes recommendations both within the Otay Ranch Preserve and ranch-wide. Goals and recommendations that apply to the Otay Ranch Preserve are intended to maintain resources in their existing condition prior to conveyance of land to the Preserve, as specified by the Resource Management Plan (RMP). Ranch-wide goals and recommendations are related to maintaining a well-run, balanced ranching operation on the entire Ranch. Of concern with respect to the Phase 2 RMP are those management goals and recommendations that apply to the Otay Ranch Preserve. The ranch-wide management goals and recommendations are regarded as discretionary and may or may not be implemented by the landowner.

With respect to the range management activities within areas designated for future conveyance to the Otay Ranch Preserve, the Range Management Plan includes the following general recommendations:

- Eliminate grazing in the area designated Vernal Pool Preserve (pasture 9) at the onset of winter rains through summer when plants have set seed and senesced (generally by early summer). Restriction of grazing shall begin in late 1995-early 1996; either fencing of the Vernal Pool Preserve or elimination of grazing on Otay Mesa will be required to implement this recommendation.

- Coordinate grazing activities within the Vernal Pool Preserve with restoration activities described in the Vernal Pool Management Plan for the Otay Ranch (DUDEK 1995a); grazing should be eliminated entirely from the Vernal Pool Preserve prior to initiation of restoration activities.

- Eliminate grazing in riparian habitat in the Otay River Valley (Horse, River Valley West, River Valley East, and O'Neal pastures) during winter through summer months following the onset of winter rains beginning in late 1995-early 1996; some repair of existing fencing and new fence construction will be required to implement this recommendation.

- Continue grazing in existing locations and at existing stocking levels on the Jamul Mountains and San Ysidro parcels prior to conveyance of land to the Preserve.

- Coordinate grazing activities within those portions of the Preserve designated for coastal sage scrub restoration activities with the Otay Ranch Coastal Sage Scrub and Maritime Succulent Scrub Habitat Replacement Master Plan (DUDEK 1995b); the Master Plan calls for elimination of grazing in areas designated for restoration a period of time prior to initiation of restoration activities to facilitate soil preparation and the control of exotic and pest plant species.

- As lands are conveyed to the Preserve, temporary ongoing managed grazing activities on conveyed lands may be desirable and should be coordinated with the Preserve Owner/Manager; as discussed in the Range Management Plan, properly managed cattle grazing at light to moderate levels need not negatively affect biological resources and, in fact, abrupt elimination of grazing may be undesirable, particularly with respect to exotics control.

1.0 INTRODUCTION

The Range Management Plan for Otay Ranch (Ranch) (*Figures 1 and 2*) has been developed in order to specify the relationship between livestock grazing and sensitive habitat and species protection. Several policies in the Otay Ranch Resource Management Plan (RMP) address the Range Management Plan and its relation to the preservation of important biological resources on the Ranch.

Policy 5.3 (RMP) calls for development and implementation of a strategy that facilitates effective, long-term management of the Otay Ranch Preserve (Preserve) consistent with the goals of RMP. The standard for Policy 5.3 is that management activities shall be undertaken to ensure no reduction in habitat values and no adverse impacts to biological resources included within the Preserve.

Policy 8.1 states that existing conditions (uses) of the Ranch will not be allowed to negatively impact the sensitive resources in the Preserve, and includes the following standards:

1) Existing agricultural uses, including cultivation and grazing, shall be permitted to continue as an interim activity only where they have occurred historically and continually.

2) No increase in irrigation shall be allowed, except for temporary irrigation that may be installed as part of restoration plans.

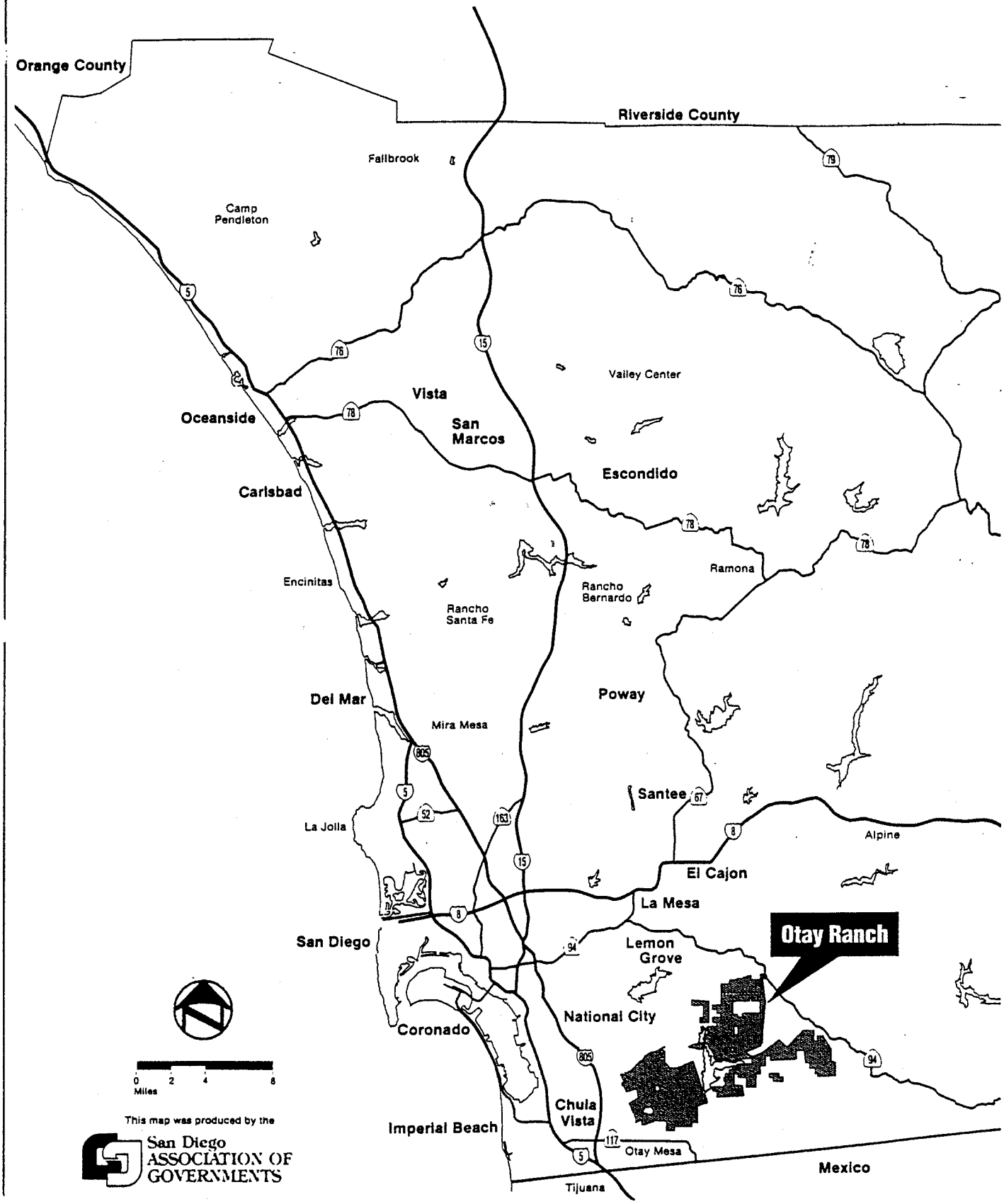
3) Grazing by sheep and goats shall not be allowed.

4) Cattle grazing shall be phased out in accordance with the conveyance and Range Management Plan.

Policy 8.4 requires the development of a Range Management Plan that will depict the allowable interaction between grazing activity and sensitive resources. The Range Management Plan shall be developed as part of the submittal of the first SPA in the Phase 2 RMP. Under this plan, the most sensitive areas (i.e., areas that support, or potentially could support, sensitive species) shall have restricted access either by fencing or other appropriate method. The plan shall be subject to review and comment by the Preserve Owner/Manager (POM), the City, and the County.

This Range Management Plan discusses current grazing conditions on the Ranch, and ways to achieve the policies and standards of the RMP while allowing managed grazing activities. As such, the Range Management Plan identifies management goals and makes recommendations concerning the designated Preserve and ranch-wide. Goals that apply to the Preserve are intended to maintain resources in their existing condition prior to conveyance of land to the Preserve. Ranch-wide goals are related to maintaining a well-run, balanced ranching operation on the entire Ranch. Of concern with respect to the Phase 2 RMP are those management goals that apply to the Preserve. The ranch-wide management goals are regarded as discretionary and may or may not be implemented by the landowner.

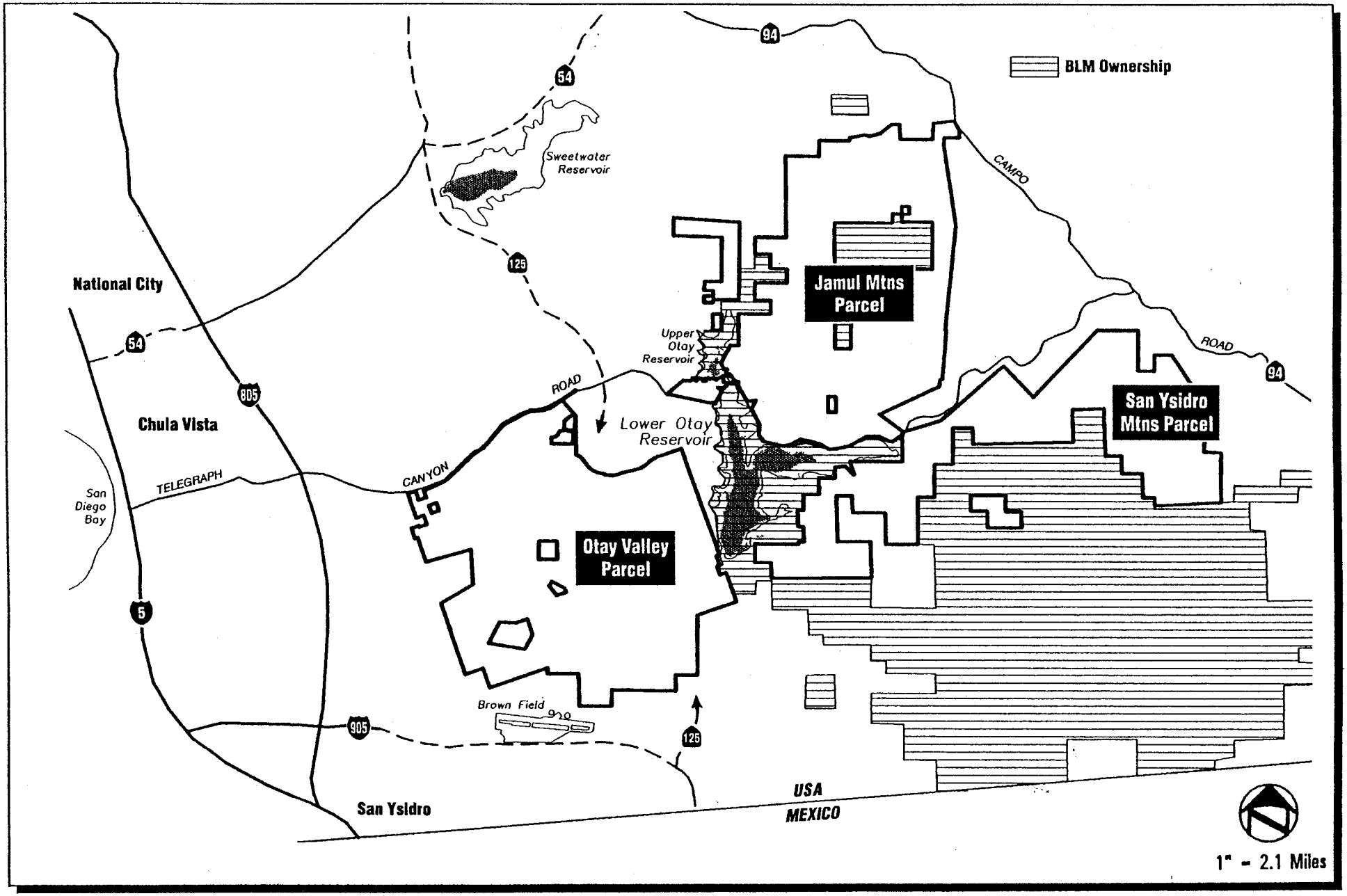
To this end, existing physical facilities are identified, and new facilities are recommended, both for the Preserve and ranch-wide. Existing range management resources are identified and recommendations for improvement or modification are made. Descriptions of how to monitor ranch-wide range trend and condition are discussed, and areas of potential scientific research to improve range management policies and practices are identified. Livestock inventory is discussed in terms of existing numbers and



Otay Ranch Range Management Plan

Regional Map

FIGURE 1



Otay Ranch Range Management Plan

Vicinity Map

FIGURE 2

kinds of animals, existing management practices, and seasonal stocking requirements. Economic and management/labor considerations are discussed as future needs. Discussions of range condition, stocking rates, and methods to assess range conditions are included, as are management improvement practices.

The Range Management Plan, as presented here, does not purport to be prescription for a successful cattle operation on the Ranch. Rather, it provides a set of recommendations that could be implemented in whole or part, depending on the resources available for upgrading the cattle operation and the phased implementation of the RMP.

1.1 PRESERVE MANAGEMENT GOALS AND RECOMMENDATIONS

With respect to the range management activities within areas designated for future conveyance to the Otay Ranch Preserve, the Range Management Plan includes the following general recommendations:

- Eliminate grazing in the area designated Vernal Pool Preserve (pasture 9) at the onset of winter rains through summer when plants have set seed and senesced (generally by early summer). Restriction of grazing shall begin in late 1995-early 1996; either fencing of the Vernal Pool Preserve or elimination of grazing on Otay Mesa will be required to implement this recommendation.

- Coordinate grazing activities within the Vernal Pool Preserve with restoration activities presented in the Vernal Pool Management Plan for Otay Ranch (DUDEK 1995a); grazing should be eliminated entirely from the Vernal Pool Preserve prior to initiation of restoration activities.

- Eliminate grazing in riparian habitat in the Otay River Valley (Horse, River Valley West, River Valley East, and O'Neal pastures) during the winter through summer months following the onset of winter rains beginning in late 1995-early 1996; some repair of existing fencing and new fence construction will be required to implement this recommendation.

- Continue grazing in existing locations and at existing stocking levels on the Jamul Mountains and San Ysidro parcels prior to conveyance of land to the Preserve.

- Coordinate grazing activities within those portions of the Preserve designated for coastal sage scrub restoration activities with the Coastal Sage Scrub and Maritime Succulent Scrub Habitat Replacement Master Plan (DUDEK 1995b); the Master Plan calls for elimination of grazing in areas designated for restoration a period of time prior to initiation of restoration activities to facilitate soil preparation and exotic plant control.

- As lands are conveyed to the Preserve, temporary ongoing managed grazing activities on conveyed lands may be desirable and should be coordinated with the POM; as discussed in the Range Management Plan, properly managed cattle grazing at light to moderate levels need not negatively affect biological resources and, in fact, abrupt elimination of grazing may be undesirable, particularly with respect to the control of exotic and pest plant species.

1.2 RANCH-WIDE MANAGEMENT GOALS AND RECOMMENDATIONS

Short- and long-term goals have been established to help the range manager (the entity responsible for the day-to-day cattle operation) assign priorities for improving Ranch management and operations: (1) short-term goals that should be accomplished between 1996 and 1998; and (2) long-term goals that should be accomplished between 1998 and 2001, and perhaps beyond. Except where indicated in specific sections, these management goals and recommendations are discretionary and may or may not be implemented by the landowner. However, if implemented, they should be reviewed periodically to ensure that the long-term range management needs on the Ranch are being met.

1.2.1 Short-term Goals

Short-term goals have been identified for the Jamul Mountains Management Area, Otay River Valley Management Area, and San Ysidro Management Area. These goals are listed in a prioritized order of completion. Successful completion of a goal on the list would trigger the next level of management actions, such as rotational grazing, deferred grazing, or prescribed burning. Achieving several of the goals would require new, or improvement of existing, facilities. Although the Range Management Plan provides a comprehensive set of recommendations for each of the goal levels, the degree to which the goals actions are implemented depends on decisions by the range manager and the POM. The POM should have the ultimate authority over range management decisions that may affect the Preserve and biological resources. For example, the extent of new interior fencing is discretionary, as would be development of new water resources, because they are actions that potentially could improve range and/or Preserve management, but may not be specifically mandated by the RMP.

Prioritized short-term management actions for the Jamul Mountains Management Area (JMMA) for the period of 1996-1998:

(1) Repair perimeter fence
(2) Repair existing interior fence
(3) Construct new interior fence
(4) Repair existing water sources
(5) Develop new water sources
(6) Construct exclosures for vegetation monitoring
(7) Develop salt/minerals/shade to improve livestock distribution
(8) Develop rotational grazing scheme
(9) Evaluate build-out schedule for area

Prioritized short-term of management actions for the Otay River Valley Management Area (ORVMA) for the period of 1996-1998:

(1) Construct Vernal Pools Pasture fence
(2) Repair perimeter fence
(3) Construct riparian fence (River Valley West and East and O'Neal pastures)
(4) Repair existing water sources
(5) Develop salt/minerals/shade to improve livestock distribution
(6) Develop new water sources
(7) Construct cross-fencing (O'Neal, Salt Creek, and Farm pastures)
(8) Construct exclosures for vegetation monitoring
(9) Develop rotational grazing scheme
(10) Evaluate build-out schedule for area

Prioritized short-term management actions for the San Ysidro Management Area (SYMA) for the period of 1996-1998:

(1) Repair perimeter fences in West and East management units
(2) Determine cross-fencing locations
(3) Determine water source improvements or development
(4) Construct exclosures for vegetation monitoring
(5) Develop rotational grazing scheme
(6) Evaluate build-out schedule for area

1.2.2 Long-term Goals

Long-term ranch-wide goals help determine the direction that the Ranch should take with regard to range management. This includes the plan and schedule for removal of cattle and incorporation of the other resource management plans that will be implemented (e.g., coastal sage scrub, vernal pool, and riparian habitat management). A schedule and plan for build-out and conveyance of Preserve lands, desired vegetation composition, and a long-term biota monitoring program are components of these long-term goals.

Prioritized long-term management actions for the JMMA for the period of 1998-2001:

(1) Complete short-term goals
(3) Develop soils map for each pasture
(3) Determine carrying capacity for each pasture
(4) Develop prescribed burning program
(5) Establish long-term vegetation and land condition trend analysis (could be part of overall biota monitoring program)
(6) Begin rotational grazing scheme

Prioritized long-term management actions for the ORVMA for the period of 1998-2001:

(1) Complete any short-term goals
(2) Develop soils map for each pasture
(3) Determine carrying capacity for each pasture
(4) Develop prescribed burning program
(5) Establish long-term vegetation and land condition trend analysis (could be part of overall biota monitoring program)
(6) Begin rotational grazing scheme

Prioritized long-term management actions for the SYMA for the period of 1998-2001:

(1) Complete any short-term goals
(2) Develop soils map for each pasture
(3) Construct necessary cross-fencing
(4) Determine carrying capacity for each pasture
(5) Develop prescribed burning program
(6) Establish long-term vegetation and land condition trend analysis (could be part of overall biota monitoring program)
(7) Begin rotational grazing program

1.3 STRUCTURE OF DOCUMENT

Section 2 provides a brief description of the general existing range use and ecological conditions on the Ranch. Sections 3 through 5 provide specific discussions of the three distinct management areas: the JMMA; ORVMA; and the SYMA (*Figure 2*). Each section provides a description of the existing pastures within the parcel, Preserve management recommendations as specified by the RMP, and discretionary range management recommendations that would improve the overall cattle ranching operation. Section 7 provides ranch-wide general recommendations that addresses several issues, including forage, fencing, water sources, and additional management topics such as grazing options, standing crop measurement, stocking levels and rates, prescribed burning, etc.

It is important to understand that the proposed pastures and subpastures (smaller units within a pasture that allow better distribution of livestock) described in this document, and the location for construction of fences to create the pastures, are conceptual rather than prescriptive. The actual fencelines for the pastures and subpastures should be erected along Preserve boundaries where possible. Where the proposed fences do not coincide with the Preserve boundaries, adjustments to the proposed pasture and subpasture boundaries can be made.

2.0 BACKGROUND INFORMATION

Range management has been defined by Vallentine and Sims (1989) as, "the art and science of planning and directing the use of rangelands to obtain optimum, sustained returns based on the objectives of the land ownership and on the needs and desires of society." As the role of the range manager changes to that of a range ecosystem manager, the definition is changing to that of a "highly skilled, applied ecologist, thoroughly grounded in basic sciences and well-trained in the characteristics of range ecosystems: their potential uses, the compatibility of these uses, and management for maximizing values and minimizing conflicts and cost; and schooled in the use of decision making tools" (Lewis 1959). These range ecosystems are natural pastures or derived pastures managed extensively on the basis of ecological principles.

The traditional definition of range management has often given domestic livestock production and big game a greater value than other goods and services. An ecological-based definition identifies range management as the management of renewable resources composed mainly of one or more range ecosystems managed for the optimum, sustained yield of the optimum combined goods and services (Lewis 1959). Scientific range management is based on the premise that vegetation can be used for grazing while simultaneously providing society with high water and air quality, open space, and recreation (Vallentine 1989). In the case of Otay Ranch, this means balancing range management with the management of many sensitive biological resources and access for active and passive recreation.

2.1 EXISTING RANGE USE

Although the Ranch has been used for livestock and farming operations for many decades, very little is known or documented about past management practices. The current Ranch operator, who has run the Ranch for the past seven years, has had partial use of the Ranch for cattle while sharing the land with farming activities that comprise approximately 5,000 acres. There are historical signs of overuse such as gravel mining in the river valley riparian areas, absence of western sycamores (*Platanus racemosa)* and other common riparian tree species (e.g., willows [*Salix* spp.], Fremont cottonwood [*Populus fremontii*]), terracing of hillsides, large patches of filaree (*Erodium* spp.) without grasses, and the presence of tamarisk (*Tamarix* spp.) and giant reed (*Arundo donax*) in the riparian areas. However,

without adequate records of historic stocking levels, it is difficult to specify the relationship between historic grazing practices and current ecological conditions.

2.2 GENERAL EXISTING CONDITIONS

Non-native annual grasses comprise the majority of the herbaceous cover on the three management areas: JMMA, ORVMA, and SYMA. Cattle, in general, are not browsers and therefore will only forage on brush when grasses have been used. These annual grasses are mainly wild oats (*Avena* spp.) and bromes (*Bromus* spp.), and are well-established in the overall ecological system of the Ranch. A thorough understanding of annual grass germination, production, and senescing thus is important for range management on the Ranch. For example, annual plants depend upon favorable environmental conditions during the spring when they germinate and send their roots into the moist soil. Annuals are dependent upon rainfall for seed germination and growth, and may reach peak productivity at vastly different dates from year to year (Stoddart et al. 1975). In southern California, germination may occur from December to late February depending upon winter storm patterns. Furthermore, annuals are short-lived and may be grazed for only 12-15 weeks, depending upon rainfall. Extended periods of rainfall may allow for longer periods of grazing opportunities. Grazing capacities and animal gains from an annual grassland may vary as much as 300% from year to year (Murry and Klemmedson 1968).

3.0 JAMUL MOUNTAINS MANAGEMENT AREA

The JMMA comprises approximately 7,895 acres and was, until recently, grazed by cattle, goats and sheep. (Policy 8.1 of the RMP stipulates that goats and sheep shall not be allowed to graze on the Ranch.) Cattle currently graze in the JMMA; however, because of several constraints, they are under-utilizing the area. The lack of cross-fences and reliable water sources, as well as rugged terrain, limit cattle use of the area.

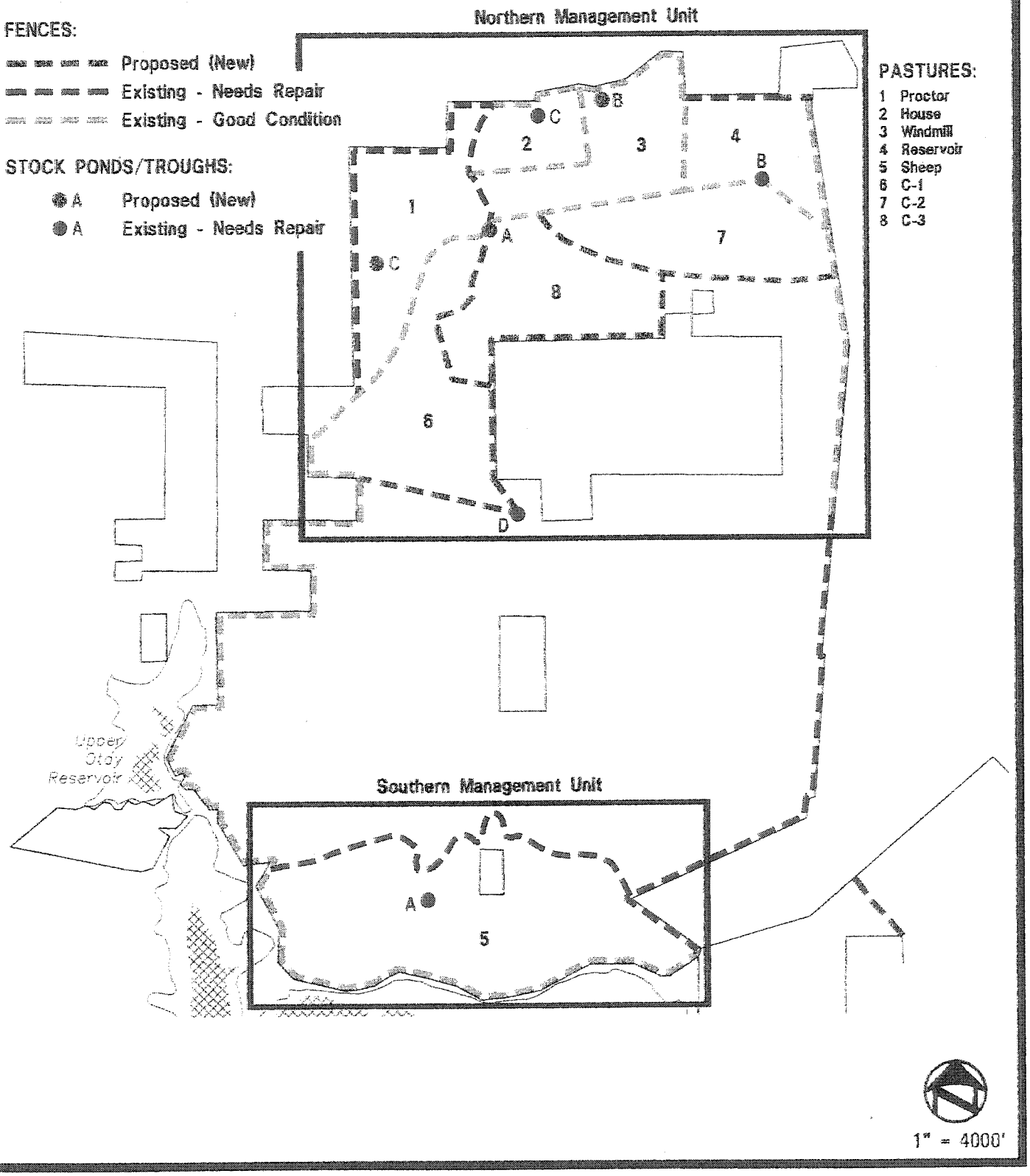
The northern portion of the JMMA has been extensively grazed in the past and most of the existing pastures are proposed for development. The central portion of the JMMA is not planned for development and comprises the main portion of the proposed Preserve. Cattle grazing in this area, however, would be difficult because of the thick brush, steep terrain, and lack of forage.

The JMMA should be divided into north and south management units (*Figure 3*). Seven pastures are identified in the northern unit: four existing pastures and three new pastures. Existing pastures are Reservoir, Windmill, House, and Proctor. Proposed pastures are C-1, C-2 and C-3. The southern unit has only the Sheep Pasture. The main Preserve lies between the two management units and is comprised mainly of Bureau of Land Management (BLM) land surrounded by Ranch property. The terrain in the Preserve is steep and densely covered with chaparral and generally is unsuited for range use.

3.1 NORTH MANAGEMENT UNIT

3.1.1 Proctor Pasture

Proctor Pasture is located east of Proctor Valley Road. It has relatively flat topography in the east rising to hills in the west. There is an eastern aspect with Friant rocky sandy loam, Olivenhain cobbly loam, San Miguel rocky silt loam, and Visalia sandy loam. Vegetation communities present are chamise chaparral and coastal sage scrub. This area is proposed as Preserve in the RMP.



Otay Ranch Range Management Plan

Jamul Mtns. Management Area - Existing & Proposed Pastures

FIGURE 3

Proctor Pasture currently has no water and inadequate fencing. Fence repair would be required along Proctor Valley Road. A property line survey to determine fence line integrity would be necessary. Water is not available, and a water source would need to be constructed (e.g., source A or C in Figure 3) or hauled in. One water source would sufficient. Possible access to City of Chula Vista water lines should be investigated. Livestock could graze the pasture without fencing only if ranch hands are available to monitor livestock movement.

3.1.2 House Pasture

House Pasture has level topography and a slight northern aspect. Soils are mainly Visalia sandy loam, Wyman loam, Friant rocky fine sandy loam, and Placentia sandy loam. Present vegetation communities are coastal sage scrub, disturbed coastal sage scrub, and alkali meadow. Water is available in House Pasture, but some repairs to the pump and storage system may be required. Fence repairs along Proctor Valley Road also may be required. Most of this pasture is proposed for development.

3.1.3 Windmill Pasture

Windmill Pasture lies east and south of House Pasture. It also has level topography and a slight northern aspect. Soils are mainly Visalia sandy loam, Wyman loam, Friant rocky fine sandy loam, and Placentia sandy loam. Vegetation communities present are disturbed coastal sage scrub, coastal sage scrub, and disturbed alkali meadow. No water source is available in this pasture, thus construction of a new source (New B) would be needed. Except for the short section adjoining Proctor Pasture, fencing is adequate and no repairs are necessary at this time. This pasture is proposed for development.

3.1.4 Reservoir Pasture

Reservoir Pasture is located east of Windmill Pasture. It has level topography and an east and west aspect. Soils are mainly Placentia sandy loam, Fallbrook sandy loam, Friant rocky fine sandy loam, and Escondido very fine sandy loam. Vegetation communities present are disturbed coastal sage scrub and coastal sage scrub.

The dam in Reservoir Pasture requires some major repair work. All fencing, except in the northern boundary, is in good condition. The north fence exists, but is in need of minor repair. This area is proposed for development.

3.2 SOUTHERN MANAGEMENT UNIT

The Southern Management Unit is located in the southern portion of the JMMA. Otay Lakes Road is the southern and western boundary. Private property lies to the east. Extensive Ranch property lies north, extending to BLM property.

3.2.1 Sheep Pasture

Only Sheep Pasture is currently grazed in the Southern Management Unit. Sheep Pasture has fairly level topography with rising hills to the north. A drainage occurs in the western portion of the pasture. It has a southern aspect and supports Olivenhain cobbly loam, Redding cobbly loam, and Friant rocky fine sandy loam soils. Vegetation communities present are chamise chaparral, coastal sage scrub, disturbed coastal sage scrub, valley needlegrass grassland, and disturbed valley needlegrass grassland. This area is proposed for development.

Forage composition in this pasture is mainly shrub and filaree species. The existing water source would require minor repair and on-going maintenance. Because of the linear shape of the pasture, a second water source should be provided in the eastern portion of the pasture to promote livestock distribution. A proposed Preserve area is located north of Sheep Pasture. The north fence appears to generally follow the proposed Preserve boundary and is in need of major repair or replacement.

3.3 PRESERVE MANAGEMENT GOALS AND RECOMMENDATIONS

In the short-term, grazing in the JMMA may continue in existing locations and at existing stocking levels prior to conveyance of land to the Preserve. However, there are small areas planned for habitat enhancement in the Coastal Sage Scrub and Maritime Succulent Scrub Habitat Replacement Master Plan (DUDEK 1995b) for Proctor and House pastures. Removal of cattle from these pastures should be coordinated with initiation of restoration activities. According to the RMP, cattle grazing on the Ranch eventually will be phased out in accordance with the conveyance plan. Removal of cattle from the JMMA should occur when the north management unit is developed. However, premature removal of cattle from the JMMA would increase fine flashy fuels (grasses) and fire fuel load (tons of fuel/acre). Assuming fire is a threat, livestock could be used as an interim management tool to reduce fine flashy fuels that are easy to ignite. This should be considered a significant benefit because of the high amount of illegal alien activity and off-road vehicle traffic that takes place as a result of Border Patrol activity and other human trespass (i.e., hunters, trash dumpers, etc.). Prescribed burning should be considered as a means of fire control in conjunction with range management.

3.4 GENERAL MANAGEMENT RECOMMENDATIONS

3.4.1 C Pastures

Additional pastures (C pastures) are recommended in the JMMA to facilitate rotational grazing. The C pastures should be created along Preserve boundaries. C-1 is located east of Proctor Valley Road and west of the BLM property. The Reservoir and Windmill Pasture are the northern boundary of C-2. C-3 is north of the BLM land and south of Windmill Pasture.

C-1 Pasture

The C-1 Pasture is located east of Proctor Valley Road. Topography is gentle slopes in the west, rising to hills in the east. It has a western aspect with Olivenhain cobbly loam, Friant rocky fine sandy loam, and Placentia sandy loam soils. Existing vegetation communities are coastal sage scrub and chamise chaparral. This area is proposed for development.

C-1 has no available water or fencing on its east and south sides. New water sources would need to be developed or the pasture could be extended to the southwest to take advantage of an existing water source that is located in the northern portion of the Preserve. There is the potential for accessing City water lines. Alternatively, water could be hauled in to fill newly developed water tanks or ponds.

New fencing would provide benefits for both the livestock operation and the Preserve. Fencing, in the short-term, would allow for better livestock control while protecting the Preserve once the area is developed. This pasture should have a shared gate with both Windmill and C-2. A road crossing would provide greater access to the Proctor Pasture.

C-2 Pasture

The C-2 Pasture has level topography in the north, rising to hills in the south. It has a northern aspect with Friant rocky fine sandy loam and Placentia sandy loam soils. Vegetation communities present are southern coast live oak woodland and coastal sage scrub. This area is proposed for development in the future.

C-2 presently has no available water or fencing on its south and southwest sides. Properly placed water sources would help distribution of livestock. A shared water source with Reservoir Pasture is recommended. Because of the level topography, grazing would be highly effective, particularly if the management is coordinated with the use of other pastures in the JMMA. A southern fence line could be constructed along proposed Preserve boundaries to facilitate management of the Preserve in the future. This also would serve as a livestock fence for the short-term and a Preserve boundary.

C-3 Pasture

The C-3 Pasture is located south of C-2 and east of C-1, and is adjacent to BLM property. This pasture has gentle topography in the north, rising to hills in the south. It has a northern aspect with Friant rocky fine sandy loam soil. Vegetation communities present are chamise chaparral and coastal sage scrub. C-3 is a proposed Preserve area and grazing would be terminated upon conveyance of the land to the Preserve.

3.4.2 Forage

Annual grasslands lend themselves to a high intensity/short duration grazing pattern. This involves rotating one herd (numbers would vary depending upon available forage for grazing) through each of the seven pastures in the North Management Unit of the JMMA. A proper rotation schedule based on standing crop and residual dry matter would allow each pasture to be grazed two or three times per year (refer to Section 6.0).

3.4.3 Fencing

The cross-fencing in JMMA is in good condition, as is the perimeter fence except where noted. Existing dirt roads should be maintained, and creation of new roads avoided as much as possible.

Smaller pastures separated by Preserve areas should either have roads connecting them so cattle can be transported via truck or have lane fencing installed so cattle can be herded into the next pasture. Access to main pastures should be maintained from public roads. All pastures should have connecting access gates allowing easy movement of cattle between pastures.

3.4.4 Water Sources

Cattle distribution is important in order to ensure adequate utilization of all pasture areas. One means of ensuring this is to import water by trucks to fill portable stock tanks. Water tanks for livestock could be attached to the water trucks, thereby increasing mobility. However, vehicles would need to be unattended, which increases the risk of vandalism and theft.

Water sources in pastures in the JMMA have been identified as either being adequate, needing repair, or in need of development. Four ponds are in need of repair. Each one should be evaluated as to the

extent of repair needed and its importance prioritized. Repair of existing source D should be delayed until the fencing is constructed. Development of three new water sources is recommended. It is recommended that new source A be developed first because it would serve several pastures. New source B would be next, followed by new source C.

4.0 OTAY RIVER VALLEY MANAGEMENT AREA

The ORVMA is the most extensively used grazing area of the Otay Ranch. The ORVMA is the largest parcel of the Otay Ranch (*Figure 4*); it consists of approximately 9,449 acres. The riparian system of the ORVMA has been continuously grazed over several decades. There is a growing concern about grazing impacts on riparian ecosystems in the western United States. For example, many researchers have shown that riparian systems are affected by grazing, as well as by road construction, logging, mining, agricultural conversions, water use, and recreational development (Platts 1981; Skinner 1986; Knopf et al. 1988). These uses affect soils, vegetation, stream channel morphology, water quality, and fish and invertebrate populations (Orr 1960; Laycock and Conrad 1967; Van Velson 1979; Platts and Raleigh 1984; Bohn and Buckhouse 1985; Platts and Nelson 1985; Knoph et al. 1988).

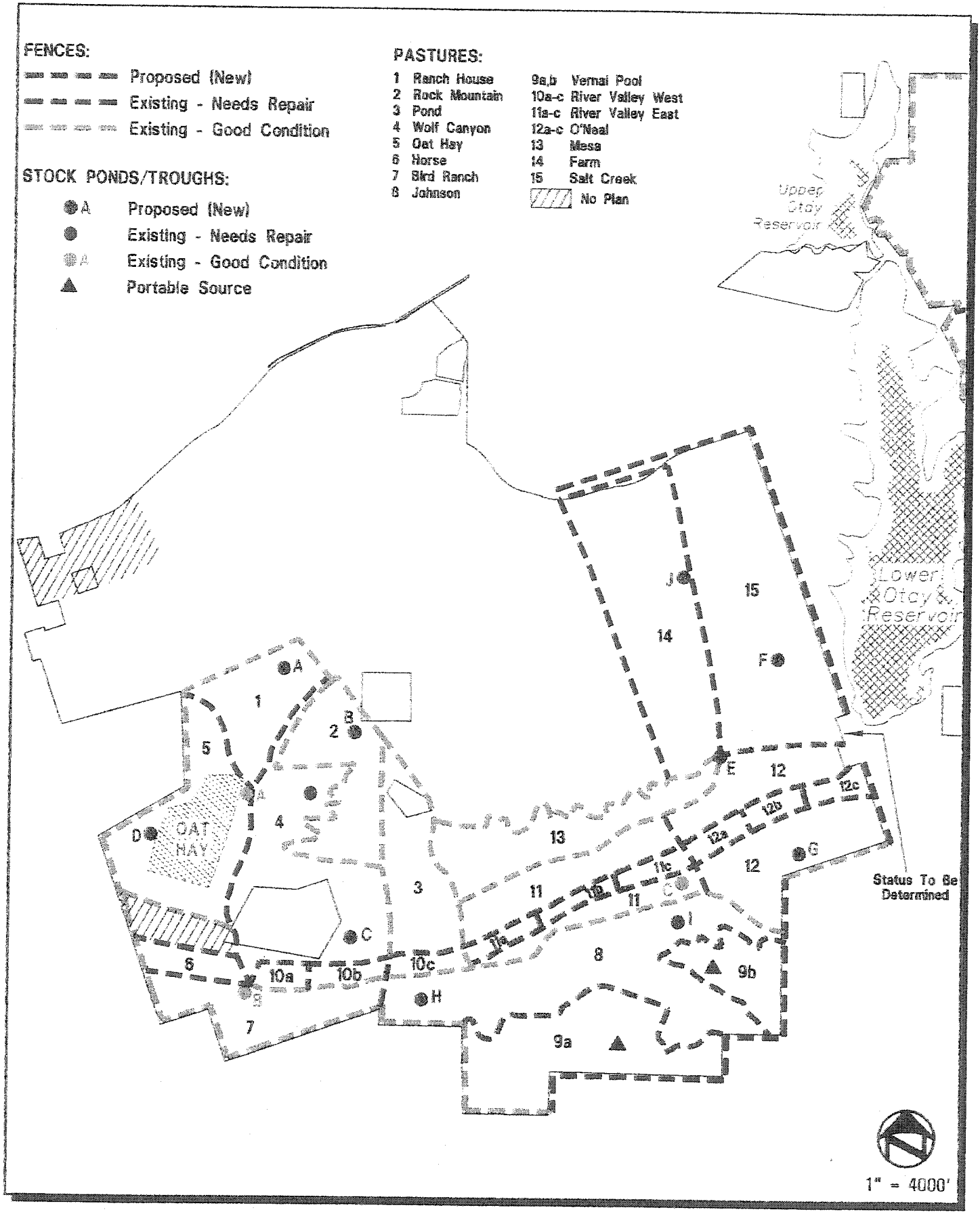
To comply with the RMP, beginning in late 1995-1996 grazing in the riparian habitat in the Otay River valley should be restricted to late summer, fall, and early winter to minimize trampling of vegetation, soil disturbance, and possible disturbance of nesting birds such as the least Bell's vireo (*Vireo bellii pusillus*), yellow-breasted chat (*Icteria virens*), and yellow warbler (*Dendroica petechia*). This section recommends upgrades of existing pastures and new pastures to help implement these necessary management activities.

Table 1 lists the existing and proposed pastures for the ORVMA. Existing pastures are discussed below. Proposed pastures are discussed in regard to Preserve and general management recommendations.

TABLE 1
EXISTING AND PROPOSED PASTURES FOR THE OTAY RIVER VALLEY MANAGEMENT AREA

Existing Pastures	Proposed Pastures
Ranch House	River Valley West a*
Rock Mountain	River Valley West b*
Pond	River Valley West c*
Wolf Canyon	River Valley East a*
Oat Hay	River Valley East b*
Horse	River Valley East c*
Bird Ranch	Salt Creek*
Vernal Pool*	O'Neal a*
River Valley East	O'Neal b*
Mesa	O'Neal c*
	Johnson Canyon
	Farm

* Pastures with special management needs discussed under Preserve Management Goals and Recommendations



Otay Ranch Range Management Plan

Otay Valley Management Area - Existing & Proposed Pastures

FIGURE 4

4.1 EXISTING PASTURES

The ORVMA has ten existing pastures that currently are grazed. Of these, the Vernal Pool Pasture is the most ecologically sensitive pasture; it requires specific grazing techniques if it is to be used without further degrading sensitive resources. Cattle probably degrade vernal pools in the winter and spring by drinking from them, trampling soil and vegetation, and urinating and defecating in pools. The other pastures currently are grazed, but the lack of adequate fencing and water sources limit the effectiveness of the grazing program. Each pasture is discussed in terms of existing conditions and facility enhancement that would improve grazing management and protection of sensitive resources.

4.1.1 Ranch House Pasture

Ranch House Pasture is located on the western edge of the ORVMA, south of Poggi Canyon. Steep slopes occur to the east and south, giving way to mesa tops. An extensive draw exists in the southwestern portion of this pasture. Soils consist of Diablo clay and Olivenhain cobbly loam. This pasture has a south to east aspect. Vegetation consists of annual grasses on the mesa and coastal sage scrub on the slopes, with maritime succulent scrub on east-facing slopes.

Fence repair/upgrade is necessary along the eastern and southwestern boundaries. New fencing should be considered along proposed Preserve boundaries to provide better control of livestock utilizing these areas. This fence also would define the Preserve boundary during and after the proposed development.

This pasture has one water source (Existing A) in the southern portion of the pasture. A new water source (New A) should be established in the northern portion of the pasture to promote proper livestock distribution.

4.1.2 Rock Mountain Pasture

Rock Mountain Pasture is located on the western edge of the ORVMA east of Wolf Canyon. Steep slopes occur to the west (Wolf Canyon) and south, giving way to Rock Mountain in the southeast portion of the pasture. Soils consist of Diablo clay and Linne clay loam. This pasture has a south to west aspect. Vegetation consists of annual grasses on the mesa and coastal sage scrub on the slopes, with maritime succulent scrub on west-facing slopes.

Fencing is adequate for this pasture at this time. It appears that the proposed Preserve boundaries have been mapped along the existing fence lines. Much of the mesa top is proposed for development. Continued maintenance of these fences would help define the Preserve boundary during and after development.

This pasture has one water source in the western portion of the pasture. A new water source in the north (New B) or access to the pond in Pond Pasture should be provided to promote proper livestock distribution.

4.1.3 Pond Pasture

Pond Pasture runs north-to-south and is located west of River Valley East and Mesa pastures. It supports coastal sage scrub, maritime succulent scrub, and non-native grassland vegetation communities. Soils consist of Diablo clay, Linne clay loam, Olivenhain cobbly loam, Olivenhain loam, Salinas clay loam, and Huerhuero loam. This pasture drains north to south into Otay River.

Repair/upgrade of existing fence lines does not appear necessary at this time. A new proposed pasture (River Valley West c) would be located in the southern portion of the pasture. The southern portion of Pond Pasture is located within the proposed Preserve boundary. Continued maintenance of these fences would help define the Preserve boundary during and after the proposed development. A cross-fence eventually would be needed to separate the Preserve from areas planned for development.

This pasture has one water source in the northern portion. No new water sources are proposed at this time.

4.1.4 Wolf Canyon Pasture

Wolf Pasture is located on the western edge of the ORVMA and contains a majority of Wolf Canyon. This pasture is highly diverse in vegetation, containing coastal sage scrub, maritime succulent scrub, annual grasslands, and a mix of annual grassland and coastal sage scrub. Soils consist of Diablo clay, Olivenhain loam, and Linne clay loam. This pasture drains north to south into Otay River.

Repair/upgrade is required for the fence line shared with Oat Hay Pasture. It appears that the proposed Preserve boundaries have been developed along the existing fence lines. Much of this pasture is included in the proposed Preserve. Continued maintenance of these fences would help define the Preserve boundary during and after the proposed development. Fencing private property in the southern portion is recommended to avoid impacts to the area once the Preserve is established.

This pasture has one water source in the northern portion. It needs both repairs and upgrades in equipment (such as the water line, water tank and float valve). A new water source (New C) should be developed in the south to promote proper livestock distribution. The gravel mine operation also should be considered as a source of water.

4.1.5 Oat Hay Pasture

Oat Hay Pasture is located on the western edge of the ORVMA. Steep slopes occur to the east and south, giving way to mesa tops. Soils consist of Diablo clay, Diablo-Olivenhain clay complex, Olivenhain cobbly loam, and Linne clay loam. This pasture has a south to east aspect. Vegetation includes annual grasses on the mesa and coastal sage scrub and occasional maritime succulent scrub on the slopes.

The perimeter fencing is in good condition, but the fence along Wolf Canyon requires some minor repair. There is only one water source (Existing A) in the northeastern portion, thus limiting livestock distribution. An additional water source (New D) should be established in the southern portion of the pasture to improve foraging patterns.

4.1.6 Horse Pasture

Horse Pasture is located on the southwestern edge of the ORVMA and lies south of Otay River. This pasture mostly consists of annual grassland. It currently contains horses, and is used as a working pasture for livestock. Oat hay is grown in this pasture for summer feeding. Soils consist of Stockpen gravelly clay loam and Diablo clay. It has level topography with no distinct aspect.

Fence repair/upgrade is required for most of this pasture. Because it is part of the proposed Preserve, continued maintenance of these fences would help define the Preserve boundary during and after proposed development. Access to other pastures should be established.

This pasture has one water source (Existing B) in the eastern portion near the house. It is in good condition and does not require repair at this time.

4.1.7 Bird Ranch Pasture

Bird Ranch Pasture is located in the southwestern portion of the ORVMA, south of Oat Hay and Wolf Canyon pastures. Drainage runs south-to-north. Bird Ranch Pasture supports mostly non-native grassland with patches of coastal sage scrub. Soils consist of Diablo clay, Olivenhain cobbly loam, and Olivenhain loam.

Except for the portion of fenceline common with House Pasture, repair/upgrade of fence lines does not appear necessary at this time. The entire pasture is located within the proposed Preserve. Continued maintenance of existing fences would help define the Preserve boundary during and after proposed development.

This pasture has one water source (Existing B) in the north-central portion. No new water sources are proposed at this time.

4.1.8 River Valley East Pasture

The River Valley East Pasture is located in the south-central portion of the ORVMA and contains the Otay River drainage. This pasture is highly diverse in vegetation, containing coastal sage scrub, maritime succulent scrub, tamarisk scrub/mule fat scrub, annual grasslands, and a mix of annual grassland and coastal sage scrub. Soils include River wash, Olivenhain cobbly loam, Terrace escarpment, Salinas clay loam, and Huerhuero loam. The pasture drains east to west as part of the Otay River and has level topography. This entire pasture area is part of the proposed Preserve.

Most of the pasture area is adequately fenced, but improvements need to be made along the eastern fence line. No cross-fencing is required at this time, but holding pens may eventually be required near the existing water source at the southeast corner. The following section recommends subdivisions of this pasture to restrict grazing in riparian habitat.

Water availability is not a concern throughout most of the year. There are large pools of water in the channel, however, that could be hazardous to livestock. It is recommended that these areas be fenced off to prevent injury or death to livestock and humans. Adequate access to the river should be developed. This includes gentle slopes to the river or to large pools, and clearing of exotic and invasive vegetation along the river. Having safe or clear access along the river would prevent animals from injuring or drowning themselves. Continued maintenance of these fences would help define the internal Preserve boundary for the Preserve both during and after proposed development.

4.1.9 Mesa Pasture

Mesa Pasture is located north of River Valley East Pasture below the main farm land on the mesa. It consists of coastal sage scrub, maritime succulent scrub, and non-native grassland vegetation communities. Soils consist of Diablo clay, Olivenhain cobbly loam, Olivenhain loam, and Linne clay loam. This pasture drains north to south into Otay River.

Repair/upgrade of fence lines does not appear necessary at this time. It appears that portions of the proposed Preserve are located within this pasture and portions are targeted for habitat revegetation or

restoration (DUDEK 1995b). Continued maintenance of these fences would help define the Preserve boundary during and after proposed development.

This pasture has one water source in the northwestern portion. A new water source (New E) should be developed in the east to promote proper livestock distribution.

4.1.10 Vernal Pool Pasture

Because of its sensitive status, Vernal Pool Pasture is discussed in the following section on Preserve Management Goals and Recommendations.

4.2 PRESERVE MANAGEMENT GOALS AND RECOMMENDATIONS

Special Management Areas are designated within the ORVMA and require seasonal grazing restrictions during the time of year they are most sensitive to grazing impacts. There are 12 proposed new pastures and subpastures that could be developed in order to protect biological resources in the ORVMA and better manage grazing. Most of these new pastures/subpastures would be created by erecting new fencing where cattle currently graze, resulting in subdivision of several existing pastures. The concept is to create smaller and more manageable pasture areas to facilitate protection of biological resources and implement rotational grazing. Of the 12 proposed pastures, ten are considered ecologically sensitive and will require special management strategies. They include Vernal Pool (9a,b), River Valley West (subpastures 10a-c), and River Valley East (subpastures 11a-c). O'Neal (subpastures 12a-c) and Salt Creek pastures also require seasonal grazing restrictions, as discussed above, because they support coastal California gnatcatcher (*Polioptila californica californica*). Also discussed in this section are two proposed pastures that do not contain significant sensitive resources, but would enhance the overall management of grazing: Johnson Canyon and Farm pastures.

4.2.1 Vernal Pool Special Management Area

Vernal pools are located on the southern end of the ORVMA. They occur in pastures 9a,b and O'Neal (*Figure 4*) and the pools are included in the Vernal Pool Preserve (DUDEK 1995a). Federal and private property are adjacent in the south, while steep hillsides leading to the Otay River (Johnson Canyon) lie to the north. The southern portion of pasture 9a is proposed for development.

Vernal pools are formed on mesa tops with level topography and in soils having high clay content (e.g., Stockpen gravelly clay loam). These pool areas support vegetation communities dominated by coastal sage scrub and annual grasslands. Others are located in an area historically used as a bombing range.

Vernal pools are considered one of the most sensitive resources in San Diego County and, as wetlands, are regulated by the California Department of Fish and Game and federal resource agencies (U.S. Army Corps of Engineers and U.S. Fish and Wildlife Service [USFWS]). Because of this concern, timing of any grazing activity should be carefully scheduled to avoid impacts. In the winter and spring the vernal pools are extremely vulnerable to damage from livestock walking through wet pools and leaving depressions and probably drinking from, and urinating and defecating in, pools. These disturbances cause increased turbidity and possible decreased potential for plant and fairy shrimp (*Branchinecta sandiegonensis* and *Streptocephalus woottoni*) reproduction.

Grazing should be eliminated in pastures 9a,b and the southern portion of O'Neal Pasture (refer to discussion below) at the onset of winter rains through summer when plants have set seed and senesced

(generally by early summer). Restriction of grazing shall begin in late 1995-early 1996. Either fencing of the Vernal Pool Preserve or elimination of grazing on Otay Mesa will be required to implement this recommendation. Seasonal restriction of grazing in vernal pool areas would serve two purposes: (1) it would provide protection for the pools during the critical wet period of the year; and (2) it would provide necessary summer forage for livestock. Grazing in the summer and fall would reduce the amount of aboveground biomass (forage). Removal of vegetation by grazing around the pools should have a positive effect on the amount of runoff that occurs within vernal pool watersheds. With less forage to intercept rainfall, more precipitation would be available as runoff. It would be beneficial and worthwhile to evaluate this hypothesis by establishing exclosures around some vernal pools to determine the effect of removing grazing from the area. If it has a positive effect on the vernal pools, livestock could then be used as a interim tool to better manage these highly sensitive resources. On the other hand, if the vernal pools in the exclosures demonstrate higher quality, cattle should be excluded from vernal pool areas altogether.

Over the long-term, grazing activities and permanent removal of cattle within the Vernal Pool Preserve should be coordinated with restoration activities set forth in the Vernal Pool Management Plan (DUDEK 1995a). It is anticipated that grazing will be permanently eliminated from the Vernal Pool Preserve prior to initiation of restoration activities.

There are remnants of an old fence line along the north mesa rim. This fence line, which is common with Johnson Canyon Pasture, must be rebuilt for proper management of this pasture. This fence should connect at the corners of the main property line. Once development begins in the south, fencing should be constructed between the developed area and the vernal pools. At that time, all grazing should be eliminated from this area.

4.2.2 River Valley West Pasture

Vegetation in River Valley West Pasture (divided into subpastures 10a-c) consists of mule fat scrub/tamarisk scrub with annual grasses. This pasture supports Salinas clay loam and River wash soils. It may flood during the winter and spring, putting livestock at risk if they are allowed access during these times. The best use of this pastures would be as a summer feed and calving area (shade, shelter, and cover make them appropriate areas).

To restrict grazing in this pasture, new fencing would need to be constructed to create the subpastures. There is existing fencing in good condition along the southern boundary of the proposed subpastures, but new fencing would need to be constructed along the river channel on the northern boundary of subpastures 10a and 10c to prevent livestock access to the channel. The existing fence on the northern border of subpasture 10c needs repair. Cross-fences to separate the subpastures and gates connecting the three subpastures would need to be installed.

Otay River should supply ample water for livestock. Care needs to be taken that new access points are safe and do not have steep cliffs that would prevent livestock from emerging from the water.

4.2.3 River Valley East Pasture

To create the subpastures and restrict grazing in the existing River Valley East Pasture, new fencing would need to be constructed along the river channel on both the northern and southern boundaries of proposed subpastures 11a-c to prevent livestock access to the channel (Figure 4). Cross-fences would be needed between the three subpastures. There is an existing fence that needs repair

separating subpasture 11c and O'Neal subpasture 12a. Gates connecting the three pastures also would need to be installed.

Otay River should supply ample water for livestock. Care needs to be taken that new access points are safe and do not have steep cliffs that would prevent livestock from emerging from the water.

4.2.4 Salt Creek Pasture

Salt Creek Pasture is located in the eastern portion of the ORVMA. This pasture contains coastal sage scrub, maritime succulent scrub, annual grasslands, and a mix of annual grassland and coastal sage scrub. Soils consist of Huerhuero loam, Olivenhain cobbly loam, Salinas clay loam, and Diablo clay loam. This pasture drains east to west as part of the Otay River. The pasture has level topography in the drainage, giving way to steep slopes on the east and west sides. Most of the pasture is part of the proposed Preserve.

Much of the pasture is fenced. Minor repairs and gate replacements are recommended. Improvements need to be made along the east and west fence line. New cross-fencing is required at the mouth of Salt Creek to create this pasture; currently, there is no fence in this area. A new fence would aid both in managing livestock distribution and protecting sensitive biological resources. For example, the coastal California gnatcatcher is abundant in this area. Exclusion of livestock during the nesting season (March-August) would prevent impacts to nests and young. The pasture would be available for grazing during the late summer (August) through winter (up to mid-February).

Available water is a concern in this pasture. New water sources (New E & F) should be developed in the north and south portions of the pasture. The southern source could be combined with the O'Neal, Mesa, and Farm pastures where they meet. Continued maintenance of these fences would help define the internal Preserve boundary both during and after the proposed development.

4.2.5 O'Neal Pasture

O'Neal Pasture is located in the southeastern part of the ORVMA. This pasture contains coastal sage scrub, mule fat scrub, maritime succulent scrub, and annual grasslands. Soils consists of River was, Huerhuero loam, Olivenhain cobbly loam, Visalia gravelly loam, Salinas clay loam, and Terrace escarpment. This pasture has relatively level topography and drains from east to west. The entire pasture is in the proposed Preserve. While much of the pasture is fenced, minor repairs and gate replacements are needed along the west and east fence lines. A new cross-fence would be required at the mouth of Salt Creek (south end of Salt Creek Pasture) to create O'Neal Pasture. This fence would aid in managing livestock distribution and protecting sensitive species. For example, the coastal California gnatcatcher is abundant in this area and exclusion of livestock during the nesting season would prevent impacts to nests and young. The pasture would be available for grazing from the late summer (August) through winter (to mid-February). Water sources are lacking in this area and new sources would need to be developed (New E & G). The northern source could be combined with the Salt Creek, Mesa, and Farm pastures where they intersect. Long-term maintenance of these fences would help define the internal Preserve boundary.

Subdivision of the pasture into subpastures (12a-c) to restrict grazing in the riparian zone is recommended. They flood during the winter and spring, putting livestock at risk if they are allowed access during these times. The best use of these pastures would be as a summer feed and calving areas (shade, shelter, and cover make them appropriate areas).

To restrict grazing in these subpastures, new fencing would need to be constructed along the river channel on both the northern and southern boundaries of subpastures 12a-c to prevent livestock access to the channel. Cross-fences would be needed between the three subpastures. There is an existing fence that needs repair separating subpasture 12a and River Valley East subpasture 11c. Gates connecting the three pastures would need to be installed. Cattle could be rotated in a deferred pattern (described later) to relieve grazing pressure on riparian habitat in this pasture. Grazing in each subpasture would occur every third year.

Otay River should supply sufficient water for livestock. Care needs to be taken that new access points are safe and do not have steep cliffs that would prevent livestock from emerging from the water.

4.2.6 Johnson Canyon Pasture

Johnson Canyon Pasture is located in the southern portion of the ORVMA. This pasture contains coastal sage scrub, annual grassland/coastal sage scrub mix, annual grasslands, tamarisk scrub, and maritime succulent scrub. Soils consist of Olivenhain cobbly loam and Diablo clay. Johnson Canyon Pasture is part of the Otay River Valley, and drains south to north. The pasture has a northern aspect and level topography in the valley, rising to hills to the south. The entire pasture is part of the proposed Preserve.

Much of Johnson Canyon Pasture is fenced along the valley. Minor repairs and gate replacement are recommended. Improvements need to be made along the east and west fence line. New fencing is required along the mesa rim adjacent to the Vernal Pool Pasture. This fence would aid in managing livestock distribution and protecting sensitive biological resources. Vernal pools require protection during the wet season (typically from December until they dry in late spring).

Water resources are lacking in this pasture except during the wet season. Because of the linear nature of the pasture, new water sources should be developed in the west (New H) and east (New I) to promote better livestock distribution. Continued maintenance of these fences would help define the internal Preserve boundary for the proposed Preserve both during and after proposed development.

4.2.7 Farm Pasture

Farm Pasture is located west of Salt Creek Pasture on the mesa. It has rolling topography with a southeast aspect. Vegetation is predominantly oat hay pasture. This pasture is not currently grazed. The cattle operation would benefit if grazing were allowed to occur during the winter and spring months to alleviate grazing pressure on some of the more sensitive pastures: e.g., Vernal Pool; River Valley West and East; O'Neal; and Salt Creek. This pasture could be used to grow hay for either summer use or grazing during the winter. If grazed, new water sources would need to be developed (New E & J), and fence repairs and maintenance would be necessary. Because of lack of shade, cover also would need to be constructed.

4.3 GENERAL MANAGEMENT RECOMMENDATIONS

According to the RMP, cattle exclusion is desired on the Ranch. Removal of cattle from the ORVMA could occur at any phase of the build-out. However, removal of cattle from the ORVMA would increase fine flashy fuels (grasses) and fire fuel load (tons of fuel/acre). Assuming fire is a threat, livestock could be used as an interim management tool to reduce fine flashy fuels that are easy to ignite. This should be considered a significant benefit because of the high amount of illegal alien

activity and off-road vehicle traffic that takes place as a result of Border Patrol activity and other human activities (i.e. hunters, trash dumpers, etc.). Prescribed burning should be considered an effective means of fire control in conjunction with range management.

4.3.1 Forage

Annual grasslands lend themselves to a high intensity/ short duration grazing pattern. This involves rotating one herd (numbers would vary depending upon available forage for grazing) through each of the pastures. A proper rotation schedule would allow each pasture to be grazed two to three times per year, except where the presence of sensitive biological resources restrict access (e.g., vernal pools, riparian habitat, coastal sage scrub occupied by coastal California gnatcatchers or cactus wrens [*Campylorhynchus brunneicapillus*]). Forage production should be monitored on a quarterly basis.

4.3.2 Fencing

The cross-fencing in ORVMA generally is in good condition, as is the perimeter fence except where noted. The recommended new fencing would be needed to isolate the riparian corridor and vernal pools on the southern portion of the ORVMA. Existing dirt roads should be maintained, and creation of new roads avoided as much as possible.

4.3.3 Water Sources

Water sources should be developed and/or enhanced to provide better distribution of livestock for the ORVMA. Currently, the lack of water sources in the ORVMA limit livestock distribution. New water sources would benefit livestock in the short-term and provide water in the future for the proposed Preserve.

It is recommended that water sources be provided for new pastures as those pastures are fenced. New source A should be provided first because it would enable multiple use of several pastures.

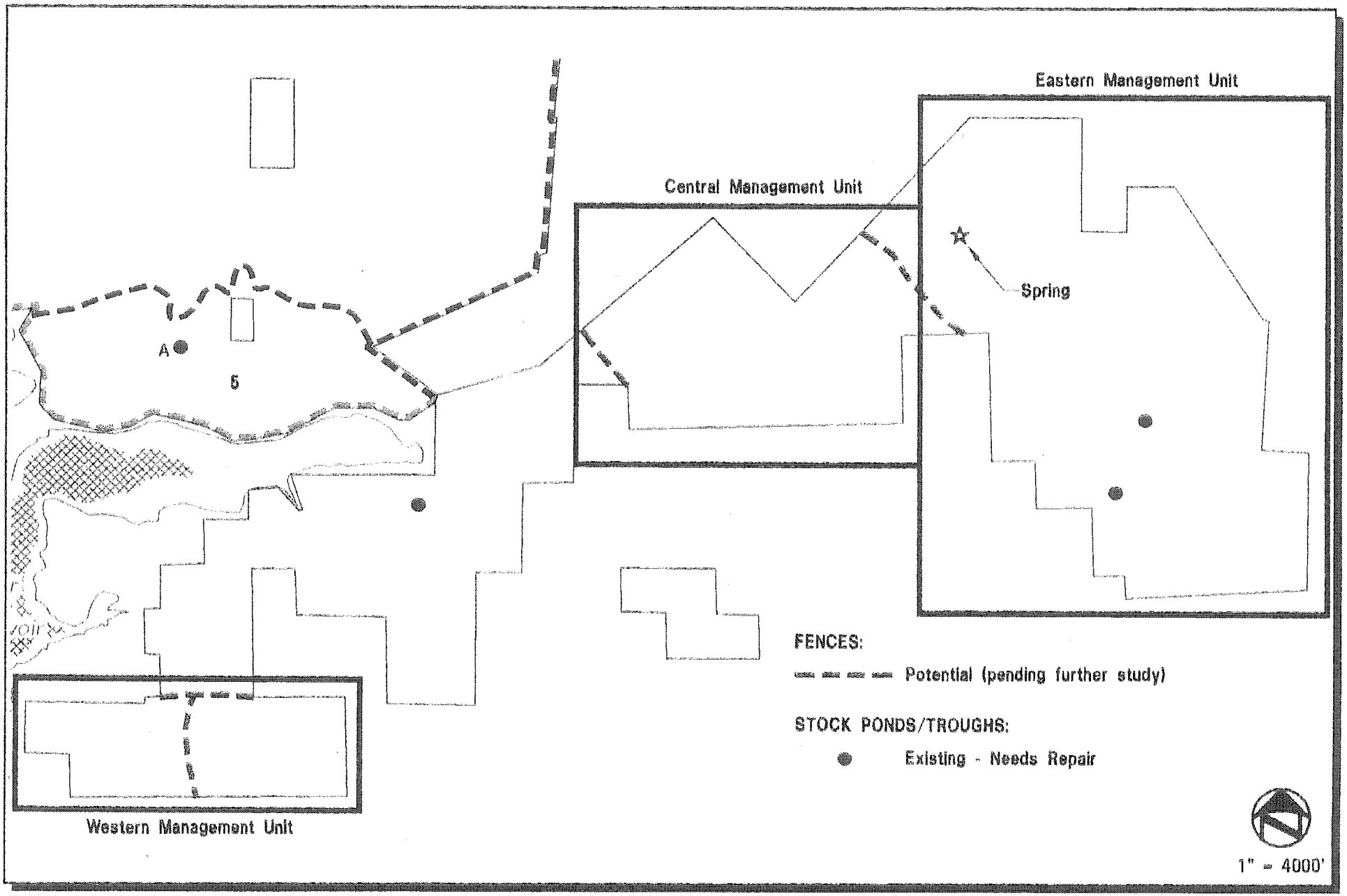
One method for establishing new water sources is to import water by trucks to fill portable stock tanks. Water tanks for livestock could be attached to the water trucks, thereby increasing mobility. Portable water sources should be used to provide water to the Vernal Pool Pastures since permanent sources may not be feasible. However, vehicles would need to be unattended which increases the risk to vandalism and theft.

5.0 SAN YSIDRO MANAGEMENT AREA

The SYMA is located in the easternmost portion of the Ranch, east of the Otay Lakes and south of the Otay Lakes Road. The San Ysidro Mountains are in the southeast portion of the Ranch, and Otay National Cooperative Land and Wildlife Management Area lies to the south. It consists of approximately 5,555 acres. It has highly irregular borders making it difficult to fence. To help better manage the San Ysidro Management Area, it has been divided into three management units: Eastern, Central, and Western (*Figure 5*).

5.1 EASTERN MANAGEMENT UNIT

Use of the Eastern Management Unit of the SYMA is greatly constrained by the proposed intermixing of full development and restricted development areas. The proposed Preserve area occupies a majority



Otay Ranch Range Management Plan

San Ysidro Management Area - Potential Pastures

FIGURE 5

of the western portion of the Eastern Unit. Vegetation in the proposed development area consists of coastal sage scrub, southern coast live oak riparian forest, chamise chaparral, annual grassland/coastal sage scrub mix, native grassland/coastal sage scrub mix, and non-native grassland. The proposed Preserve area supports coastal sage scrub, southern coast live oak riparian forest, chamise chaparral, non-native grassland/coastal sage scrub mix, native grassland/coastal sage scrub mix, coastal sage scrub/mixed chaparral, mixed chaparral/ southern interior cypress forest, and southern interior cypress forest. Most of the area has an eastern or northern aspect. Soils are greatly diverse, ranging from San Miguel-Exchequer rocky silt loam, to Olivenhain cobbly loams, Friant fine sandy loam, Chino fine sandy loam, Anderson very gravelly sandy loam, and Escondido very fine sandy loam.

Fencing this area would be very difficult because existing fences are in poor condition. Water sources do occur in the area, but need much improvement (cleaning, dam repair, etc.). Cattle are currently in the area, but lack of appropriate fencing makes it difficult to manage their distribution. Cross-fencing and establishment of smaller pastures might be feasible; however, the lack of information on fencing for this area makes any recommendations on new fencing and management strategies difficult. Further examination of the status of fences and water resources is warranted.

5.2 CENTRAL MANAGEMENT UNIT

The Central Management Unit is narrow and constrained by numerous proposed Preserve corridors. Vegetation communities are coastal sage scrub, chamise chaparral, non-native grassland/coastal sage scrub mix, coastal sage scrub/mixed chaparral, coastal and valley freshwater marsh, and southern interior cypress forest. Soils are San Miguel-Exchequer rocky silt loam and Olivenhain cobbly loams.

New fencing for this area would be very difficult to establish and many existing fences are in poor condition. It would be cost-prohibitive to fence along Preserve boundaries in this pasture. Water sources are lacking and piping or trucking in water would be necessary. Cattle are currently using the area, but lack of appropriate fencing makes it difficult to manage distribution and rotation patterns. Cross-fencing and establishment of smaller pastures might be advisable. However, the lack of information regarding fencing, conditions of water sources, and existing boundaries makes any recommendations on new fencing and water resources difficult. Further examination of the status of fences and water resources is warranted.

5.3 WESTERN MANAGEMENT UNIT

The Western Management Unit mainly is comprised of proposed Preserve areas. Vegetation communities present are coastal sage scrub, chamise chaparral, southern interior cypress forest, mixed chaparral/coastal sage scrub, mixed chaparral/southern interior cypress forest, mixed chaparral, and mixed chaparral/chamise chaparral. The dominant soil in this unit is San Miguel-Exchequer rocky silt loam.

Fencing this area would be very difficult and many existing fences are in poor condition. Water sources are lacking and piping/trucking in water would be necessary. Cattle are using the area, but lack of appropriate fencing makes it difficult to manage distribution and rotation patterns. Cross-fencing and establishment of smaller pastures would be advisable. A wildland fire in 1994 destroyed much of the existing fence. This fence would need to be replaced before any new fencing could be installed. Furthermore, lack of information on water resources, proposed Preserve boundaries, and lack of boundary fencing makes any recommendations on new fencing and water resources difficult. Further examination of the status of fences and water resources is warranted.

5.4 PRESERVE MANAGEMENT RECOMMENDATIONS

Grazing may continue in the SYMA in existing locations and at existing stocking levels prior to conveyance of land to the Preserve.

5.5 GENERAL MANAGEMENT RECOMMENDATIONS

General management recommendations assume that grazing would be continued in the SYMA for the foreseeable future. The following recommendations would help facilitate grazing management, but should be viewed in light of the uncertain future for grazing in the area.

5.5.1 Fencing

New perimeter fence needs to be developed or identified for all pastures. The irregular shape of the boundary, however, would make fencing difficult and expensive. The fire in 1994 destroyed much of the perimeter fence requiring this fence to be rebuilt. Until then, determining appropriate new cross-fencing would be difficult. Grazing should continue as is until a final build-out schedule is provided.

Major sections of the proposed Preserve area should have fencing built if not already done. This would allow the range manager to better control grazing in the Preserve area.

5.5.2 Water Sources

Water sources are not well developed in the western unit of the SYMA. New water sources would need to be developed to better enhance cattle distribution.

The central unit has one reservoir, but the majority of the area is comprised of proposed Preserve. Because of the extensive division of Preserve boundaries, fencing to separate Preserve areas from approved development areas would not be economically feasible. Continued grazing under the existing program is advisable.

The eastern unit is divided into proposed development and Preserve areas. A new fence should be constructed to separate the Preserve and development areas. The remaining areas that have Preserve areas adjacent to developed areas should be managed according to existing conditions. Water tanks for livestock could be attached to the water trucks, thereby increasing mobility. Portable water source should be used to provide water because development of permanent sources may not be feasible. However, vehicles would need to be unattended, which increases the risk to vandalism and theft.

6.0 RANCH-WIDE GENERAL RECOMMENDATIONS

6.1 FORAGE

Standing crop (available erect forage) has not been measured for any pastures on the Ranch. Stocking rates based upon standing crop and forage production should be established. Forage production in annual grasslands is highly dependent upon rainfall. Therefore, proper stocking rates in these pastures are subject to quarterly analysis for determining stocking rates and rotation of livestock in pastures.

Establishing one to three exclosure pens (10' x 10') in each pasture would help the range manager obtain forage clippings for determining forage production. This should be done for several years to

help determine the variation in range production, as well as residual dry matter levels *(refer to Section 6.4 ADDITIONAL MANAGEMENT METHODS)*.

6.2 FENCING

Fencing is a vital component of any ranch management operation because it benefits cattle distribution and rotational grazing. Currently, the Ranch has a reasonably comprehensive fencing network. However, substantial segments of the existing fencelines in each of the management areas need repair. Also, new interior and cross-fences are recommended to facilitate rotational grazing. Although substantial costs for new fencing would be incurred, return for the cost should be recovered over several years by increasing the selling weight of livestock in a shorter period of time. Furthermore, existing and proposed fencing in many areas reflect the proposed Preserve boundaries and thus ultimately would serve to protect biological resources over the long term.

6.2.1 General Recommendations

Some of the beneficial aspects of fencing listed by Vallentine (1989) are:

- Establishment of permanent boundary lines
- Rotation, deferment and resting of land
- Seasonal regulation of use
- Regulation of stocking rate
- Better distribution of grazing
- Reduction of labor required for handling stock
- Exclusion of livestock from dangerous areas
- Protection of restoration and/or sensitive vegetation areas
- Increased cattle productivity through better management

Fence construction and location also are very important. An improperly placed fence can result in soil erosion, escaped livestock, and poor range utilization. Fence recommendations will vary with class of livestock, type of range, and proposed use.

Several factors should be considered during fence construction (Vallentine 1989):

- Provision for the best distribution of livestock around water
- Assurance that adequate water currently exists or can be provided
- Separation of range sites where feasible, particularly where different management styles will be required

- Provision of adequate pasture to carry out grazing systems
- Completion and repair existing fencing
- Avoidance of interference with fire breaks, roads, trails, and general operations
- Prevention of livestock trailing along erosive areas
- Placement of division fences along ridges where possible for best distribution of grazing.

6.2.2 Specific Recommendations

The conventional barbed-wire fence is the predominant type of fence on the Ranch. Four to five strand barbed-wire fence has been utilized for both past and current fencing requirements. Based upon experimental and rancher use (Halff 1957; Hoffman et al. 1964; R. Moore et al. 1968) suspension fence may be feasible for some parts of the Ranch where new fencing has been recommended. Suspension fence has been shown to have several advantages over traditional barbed-wire fence, including approximately 200 fewer posts/mile, material costs up to one-third less than that of a standard fence, a savings of up to 50 man-hours/mile when wooden posts are used or 12 man-hours/mile when steel posts are used, less maintenance for breakage (this might be important with the high illegal alien activity), and more durable than standard barbed wire when properly constructed and maintained. Suspension fences are most suitable for level to rolling terrain and uniform slopes; they are less suitable for steep slopes.

Movement across the Ranch by illegal aliens should be considered in operation the Ranch. The continuing problem of cut fences and opened gates makes it difficult to deal with the migrants. Two methods to help reduce the number of occurrences of cut fences and opened gates are: (1) providing wood or steel rail fences at the most common crossing areas to lower the risk of torn clothes; and (2) installing rail cattle guards at existing gate locations on the interior gates of the Ranch to help eliminate gate damage or leaving gates open. Other methods available include using "S-shaped" fence designs that allow a person to weave through but preclude cattle in areas with high pedestrian traffic.

6.3 WATER SOURCES

Existing water sources should be improved or new sources developed in several pastures to provide better distribution of livestock. Currently, the lack of water sources in the ORVMA and JMMA limit livestock distribution. New water sources would benefit livestock in the short term and provide water in the future for the proposed Preserve.

Establishing one water source for several pastures at a location where they meet can reduce costs while improving cattle distribution. For example, in the ORVMA, moving the fence of Ranch House, Wolf Canyon, and Oat Hay pastures to include the existing water source would provide water to these three pastures without requiring new construction of water sources. Other groupings in the ORVMA that could utilize a common water source include O'Neal, Mesa, Farm, and Salt Creek pastures, and Horse and Bird Ranch pastures. The JMMA also would benefit by grouping Windmill, C-1, and C-3 pastures and C-2 and Reservoir pastures. These minor changes in fencing arrangements would result in more efficient use of water sources and improve cattle distribution.

6.4 ADDITIONAL MANAGEMENT METHODS

Several grazing systems have been developed to enhance forage production on rangelands. At least five factors need to be evaluated when choosing a grazing system in annual grasslands: (1) the type of plant(s) present; (2) the physiology and life history of the plant(s); (3) soil conditions (to control erosion, puddling, etc., that may result from heavy grazing); (4) benefit or detriment to animal gain; and (5) practicality for the ranching operation.

6.4.1 Annual Grasslands

Relatively little research has been conducted on annual grasslands compared with perennial grasslands. Research on perennial grasslands probably provides little value to management of annual grasslands. Nonetheless, some generalizations about grassland management can be drawn. Grazing systems generally should be designed to improve range condition, plant vigor, and seed production and establishment. Ultimately, proper grazing management in annual grasslands potentially can increase forage yield, livestock production, and species composition. However, the typical life cycle of annual grasses (high forage production in a short period of time) lends itself to a high intensity/short duration grazing scheme. This involves one herd being rotated through different pastures. As forage is reduced, the herd is moved to the next pasture. This rotation period could be as short as 15 and as long as 30 days, depending upon available forage, size of pasture, and number of livestock. As forage production decreases throughout the pastures, livestock would either be sold, moved to other areas, or supplemented with feed.

6.4.2 Grazing Options

The Mediterranean climate of southern California provides three basic grazing options for consideration: (1) continuous grazing (CG); (2) four pasture/three herd (4P/3H); and (3) many pasture/one herd (MP/1H). The CG option utilizes one large pasture with one herd of livestock. The 4P/3H option takes a large pasture and divides it into four pastures of generally equal forage value. Livestock are then divided into three herds and rotated among the pastures so that one pasture is always at "rest" or deferred. This allows vegetation to recover, and over time can increase the quality of the pastures. The MP/1H option takes a large pasture and divides it into several pastures. One herd is rotated among the pastures for 15 to 30 days depending upon the stocking rate. With each of these grazing systems, there is the option of grazing on a seasonal, year-long, or deferred rotation basis.

Continuous Grazing

Continuous grazing on the Ranch would not be efficient on annual grasslands because of the many existing small pastures and the uneven, localized distribution of water sources. This system is not recommended for the Ranch.

Four Pasture/Three Herd Grazing System

The 4P/3H grazing system allows herbage recovery over time for rangelands in a degraded state. Three separate herds of cattle are place in three pastures for three months and then rotated to the next pasture. Each pasture is grazed for nine months, allowing three months of rest. A variation of this rotation scheme allows each pasture at least one month of rest during the months of January, February, March, or April. Using this rotation scheme, the range manager could take advantage of rainfall providing a second opportunity to graze a second forage crop. Stocking rates should be increased from December

through May to take advantage of the growing season. Stocking rates for June through December should be reduced because of reduced forage quality during the dry season, or be supplemented with hay or commercial feed.

Many Pasture/One Herd Grazing System

The MP/1H grazing system involves many pastures being rotationally grazed by one herd throughout the year. The goal is to put cattle in each pasture for 15 to 30 days, depending upon pasture size and available forage. This would allow high intensity use of green available forage. This system has shown in perennial grass that higher than normal stocking rates can be achieved. However, it is not known if this would apply to annual grasslands or that it would be desirable.

The existing fencing patterns on the Ranch in the ORVMA and JMMA are most suitable for a MP/1H (one herd for each management area). Using such a system may yield less impact near the water sources, reduced fence costs, and better distribution of cattle.

Many Pasture/One Herd-Modified

Another potential grazing system is a MP/1H-modified scheme. This is a variation of the MP/1H that includes monitoring of standing crop. When standing crop reaches 50 percent utilization, livestock are rotated to the best available pasture. When standing crop reaches 50 percent in that pasture, livestock are moved to the next best available pasture, and so on. Continuous monitoring of standing crop is required to implement the MP/1H-modified scheme.

Current practices on the Ranch include using a modified rotation system which has several herds rotated among the various pastures. Increasing the number of pastures by subdividing existing pastures or incorporating farm land would not necessarily increase the number of livestock that could be put on the Ranch (which likely is not desirable in any case). It would, however, allow for better utilization of existing forage by increasing distribution of livestock throughout the Ranch. Livestock naturally congregate at certain points such as valley bottoms, low saddles between drainages, areas around watering holes, and level mesas. Steep areas, hillsides and areas far from water are often under-utilized. By putting more livestock in a smaller area and providing additional water/ mineral sources, cattle are more apt to move to these areas to find forage. Such a scheme also would allow more precise tracking and monitoring of the effect of livestock on biological resources.

Deferred Grazing

Deferred grazing is a general management scheme that delays grazing until after the most important plants have set seed. This generally applies to perennial grasslands rather than annual grasslands and generally cannot be recommended for the Ranch at this time. However, it can apply to the pastures containing riparian habitat. In this management plan, deferred grazing is combined with rotational grazing such that the riparian habitat subpastures are fenced separately within the larger pastures (River Valley West and East and O'Neal pastures). As the larger pasture is grazed, only one of the riparian subpastures is grazed, thus allowing each subpasture to be rested for two years between being grazed. Also, if grazing is removed from these pastures, fencing would have been established to exclude cattle and protect future riparian habitat restoration efforts.

6.4.3 Residual Dry Matter

Regardless of the grazing system utilized, some method of determining when to rotate herds is necessary. Because of the life cycle of annual grasslands and the variability in the timing and amount of rainfall in Southern California, forage production will vary year to year. Forage that is not grazed while green will become "residual dry matter" (RDM) (forage that is not grazed and is left standing). The amount of RDM that should be left in a pasture varies with geographical, soil, and livestock factors. Minimum RDM levels have been developed by the University of California Cooperative Extension (Clawson et al. 1982). Table 2 shows minimum recommended levels of RDM (pounds(lbs)/acre) that should be left depending upon slope. Each pasture should be evaluated to determine its specific levels.

TABLE 2
RECOMMENDED RDM IN POUNDS PER ACRE IN RELATION TO SLOPE

Lower/Flat Slopes	Average/Gentle Slopes	Upper/Steep Slopes
300-400 lbs RDM/acre	350-450 lbs RDM/acre	450-500 lbs RDM/acre

As described below, RDM can be determined using a visual method or weight determinations (forage clippings). Residual dry matter should be evaluated throughout the year.

6.4.4 Stocking Levels and Rates

Range managers have been trying to develop different management schemes to provide a better return on their investment (livestock) from grazing. Researchers (e.g., Pieper and Heitschmidt, 1988; Bryant et. al, 1989) have determined that the single most important variable in grazing management success or failure is stocking rate. Stocking rates for annual grasslands in Southern California will vary from year to year depending upon precipitation. Duration and timing of the rainy season and the yearly rainfall total will affect a range manager's decision on how heavily or lightly the pasture should be stocked (stocking level) and how long the pasture should be grazed (stocking rate). For this reason, specific recommendations for stocking levels and rates cannot be made; they depend on environmental factors that vary from seasonally and yearly.

Within each type of grazing scheme (CG, 4P/3H, MP/1H, MP/1H-modified), there are three stocking levels: light, moderate, and heavy. Stocking levels represent the number and kinds of animals that are utilizing an area. Stocking levels should be a reflection of the amount of RDM available prior to grazing or remaining after a grazing event.

For a visual determination of RDM, light grazing results in little or no patchy appearance. Standing plant material is three or more inches in height and small objects are obscured from view. Residual dry matter is approximately 800 lbs/acre. Moderate grazing results in a patchy appearance with minimal bare soil. Standing plant material is an average of two inches in height and small objects are obscured from view beyond 20 feet. Residual dry matter ranges from 400 to 700 lbs/acre. Heavy grazing results in extensive bare soil. Standing plant material is less than two inches in height and small objects and areas of bare soil are visible beyond 20 feet. Residual dry matter is less than 400 lbs/acre.

The other method for determining RDM is by means of clipping and weighing. To determine RDM, a square foot frame is randomly placed in specific range sites (sometimes in relation to soil types).

Vegetation is clipped as close to the ground as possible and any litter or shattered plant material is collected for weighing. Gram scales are used for weighing in the field. Air dry weights are satisfactory during the summer or fall. Any green or wet forage samples should be oven-dried for dry matter determination. Grams of RDM per square foot multiplied by a constant value 96 yields RDM lbs/acre (e.g., 15 grams per square foot x 96 = 1,440 RDM lbs/acre). Ten samples from each range site (or soil series) should provide an adequate number of samples for an accurate analysis of RDM. The range manager may need to experiment to determine the best RDM level for ranching operations.

It is necessary to evaluate remaining available standing crop during the dry season to determine "days grazing" remaining or available (i.e. stocking rate). The following formula can provide the range manager with an estimate of the "available residual standing crop" which is expressed as the number of days of dry forage remaining in a particular pasture.

$$\frac{\text{(Available Forage per acre - Desired RDM) x Acreage of Pasture}}{\text{No. Animals x 3\% of Average Body Weight}}$$

To use this formula, the range manager must know the amount of available forage per acre, daily amounts of forage consumed, amount of RDM desired, and the number and average weight of the cattle.

For example:

Available forage per acre	=	1,100 lbs
Desired RDM per acre	=	500 lbs
Pasture size	=	1,000 acres
Number of animals	=	300
Average weight of animals	=	600 lbs

Using the formula:

$$\frac{(1{,}100 - 500) \times 1{,}000}{300 \times (.03 \times 600)}$$

$$= \frac{600 \times 1{,}000}{300 \times 18}$$

$$= \frac{600{,}000}{5{,}400}$$

= 111 days of dry forage available

Stocking rate should be evaluated every three months by the use of grazing exclosures to determine the amount of forage available. These exclosures could be grouped in three individual exclosures (2'x 2') or be a single 10'x 10' exclosure in each pasture.

6.4.5 Prescribed Burning

Prescribed burning is an important management tool for any range management program. It is described as systematically planned burning of selected land areas when weather and vegetation favor a particular method and intensity to accomplish a particular goal (Vallentine 1989). The major benefit

of burning is the removal of old, dead material and increasing the palatability of new forage, improved grazing use and distribution, release of plant nutrients into the soil, rejuvenation of woody plants, and increased wildlife use (Vallentine 1989). Burning in southern California dates to the Native Americans who used it to produce new forage for attracting and increasing the visibility of game and for clearing areas for food plants. Currently, prescribed burning of chaparral habitats is practiced by wildlife managers to rejuvenate woody plants and bring them within reach of deer (Gibbens and Schultz 1962).

Prescribed burning in small patches (< 5 acres) is demonstrably beneficial to wildlife (Biswell et al. 1952). Pope and Wagstaff (1986) suggested that prescribed burning on public lands in the future will be less for increasing livestock forage and more for wildlife habitat, ecosystem management, and the maintenance of desired aesthetic qualities.

The use of prescribed burning of chaparral in California has been very limited; total fire exclusion in many areas has eventually resulted in extremely large and damaging wildfires. Biswell (1977) concluded that fire exclusion is a relatively new practice, and is unnatural in both forest and shrubland environments.

A prescribed burning program should be developed as a management tool alternative for the Ranch. A specific burning program would need to be developed for each potential burn site because local conditions vary. A burning program should include the following elements:

- Purpose of the burn
- Where to burn
- What to burn (size, particular habitat)
- When to burn (season)
- Environmental constraints (wind, fuel, moisture)
- A systematic plan

The need for and extent of prescribed burning on the Ranch depends on the status of the cattle operation in the future; it is unclear what level of grazing will be maintained as the Ranch is built out and Preserve lands are conveyed and managed. In the absence of grazing, a concerted effort to reduce the fuel load that will accumulate on the Ranch will be necessary. Failure to reduce fuel load, either through grazing or prescribed burning, may result in potentially dangerous and destructive wildfires. With the high level of illegal human activity present on the Ranch, ignition sources (e.g., camp fires, off-road vehicles, illegal shooting and hunting) have the potential to start frequent fires. A major problem with uncontrolled fires is the potential for type conversion of habitat if it is burned at frequent intervals. Without grazing or prescribed burning to reduce fuel loads, wildfires could travel at an accelerated rate making control difficult.

6.4.6 Water, Shade and Mineral Sources

Water and shade are necessary for proper dispersement of cattle in the pastures. Because cattle will concentrate around water and shade, providing more water and shade areas will result in better utilization of forage. Shade can be provided by erecting metal buildings or wooden structures. The structures should be open on three sides and should measure from 10'x 10' to 20'x 20'.

Mineral and salt blocks are essential for every pasture to aid in the movement and dispersal of livestock. This is an inexpensive method that would benefit livestock. Placement of these blocks should be away from watering or supplemental feeding areas. Livestock will seek out these blocks and forage while in the area. These blocks can be moved as the forage is used to better distribute livestock.

6.4.7 Exotic Plant Control

In order to improve habitat quality for wildlife, including threatened and endangered species, exotic plant control is essential. Two main plant species are of particular concern: giant reed (*Arundo donax*) and tamarisk (*Tamarix* sp.). These two species routinely are found in riparian habitats on the Ranch and have, in most cases, led to the degradation of the riparian systems.

Giant reed spreads primarily by sprouting from roots or stems containing nodes and has little value as wildlife habitat. Because giant reed has a high potential for spreading, it must be killed with herbicides or cut and dried thoroughly before disposal. Cutting can be a temporary repair in stand composition but is not a long term answer for control. Root kill must be achieved in order to kill giant reed. Giant reed can be cut any time with hand tools, but mechanized equipment is not recommended within 300 feet of any nesting habitat for the least Bell's vireo or other riparian birds during the breeding season.

Manual Techniques

There are five options for control of giant reed: cut and burn; cut and remove; cut, shred, and dispose in place; hand cut and spray; and selective cutting. All cuts should be sprayed with herbicide.

1) The cut and burn option is labor-intensive and can be done with either hand or mechanical equipment. Plants should be stacked and dried before burning. Stumps should be treated with herbicide within two minutes of cutting and regrowth treated with herbicide. This approach is recommended for small areas where desirable vegetation is to be preserved and labor is not a limiting factor.

2) Cut and remove is similar to cut and burn except that giant reed is disposed off-site. Plants removed in large quantities can be expensive and difficult to dispose of.

3) Cut, shred, and dispose of material in place is similar to cut and burn except that plants are shredded onsite by use of mechanized equipment. Stumps should be treated with herbicide within two minutes of cutting and regrowth treated with herbicide. Plants will decompose and native vegetation should begin to grow without any new action. Disposal of giant reed onsite eliminates the need to haul to offsite disposal areas. However, this operation cannot be conducted within 300 feet of nests of least Bell's vireo and other riparian birds during the breeding season.

4) Hand cut and then spray stumps with herbicide within two minutes of cutting. Giant reed can be left untreated at the time of cutting and then treated with herbicides before regrowth reaches 3-4 feet in height. Surviving vegetation should be treated within 12 months.

5) Selective cutting is often the approved method to protect native vegetation and migratory birds during the nesting season. Effective control can be achieved by treating stumps with herbicide within two minutes.

Herbicide Treatment

There are three methods for applying herbicides for giant reed: spray and cut; spray and burn; and spray only.

1) Spray and cut requires herbicide application to standing vegetation in late summer to early fall. Treatments with herbicides at other times has been shown to be less effective. Aerial application by helicopter for large blocks is recommended. Handheld application is appropriate for small blocks. Dead giant reed can then be shredded and left in place or removed. Any surviving plants and regrowth must be retreated during the next growing season.

2) The spray and burning of giant reed kills the plant and clears the ground for planting native vegetation or natural regeneration. Burning requires extensive equipment, personnel, and fire support.

3) Giant reed also can be sprayed and left in place. However, this technique often leads to die-offs of native vegetation as well.

Timing in the application of herbicides is important, and second and third treatments often are required. All regrowth should be limited to 6 feet in height and retreatment should occur for at least three years.

Tamarisk Treatment

Tamarisk can invade wetland habitat through disturbed soils. Once established, it displaces native plants by competing for water, nutrients, and also by secreting salts through its leaves, making the soil unsuitable for salt intolerant plants. This plant readily reproduces by both seed and roots re-sprouting following fire or cutting. There are only two methods for controlling tamarisk: cutting and stump treatment and foliar herbicide application.

Cutting and stump control requires that trees are cut and then an approved herbicide immediately applied to the stump. If the herbicide cannot be immediately applied, wait for re-growth and treat with a foliar herbicide.

Treatment with a foliar herbicide occurs during the growing season with Renovate or equivalent following the product label directions. Caution must be used when using this type of herbicide because it can kill desired native vegetation. Follow-up treatment by foliar spray must be done for a minimum of three years on surviving or established tamarisk. Treatment must be done during the growing season.

6.4.8 Brown-headed Cowbird Management

The brown-headed cowbird (*Molothrus ater*), which forages on insects disturbed by livestock, reproduces by "parasitizing" the nests of a variety of song birds (i.e., laying their eggs in nests of other species). Cowbird nest parasitism has had a severe impact on the decline of several species of birds in southern California, especially that of the least Bell's vireo. Cowbird trapping has been shown to significantly reduce the impact of cowbirds on these species.

Because cowbirds are common on the Ranch, a cowbird trapping program will be an integral part of Preserve management. Cowbird trap locations should be strategically located along the Otay River. Current locations would be located next to existing/known breeding locations for the least Bell's vireo. As habitat quality improves and vireo numbers increase, additional traps should be established to protect newly established territories.

There also is concern about potential impacts of cowbirds on nesting coastal California gnatcatchers. Surveys should be conducted to determine the level of cowbird parasitism on breeding coastal California gnatcatchers. If there is a substantial impact, then the POM may need to trap coastal sage scrub habitat supporting gnatcatchers.

Cowbirds traps should be operated from 15 April through 15 June. Once young are fledged, there is no need to continue operation of the traps. Existing trapping protocols adopted by the USFWS should be followed.

6.4.9 Economics

An economic inventory analysis should be conducted to evaluate cash flow requirements, capital required (short, intermediate, and long term), capital available (short, intermediate, and long term), and present inventory value (facilities, improvements, livestock, and equipment). This inventory would be beneficial in determining cost/benefit ratios for excluding cattle and the various stocking levels that can be economically applied on the Ranch prior to development or establishment of the Preserve. This would be helpful in determining when cattle should be removed from a particular area of the Ranch.

In this analysis, management and labor also should be included. Amount of management input and technical level should be discussed and calculated. Available labor (amount and type) should also be evaluated.

6.4.10 Management Support

There is a need to provide proper support for ranching operations. With the chronic impact from illegal activity, there appears to be the need to employ two ranch hands who would spend the majority of their time maintaining and building fences, and providing miscellaneous support. A full-time cowboy would tend to the daily cattle operation. Additional support would be required during labor intensive cattle operations (branding, shipping, medicating, etc.).

6.4.11 Proposed Research

Research should be considered in the following areas:

- Riparian restoration (as part of the riparian habitat restoration plan)
- Prescribed burning and recovery/restoration of native perennial grasslands
- Effects of summer grazing on vernal pool ecology

7.0 SUMMARY

Proper management of the biological resources on the Otay Ranch requires an understanding of many different ecological processes in operation. Properly implemented, cattle grazing on the Ranch can be a valuable management tool to help maintain and possibly enhance many of the areas. Grazing at light to moderate levels with regular rotation need not result in degradation of existing biological resources on the Ranch. This plan recommended new fencing and cross-fences that would enhance cattle distribution and benefit the Preserve as well as the management of the cattle operation. In addition, the need for repair and/or development of water sources was identified. Additional management techniques such as grazing options, determination of residual dry matter, prescribed burning, shade and mineral sources, and exotic plant and brown-headed control were described.

Specific objectives of the Preserve in relation to the cattle operation need to be established early in the Preserve management strategy. Specific management objectives of the Preserve and methods to achieve those goals are necessary in order to meet the long range needs of the Preserve and the cattle operation. These objectives need to be clearly stated and incorporate the many plans being developed for the Ranch. It is clear that pre-cattle ecological conditions cannot be recreated. Westman (1990) states, "attempts to maintain parklands in their current conditions or to return them to some vignette of primitive America are inevitably frustrated by both climate change and by changing patterns of human use of fire, air and water." Man has had a significant impact on the Ranch over many decades; complete and total removal of this influence (grazing) may not be in the best interest of the ecosystem. Rather, an adaptive management approach that considers the effects of a variety of uses of the Ranch must be applied.

8.0 ACKNOWLEDGMENTS

9.0 GLOSSARY

Cross-fence	Generally short fences that subdivide pastures into subpastures and allow for finer control of grazing patters and control of biological resources. A subtype of interior fence.
Grazing exclosure	A small rectangular area fenced off to prevent cattle grazing. Can be used as a control plot for measuring the effects of removing grazing or monitoring impact of grazing on standing crop adjacent to the exclosure.
Interior fence	Fences that separate internal pastures on the Ranch such that cattle can be restricted to certain areas of the Ranch, as opposed to perimeter fences that define the boundary of the Ranch parcels.
Pasture	Defined areas used for grazing. In the case of Otay Ranch, discrete locations demarcated by fences and gates that allow for control of grazing patters.
Perimeter fence	Fences that define the outside boundaries of the Otay Ranch parcels.
Range manager	The entity responsible for managing the daily cattle operation, such as implementing grazing options, stocking rates, stocking levels, and monitoring range condition.

Residual dry matter	Forage that is not grazed and is left standing.
Rotational grazing	The practice of rotating herds of cattle from pasture to pasture in order to rest pastures and allow for recovery of forage and protection of biological resources. Used to prevent overuse, maximize weight gain, and other forms of environmental damage.
Standing crop	The amount of erect forage available for grazing.
Stocking level	The level of grazing intensity in a pasture. Usually measured in the number and kinds of animals per unit area. Generally defined as light, moderate or heavy.
Stocking rate	The length of time a pasture is grazed.
Subpasture	A subdivision of a pasture defined by cross-fences. Allows refined control of grazing patterns to maximize the efficiency of range use and minimize adverse impacts on range quality and other biological resources.

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8

Otay Ranch

Phase 2
Resource Management Plan

Appendix F8
Otay Ranch Coastal Sage Scrub and Maritime Succulent Scrub Habitat Replacement Master Plan

APPENDIX F8

OTAY RANCH
COASTAL SAGE SCRUB AND
MARITIME SUCCULENT SCRUB
HABITAT REPLACEMENT
MASTER PLAN

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September 1, 1995

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1.0 INTRODUCTION

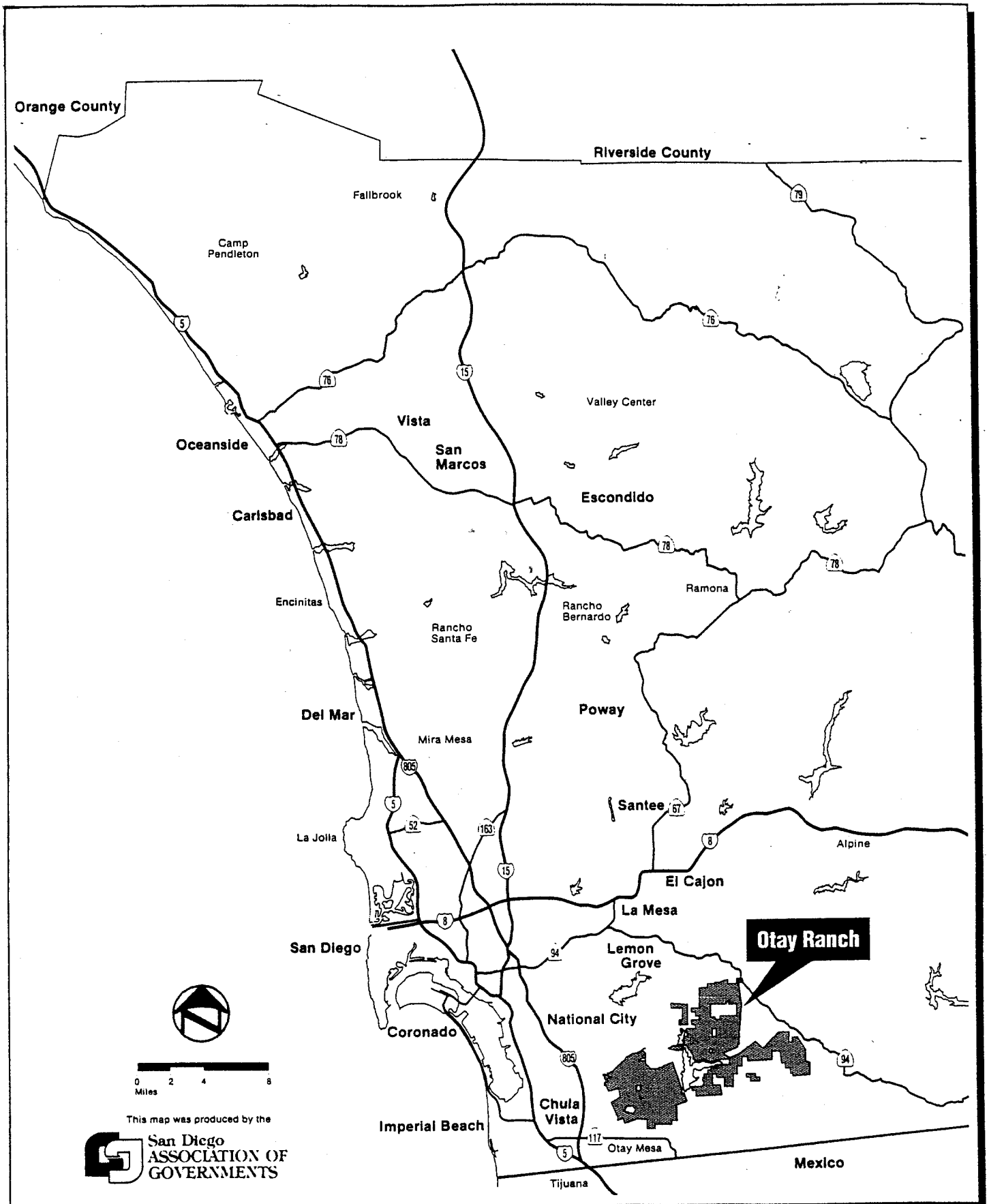
The Otay Ranch Habitat Replacement Master Plan for Coastal Sage Scrub and Maritime Succulent Scrub provides a basis for evaluating and monitoring ongoing coastal sage scrub (CSS) and maritime succulent scrub (MSS) habitat replacement activities during the buildout of Otay Ranch. The plan involves a comprehensive investigation of ranch-wide CSS/MSS replacement opportunities and development of an overall plan that ensures achievement of the 1,300 acres of CSS replacement and 57 acres of MSS replacement within Otay Ranch, as required in the Otay Ranch Resource Management Plan (RMP). Although this Master Plan has identified 2,010 acres of potential habitat replacement, only 1,300 acres will be treated under this plan. The Master Plan presents a coordinated program for phasing and implementing CSS/MSS replacement efforts. The preparation of this plan ensures that habitat replacement activities are carried out in a planned and coordinated manner that will be more efficient and cost effective over time.

This plan provides the initial evaluation of the locations for habitat replacement and the habitat goals of the replacement sites. It ensures that the policies and standards of the RMP are met. However, this plan should not be considered the final design and specific site methodology. When the habitat replacement process arrives at the actual treatment phase, a detailed plan will need to be prepared including the implementation pre-design plan and site-specific plant palette. Because the CSS/MSS replacement will take place over a number of years, it is anticipated that some changes may take place in the conditions of a potential habitat replacement site. Those changes will be incorporated into the predesign plans and specific revegetation site plans prior to the habitat replacement activities at the site, thus ensuring that the replacement site will receive the appropriate treatment and will achieve the appropriate goal.

The Otay Ranch Habitat Replacement Master Plan requires coordination with other plans and activities being prepared for the development of Otay Ranch including the Range Management Plan, the Vernal Pool Management Plan, the development of active recreation areas, the placement of the Nature Interpretive Center, and the restoration of native grassland areas. In some cases, other activities may be in conflict with this plan and modifications of the plan will be required.

The 22,899 acre Otay Ranch is situated within the unincorporated area of southwestern San Diego County (*Figure 1*). The ranch is located approximately 3.5 miles east of downtown Chula Vista and 13 miles southeast of downtown San Diego. The Final Program EIR for Otay Ranch concludes that approximately 12,566 acres contain sensitive habitats which includes 10,364 acres of CSS, 761 acres of disturbed CSS, and 285 acres of MSS (Ogden, 1992). For planning purposes, Otay Ranch is grouped geographically to form three distinct parcels: Otay Valley Parcel, San Ysidro Mountains Parcel, and Jamul Mountains Parcel (*Figure 2*).

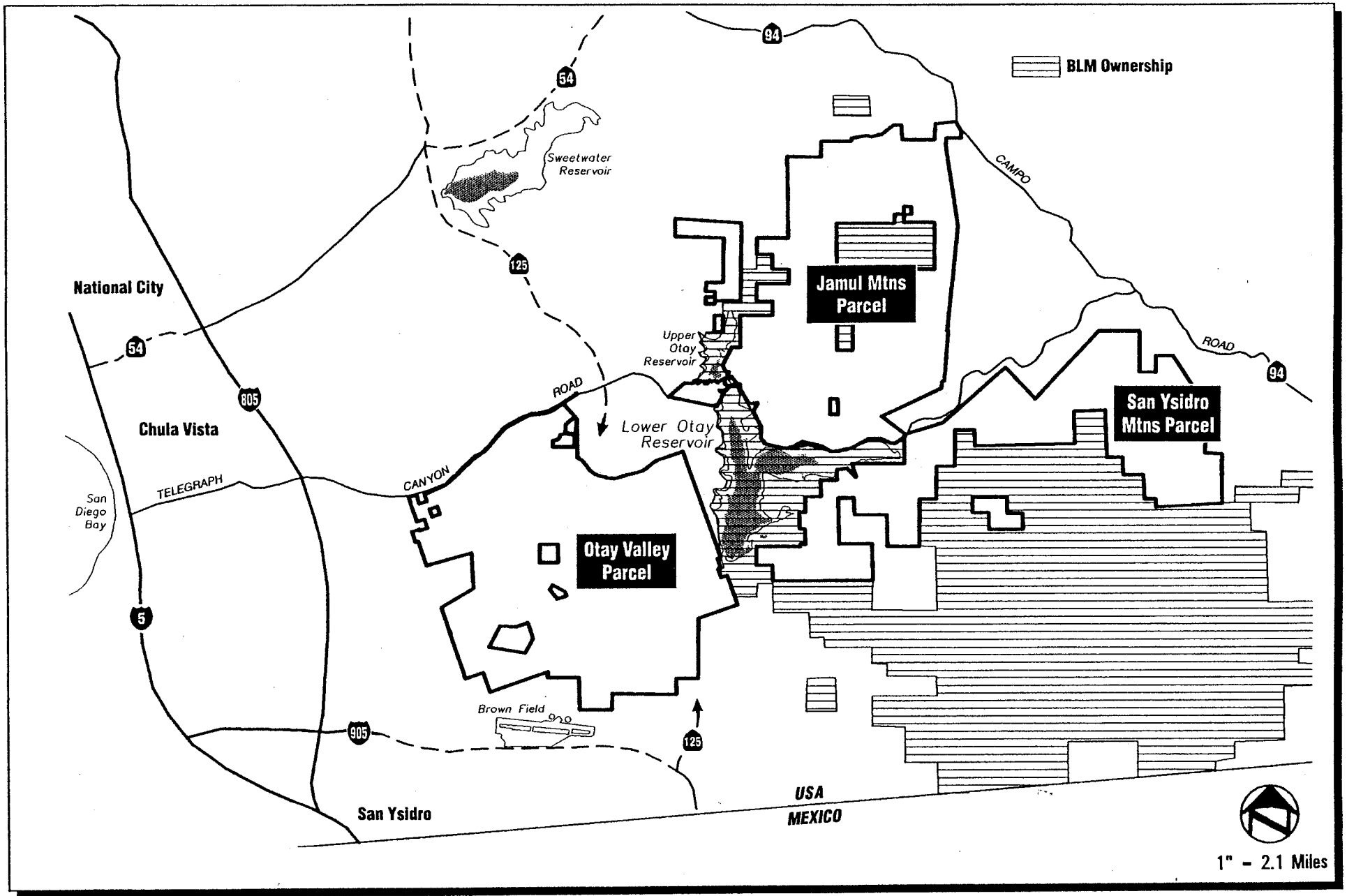
The Otay Valley Parcel is the largest parcel of Otay Ranch, comprising 9,449 acres. This area of land is bounded by Telegraph Canyon Road on the north, Heritage Road and the Otay Landfill Site on the west, Brown Field on the south, and Lower Otay Lake on the east. Several natural landforms are situated within this parcel: Wolf Canyon, Salt Creek, Poggi Canyon, Johnson Canyon, O'Neal Canyon and Rock Mountain.



Otay Ranch CSS/MSS Habitat Replacement Master Plan

Regional Map

FIGURE 1



Otay Ranch CSS/MSS Habitat Replacement Master Plan

Vicinity Map

FIGURE 2

The Jamul Mountains Parcel comprises 7,895 acres. The Proctor Valley area is the northernmost portion of the parcel, which is generally bounded by Otay Lakes Road and Lower Otay Lake to the south, the Upper Otay Lake and San Miguel Mountains to the west, the community of Jamul to the north, and vacant agricultural land to the east. The Jamul Mountains Parcel also includes the Mary Birch-Patrick Estate and the "Upside-Down L" areas. The major landforms include the Jamul and Callahan mountains.

The San Ysidro Mountains Parcel is comprised of 5,555 acres located in the southeastern portion of the project area, along the fringes of the northern foothills of the San Ysidro Mountains and Otay Mountain. The parcel is generally bounded by the eastern arm of Lower Otay Lake and vacant land along Otay Lakes Road to the north, the main body of Lower Otay Lake to the west, land owned by the BLM to the south, and vacant land just west of the community of Dulzura to the east. Major landforms contained within this region include Little and Big Cedar canyons and Hubbard Springs.

An 11,375-acre preserve has been established within the boundaries of the Otay Ranch. The preserve is predominantly located in areas of existing habitat, incorporating the key resource areas identified in the RMP, but includes some areas of degraded habitat. The preserve will establish a permanent open space system that will provide the maintenance of long-term biological diversity and the assurance of the survival and recovery of native species and habitats within the preserve. The preserve will be actively managed in order to provide protection and enhancement of the biological, paleontological, cultural, floodplain, and scenic resources of Otay Ranch. A total of 3,518 acres are located in the Otay Valley Parcel focusing on the habitat located in and on the slopes of the Otay River Valley, Salt Creek, portions of Wolf Canyon, and the western portion of Poggi Canyon. A total of 4,658 acres of the preserve are located in the Jamul Mountains Parcel with valuable corridor linkages through Proctor Valley to the San Miguel Mountains, and from the Jamul Mountains to Otay Lakes and the San Ysidro Mountains. A total of 3,199 acres are located in the San Ysidro Mountains parcel that serve as both high quality, diverse habitat and a link to the existing BLM wildlife management area with Otay Lakes and the rest of the preserve system.

The preserve includes portions of all of the native habitat types currently known from Otay Ranch. The preserve encompasses the richest and most diverse portions of CSS habitat, including the Salt Creek area, lower Proctor Valley, the lower slopes of the San Ysidro Mountains, much of the Jamul Mountains block, and most of Poggi and Wolf canyons. The preserve includes a total of 6,413 acres of CSS, 208 acres of disturbed CSS, and 228 acres of MSS. In addition to the CSS included within the preserve, approximately 1,166 acres of CSS situated within "restricted development areas" will be preserved in non-preserve open space at the northern portion of Proctor Valley and the eastern end of the San Ysidro Mountains. Development in these areas is restricted pending future technical studies. Maintenance of these open space areas will be funded through a homeowners association or similar mechanism.

This plan provides for the treatment of appropriate portions of the 208 acres of disturbed CSS, 1,083 acres of non-native grassland, and 483 acres of agriculture habitats to improve or become CSS or MSS habitat. Additionally, non-native grassland or burned CSS areas were added to the areas potentially suitable for habitat replacement. Although these areas were not originally identified in the RMP as potential areas for

restoration, replacement of the habitat to its original condition would improve the function of the area as a preserve.

Prior to commencing this Master Plan, a review was made of known and ongoing CSS revegetation/ restoration activities. Revegetation/restoration projects included Dennery Ranch, Coto De Caza, and the Arco Olympic Training Center (OTC). Due to the proximity of the OTC to proposed habitat replacement sites on Otay Ranch, a visit was made to the site with the project restoration ecologist. Unlike the habitat replacement activities to be conducted on Otay Ranch, a majority of the projects reviewed included revegetation/restoration of small areas on manufactured slopes. The large area encompassed by the Otay Ranch Habitat Replacement Master Plan creates the need for a detailed and systematic analysis of the levels of effort, habitat goals, phasing and cost estimating.

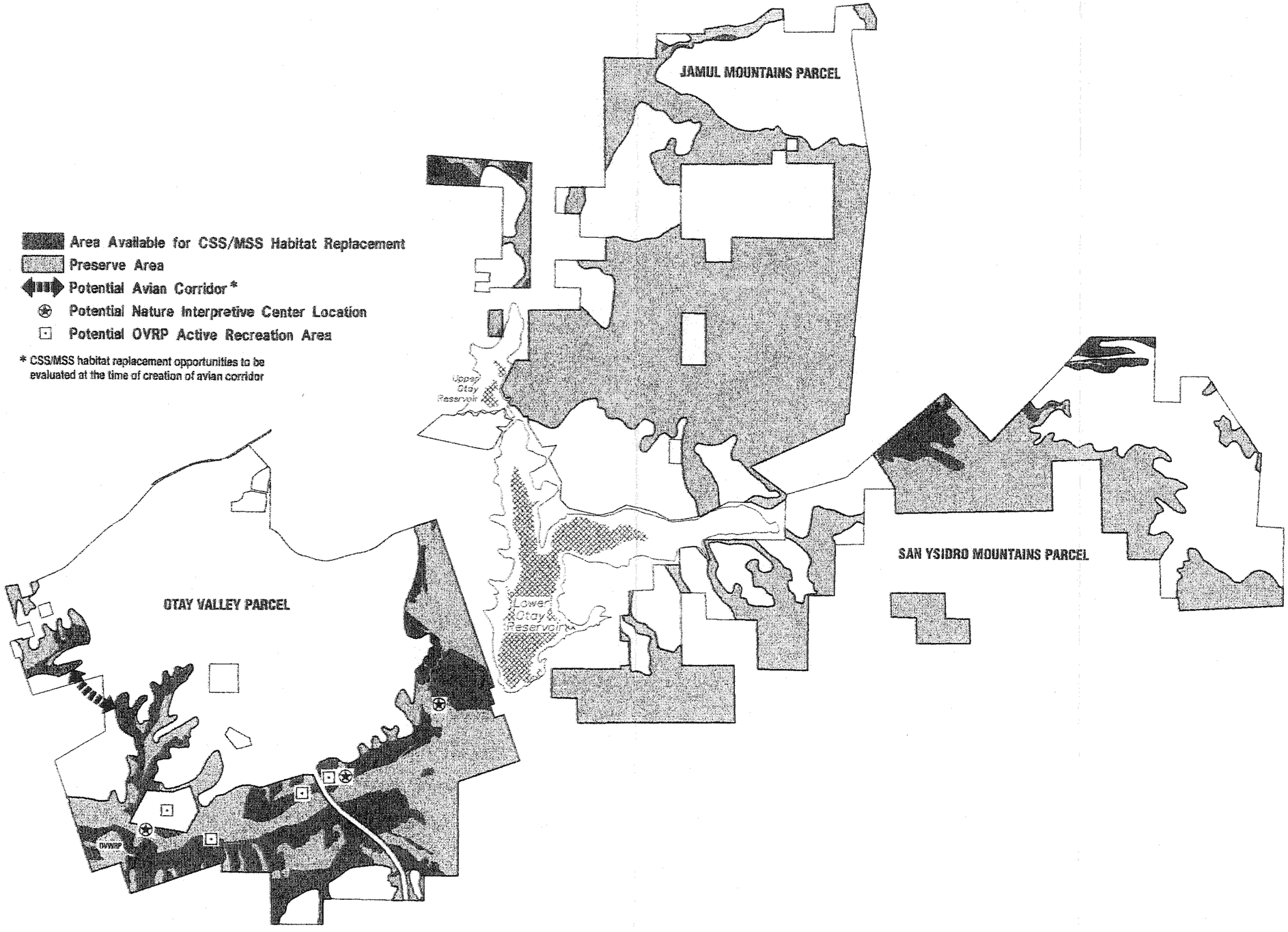
2.0 METHODS

In general, habitat replacement activities will be accomplished in association with, and concurrent with, the development of Otay Ranch. A total of 1,300 acres of CSS and 57 acres of MSS shall be replaced within the preserve. The anticipated locations of habitat replacement are illustrated in *Figure 3*. The areas available for habitat replacement, shown in *Figure 3*, includes those areas identified in the RMP as being potential replacement sites and other areas within the preserve that were judged to be suitable for replacement after the field investigations were completed.

Two distinctly different, but related, field survey investigation programs were undertaken. The results of the first field program were used to identify the requirements of the second program. These two programs are discussed below.

The first program involved a complete walkover survey of the areas designated in the RMP as suitable for habitat replacement. Prior to entering the field, survey areas were separated into polygons on topographic maps delineated by slope, aspect (the direction towards which the slope faces), and major roadways. Polygons consist of irregularly shaped areas, approximately 100 acres in size, which were then transferred to GIS and attached to a database described below. The polygons were numbered sequentially and transferred onto 1" = 400' true color aerial photographs of the project area. In the field, data were gathered and recorded on data sheets (*Exhibit 1; Appendix A*) for each polygon. The polygons were split, as needed, dependent on the heterogeneity of the site conditions relating to the habitat replacement activities and goals as determined in the field survey. If polygons were split, a separate data sheet was filled out for each sub-polygon. The data sheet information was entered into an Excel spreadsheet which was translated to a database format (*Appendix B*) and attached to the GIS polygon mapping. The data were used to assist in the determination of the appropriate type of habitat replacement effort and the habitat goals for each polygon.

The second field program involved the selection and survey of target patches of vegetation exhibiting the characteristics of the varying types of CSS and MSS on Otay Ranch. The target vegetation patches will be



Otay Ranch CSS/MSS Habitat Replacement Master Plan

Areas Available for Coastal Sage Scrub/Maritime Succulent Scrub Habitat Replacement

FIGURE 3

used to develop the goals and objectives for the habitat replacement activities and to evaluate future success of replacement activities. The selected target patches contain vegetation similar to the project site and also soil, physiography, and hydrology similar enough for its use to be appropriate as a guide to the vegetation goal. Consequently, numerous target sites were chosen to use for performance criteria for the revegetation polygons. Target sites were chosen that were near or adjacent to a group of polygons.

The target sites were sampled quantitatively and analyzed using the point-intercept method described by the California Native Plant Society (CNPS) Plant Communities Project. The data were recorded on forms that allow a simple analysis of the vegetation and also provide an opportunity to record additional species observed but not occurring along the transect (Exhibit 2, Appendix A). The sampling method is based on a 50 meter long point-transect centered in a 50 meter x 5 meter plot. At each 0.5 meter interval along the transect, a point is projected vertically down into the vegetation and up into the canopy. A "round bar" (rebar, dowel, etc.) provides a line which can be projected into the vegetation layer serving as the interception point. Only interceptions which fall within the canopy outline of a tree or shrub, including inflorescences, or which directly hit an herb, are valid. Each species intercepted at the projected point was recorded within the appropriate layer category and indicated as a native or non-native species. The vegetation at each point was divided into three layers dependent on height: surface = <0.5 m; shrub = >0.5 m and < 4 m; and canopy = >4 m. Within a layer, if no plant was intercepted, a no vegetation category (R = rock, B = bare) was recorded. The ground layer column indicates the type of soil surface (R = rock, L = litter, B = bare, C = cryptogamic[1]). On the last page of the form, all additional plant species encountered within a 5 meter wide plot along the length of the 50 meter transect were recorded.

The analysis of the target sites provides the percent cover according to height category for each species found along the transect. It also provides the percent bare ground and the composition of the ground surface. Additionally, each transect is described in general terms as to its slope, aspect, elevation, and general vegetation type (*Appendix C*).

3.0 HABITAT REPLACEMENT OPPORTUNITIES

Four types of habitat replacement will take place: natural regeneration with management, habitat enhancement, habitat revegetation, and habitat restoration. The types of habitat replacement are described below in the order of increasing level of effort. The habitat replacement opportunities will be implemented on areas of the preserve that have been designated as areas available for habitat replacement.

Each polygon will be assigned one of the habitat replacement opportunities described below. The assignment of the replacement effort opportunity may change depending on the condition of the site at the time it becomes available for treatment activity. In addition, depending on how the site responds to

[1] Cryptogamic soils occur when algae, bacteria, and lichens form "crusts" over the surface layer of the soil. This helps protect the soil and is indicative of an undisturbed soil layer.

treatment, it may need remedial action if it does not respond positively. Remedial actions will be determined during the monitoring period after the treatment has been applied to each polygon.

3.1 Opportunity Descriptions

Natural regeneration with management will be implemented on areas of the preserve that contain native vegetation with a minor weed component. These areas are expected to recover a structure and density, through natural regeneration and minimal management intervention, that is typical for the site conditions present. These areas contain a significantly greater proportion of native plant coverage than non-native species. Management areas generally are affected by grazing, previous burns, or moderate weed infestation. It is expected that the goal of habitat quality in these areas will be to return to a similar condition and composition as the target vegetation transects. This type of habitat replacement depends on natural recruitment of plant species after the removal of land uses that caused the disturbance to the habitat coverage and structure. If, during the monitoring program, the habitat appears to not be recovering on its own or shows an increase in the exotic species invasion, the area may require an increased level of effort to that of habitat enhancement. The native vegetation will be encouraged to return to its original condition by removing grazing or by phasing out grazing in coordination with the Range Management Plan. Some spot control of weeds may occur simultaneously with the removal of grazing. Other procedures that may be used as a management tool include prevention of further disturbance such as fire control or fencing to prevent off-road vehicle activities. A selected native seed program may be implemented to enhance natural recruitment. No irrigation is proposed for these areas.

Habitat enhancement will be implemented on areas of the preserve that contain a significant coverage of native vegetation interspersed with an equally significant non-native biomass. Native vegetation in these areas will be selectively enhanced to increase native habitat continuity throughout the enhancement area. These areas contain a greater proportion of native species coverage than non-native or noxious weed species but are still in need of an enhancement effort to combat further habitat degradation. The areas have been degraded and have a significant non-native species component and cannot be expected to naturally regenerate without some active replacement activities. The quality goal of the enhancement areas is to increase habitat continuity and return or develop habitat to a similar condition and composition as the target vegetation transects. The soil mantle will remain intact greatly enhancing the re-establishment of the native plant communities through seeding and weed control. No irrigation is proposed for these areas. It is anticipated that habitat will establish with natural precipitation only. Other procedures that may be used as an enhancement tool include prevention of further disturbance, removal and control of exotic species, and augmentation of shrub cover by seeding or container planting. Grazing will be gradually phased out in coordination with the Range Management Plan.

Habitat revegetation will be implemented on areas of the preserve that have no native vegetation and a lower probability for full habitat recovery than is expected for restoration areas due to physically constraining site characteristics. These areas contain non-native and noxious weed species coverage in a

much greater proportion than the native plants and are in need of a major level of effort to promote the return of the vegetation to more of a native habitat stature. In some cases the habitat contains no native vegetation and is located on steep slopes (greater than 10:1), thus would not perform well under a restoration scenario: there is no road access to allow the transport of topsoil, amendments, or plant materials. Typically, with a revegetation scenario, it is not expected that the habitat will return to a level comparable to an undisturbed state, as is expected with a typical restoration site. The quality goal of revegetation is to create the greatest level possible of species diversity, coverage, and vegetative structure. However, existing site conditions and constraints limit the ability of replacement techniques to reach the level of success that would be considered restoration. The soil mantle will remain intact greatly enhancing the re-establishment of the native plant communities. No irrigation is proposed for these areas. It is anticipated that habitat will establish with natural precipitation only. Other procedures that will be used as a revegetation tool include prevention of further disturbance, removal and control of exotic species, and establishment of shrub cover by seeding with seeds collected from adjacent similar habitat. Grazing will be gradually phased out in coordination with the Range Management Plan.

Habitat restoration will be implemented on areas of the preserve that have little or no existing native vegetation and that allow for fully mechanized construction techniques. These highly disturbed areas contain non-native and noxious weed species with very little or no existing native plant cover. A restoration program requires site conditions and physical features that are conducive to replacement of the habitat by completely renovating the site. It requires that slopes are not steep (less than 10:1) and that there is good access for transporting materials and supplies. The quality goal of restoration includes the restoration of species diversity, coverage, vegetative structure, soil structure and surface hydrology such that the replacement area resembles, in most aspects, similar patches of the undisturbed target vegetation transects. Site preparation may include soil testing and preparation, soil amending to improve the nutrient availability, weed abatement, discing of weedy areas, installation of temporary irrigation systems, and use of topsoil from areas of coastal sage scrub to be impacted by project implementation. The transfer of native topsoil and organic vegetation mulch from impacted high quality CSS/MSS habitat is strongly encouraged whenever it becomes available. Restoration treatments should be coordinated and planned in conjunction with project impacts. Other procedures that will be used as a restoration tool include: prevention of further disturbance, establishment of shrub cover by planting and/or seeding, and use of cuttings, seeds, and other vegetative parts from adjacent areas or areas that are designated for development. No grazing will be planned for restored areas.

3.2 Results of Opportunity Analysis

The purpose of the Opportunity Analysis was to identify all areas of the preserve that would benefit from some level of habitat replacement. Consequently, the total acres available for a habitat replacement treatment (2,010 ac) exceeds the total habitat replacement (1,357 ac) required for implementation of all Otay Ranch development. In addition, up to 400 acres of the identified replacement opportunities will be

designated for active recreation. Therefore, the total area for habitat replacement opportunities is 1,610 acres (*Table 1*).

TABLE 1
HABITAT REPLACEMENT OPPORTUNITIES FOR OTAY RANCH

Parcel	Opportunity	Acres
Otay Valley	Natural Regeneration with Management	16.3
	Habitat Enhancement	256.4
	Habitat Revegetation	824.6
	Habitat Restoration	502.1
Total for Parcel		***1,599.4***
Jamul Mountains	Natural Regeneration with Management	95.9
	Habitat Enhancement	12.2
	Habitat Revegetation	2.6
	Habitat Restoration	4.1
Total for Parcel		***114.8***
San Ysidro Mountains	Natural Regeneration with Management	80.9
	Habitat Enhancement	112.4
	Habitat Revegetation	100.1
	Habitat Restoration	2.8
Total for Parcel		***296.2***
TOTAL FOR ALL PARCELS		***2,010.4****

* Of this total, approximately 400 acres will be designated for active recreation use and will not be part of the habitat replacement.

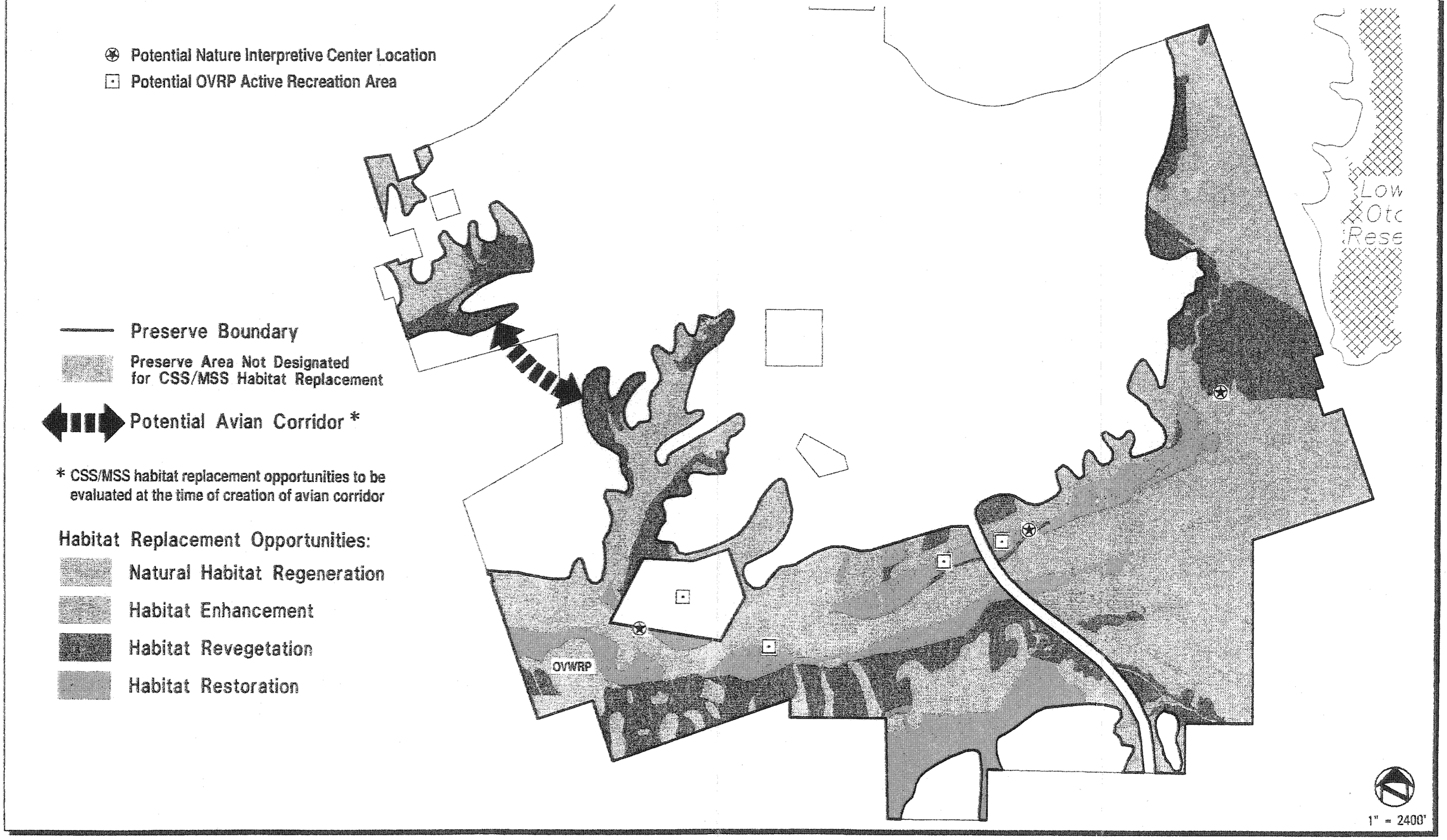
The results of the visits to the polygons were entered into a spreadsheet and database in order to analyze the habitat replacement opportunity for each polygon (Appendix B). A GIS analysis of the database was used to determine the opportunity or level of effort and habitat goals for each polygon. Initially, the field effort was restricted to those areas identified in the RMP as potentially suitable for habitat replacement.

Upon completion of the initial visits, additional areas within the preserve were identified as also being potentially suitable for habitat replacement (polygons 38 through 47). The polygons are located in the Salt Creek area. The CSS habitat burned severely and is not expected to recover to the previous habitat type. Small native shrubs are present and may be able to overtake the weedy species, however, due to the historical high quality of the area and its past importance for the coastal California gnatcatcher (*Polioptila californica californica*) and cactus wren (*Campylorhynchus brunneicapillus sandiegensis*), it was deemed important to include the area for potential habitat replacement. All areas considered potentially suitable for habitat replacement were combined into the spreadsheet and are shown on *Figure 3*.

The criteria for ranking each polygon into the four levels of effort were largely dependent on the shrub cover category for native versus exotic species. Additional information, such as slope, aspect, existing habitat type, and type of disturbance were factored into the analysis as needed. As an example, those areas with high cover in native plant species ("4" on the data sheet) and low cover in exotics ("1" on the data sheet) were ranked as being suitable for natural regeneration with management. Conversely, those areas with low cover in native plant species ("1" on the data sheet) and high cover in exotics ("4" on the data sheet) were ranked as requiring habitat restoration, provided the slope was not greater than 10:1 and that good road access is available. Areas with low native plant cover that still exceeded the exotic plant cover were ranked as requiring habitat enhancement. Areas with very low native plant cover and that were unsuitable for restoration due to steep slope, poor soil, or poor access conditions were ranked as requiring revegetation. Additional information was included into the judgement of opportunity level on a more subjective basis where necessary. Examples include areas that include large proportions of bare ground or eroded soils.

The total acreage available within the preserve boundaries for replacement is 2010.4 acres (*Table 1*). The acreage available in the Otay Valley Parcel is 1599.4 acres, that available within the Jamul Mountains Parcel is 114.8 acres, and that available in the San Ysidro Mountains Parcel is 296.2 acres.

The habitat replacement opportunities in the Otay Valley Parcel are dominated by those requiring revegetation treatment (*Figure 4*). Polygons categorized as natural regeneration with management (16.3 acres) are scattered pockets of grazed habitat embedded within larger areas of non-native grassland. Polygons categorized as habitat enhancement (256.4 acres) are generally small areas located in drainages or grazed areas that have retained a larger proportion of native vegetation than the non-native grassland areas. The areas designated for revegetation (824.6 acres) are located on non-native grassland areas found on steep slopes or poor soils. The areas designated for restoration (502.1 acres) are typically found in heavily grazed areas that have been converted to non-native grassland. These areas are concentrated along either side of the Otay River on flat "benches" or rolling hills. The burned areas of Salt Creek that were added to the potential replacement area are categorized as having a very low native plant cover and high exotic cover, however, the area was deemed to require revegetation rather than restoration. This is due to the steep slopes of the area, the intact soil mantle, the presence of a number of small, native shrub seedlings, and the potential for crown sprouting from the larger shrubs and cacti that were not killed during the fire.



Otay Ranch CSS/MSS Habitat Replacement Master Plan

Otay Valley Parcel - Habitat Replacement Opportunities

FIGURE 4

The areas designated for habitat replacement in the Jamul Mountains Parcel are located along the northern and western edges of the parcel (*Figure 5*). These areas generally are suitable for natural regeneration with management due to the largely intact native vegetation. The "upside-down L" area burned in the past and would benefit from protection from future burns. The natural regeneration acreage is 95.9 acres, the habitat enhancement acreage is 12.2, the revegetation acreage is 2.6, and the restoration acreage is 4.1.

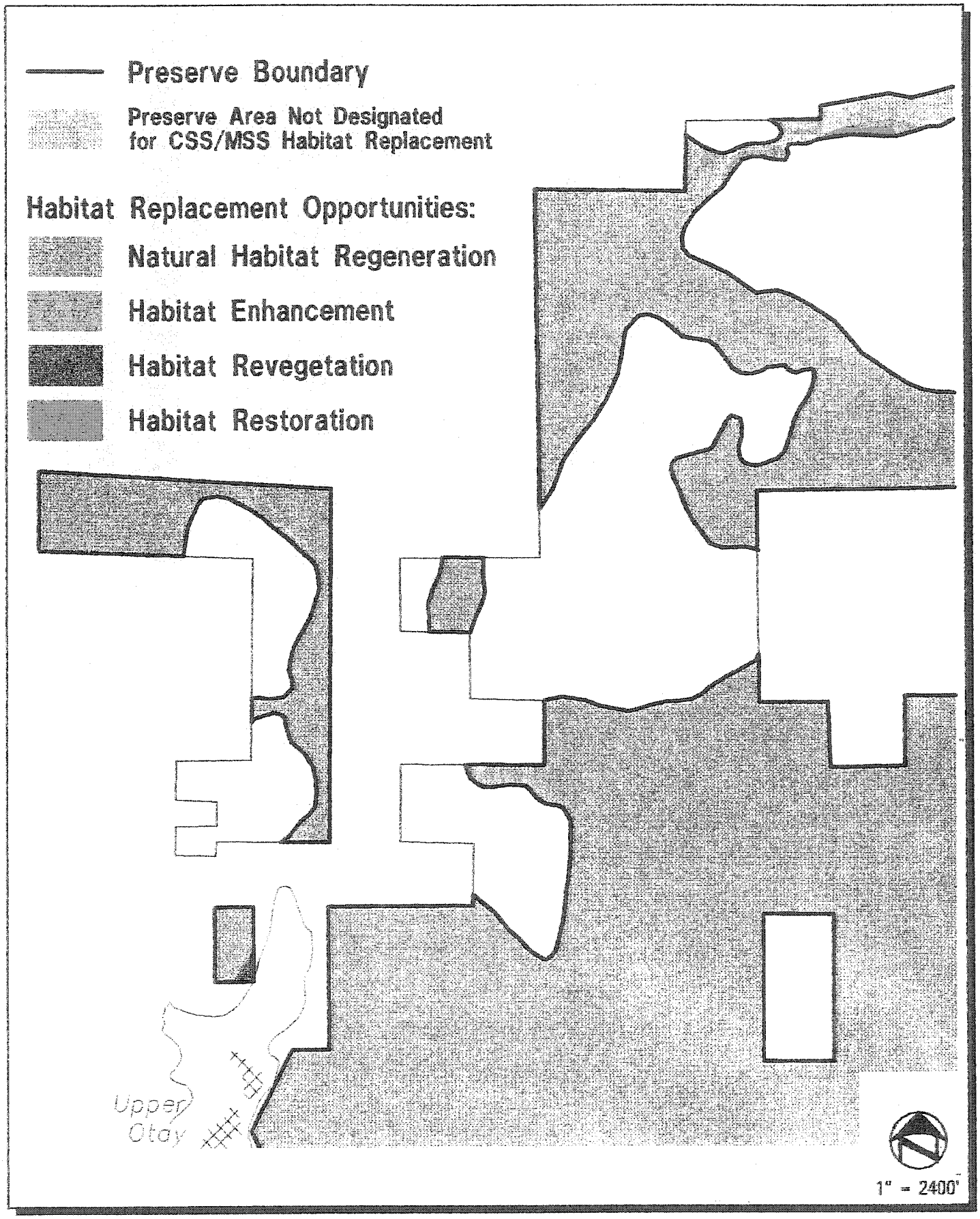
The areas designated for habitat replacement in the San Ysidro Mountains Parcel are located along the northern edge of the parcel near Otay Lakes Road (*Figure 6*). The replacement opportunities are dominated by the need for natural regeneration, habitat enhancement, and revegetation, with small areas identified for restoration. The natural regeneration acreage is 80.9 acres, the enhancement acreage is 112.4, the revegetation acreage is 100.1, and the restoration acreage is 2.8.

In summary, a substantial amount of habitat on the Otay Ranch is suitable for habitat replacement due to a number of disturbance factors including grazing, agricultural activities, mining, erosion, and burns. The total acreage available, 2,010.4 acres, is substantially greater than that required by the RMP, thus allowing the flexibility to coordinate with other activities on the Ranch that may be in conflict with a CSS/MSS replacement program.

4.0 HABITAT REPLACEMENT GOALS

Coastal sage scrub describes a wide variety of low, scrubby, native plant associations that occur on lowland bluffs and hillsides from southern Oregon to northwestern Baja California. Coastal sage scrub is a more or less open community composed of low, drought deciduous shrubs, with a sparse understory of annual and perennial grasses and forbs. Characteristic shrub species of CSS include California sagebrush (*Artemisia californica*), sage species (*Salvia mellifera, Salvia apiana*), California encelia (*Encelia californica*), San Diego sunflower (*Viguiera laciniata*), and California buckwheat (*Eriogonum fasciculatum*). Larger evergreen shrubs, such as laurel sumac (*Malosma laurina*), lemonadeberry (*Rhus integrifolia*), toyon (*Heteromeles arbutifolia*), and sugar-bush (*Rhus ovata*), along with several species of cactus (*Opuntia prolifera, O. littoralis, Ferocactus viridescens*) and yucca (*Yucca whipplei, Y. schidigera*) also occur in many patches of CSS. The understory usually is moderately diverse and includes a variety of herbaceous species, such as blue dicks (*Dichelostemma capitatum*), shooting-star (*Dodecatheon clevelandii*), blue-eyed grass (*Sisyrinchium bellum pulchellum*), wild onions (*Allium* spp.), and native needlegrass (*Nassella* spp.). Introduced species commonly found in CSS include bromes (*Bromus* spp.), mustards (*Brassica* and *Sisymbrium* spp.), and filarees (*Erodium* spp.). Other subtypes of CSS include cactus dominated CSS which appears as a CSS/MSS habitat and sage scrub-grassland ecotone which appears as CSS/native grassland habitat.

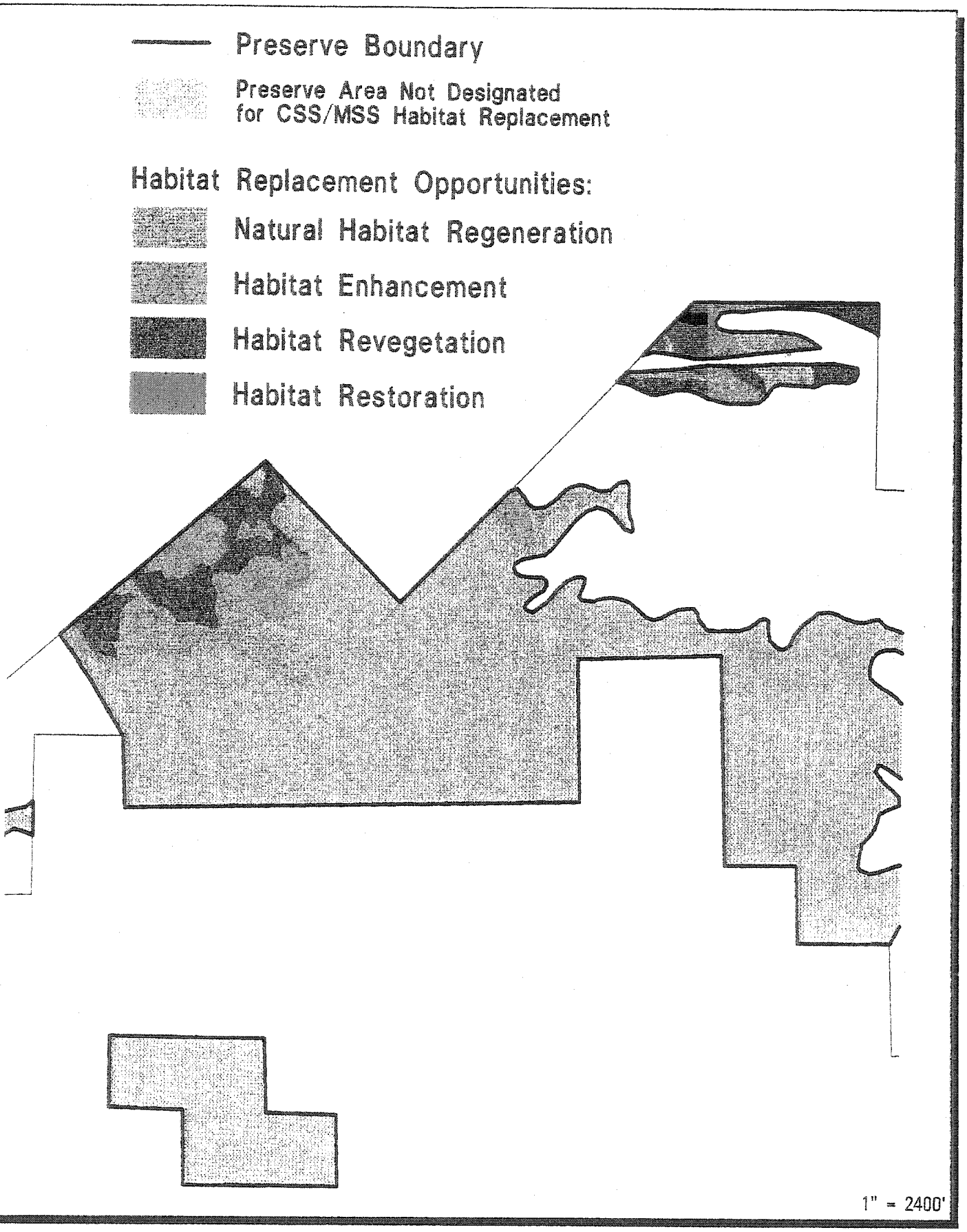
Canopy height, shrub density, percent ground cover, and species composition vary considerably throughout the range of CSS, apparently in response to local soil type, exposure, and percent slope. CSS may occupy gently sloping ground but is more common on moderate to steep slopes. CSS is more common on hotter



Otay Ranch CSS/MSS Habitat Replacement Master Plan

Jamul Mtns. Parcel - Habitat Replacement Opportunities

FIGURE 5



Otay Ranch CSS/MSS Habitat Replacement Master Plan

San Ysidro Mtns. Parcel - Habitat Replacement Opportunities

FIGURE 6

and drier south- and west-facing slopes than cooler and wetter north- and east-facing slopes although it can occur on slopes with any aspect. CSS plant species generally tolerate less rainfall and occupy more climatically stable environments than chaparral species.

Maritime succulent scrub is a low, open scrub dominated by drought deciduous shrubs with a rich mixture of stem and leaf succulents. The ground is more or less bare between the shrubs. The habitat occurs on thin rocky or sandy soils, often on steep south-facing slopes. It is distributed in coastal areas from about Torrey Pines south to El Rosario, Baja California. It typically intergrades with CSS on better developed, moister soils away from the immediate coast. Characteristic species include California sagebrush, California encelia, laurel sumac, numerous cactus and succulent species (*Dudleya, Opuntia, Mammalaria, Euphorbia, Bergerocactus, Cleome, Ferocactus*), and jojoba (*Simmondsia chinensis).*

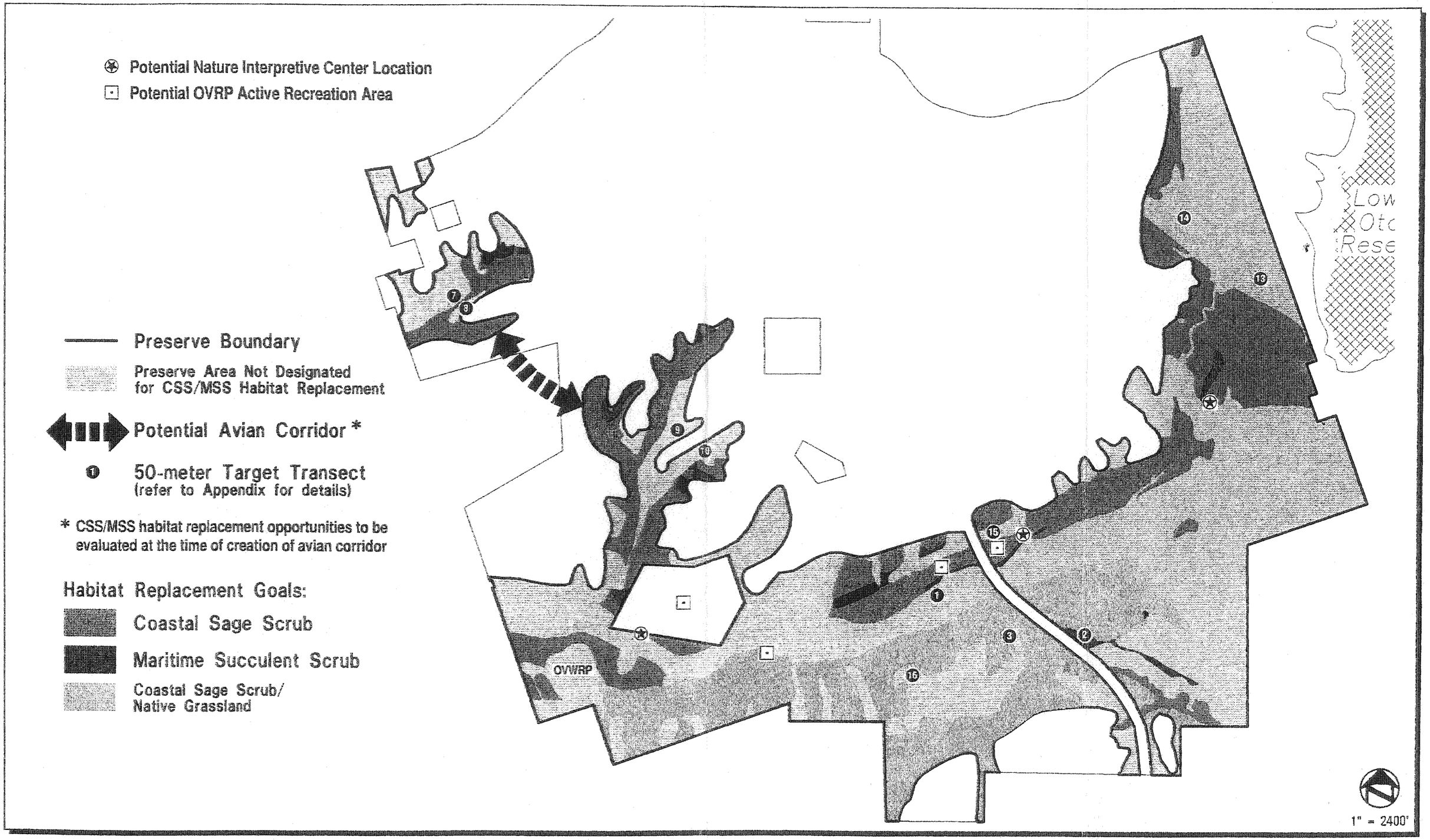
Native grassland or valley needlegrass grassland is dominated by native perennial grasses, including *Nassella, Poa, Elymus,* and *Muhlenbergia.* The habitat is a midheight (up to two feet) grassland dominated by tussock forming grasses. Native and introduced annuals occur between the perennials, often actually exceeding the bunchgrasses in cover. Grassland typically occurs on fine-textured, clay soils that are moist or even waterlogged during winter but very dry in summer. It often interdigitates with CSS on moister, better drained sites.

4.1 Target Transects

Because of the inherent variability of CSS vegetation composition and the wide range of soil types, slopes, and aspects of the habitat replacement polygons, transects were taken of target vegetation areas. Target transects included both CSS and MSS habitats. The target areas were placed near the habitat replacement areas and were located on similar slopes and aspects (*Figures 7, 8, and 9*). A total of 16 target transects were recorded (*Table 2*). The results of these target transects are shown in Appendix C. Each target transect is identified with the polygon(s) with which it is associated (*Table 2*). The target transects, by being located near the polygon, provide more detailed information as to the existing plant and seed sources, and habitats suitable for the conditions on each polygon.

The target transects provide a focal point for the replacement effort and the goal for plant species composition, density, and height. The transects will also provide a means for evaluating the success of the overall habitat replacement effort, hence the importance of locating target transects near the replacement polygons.

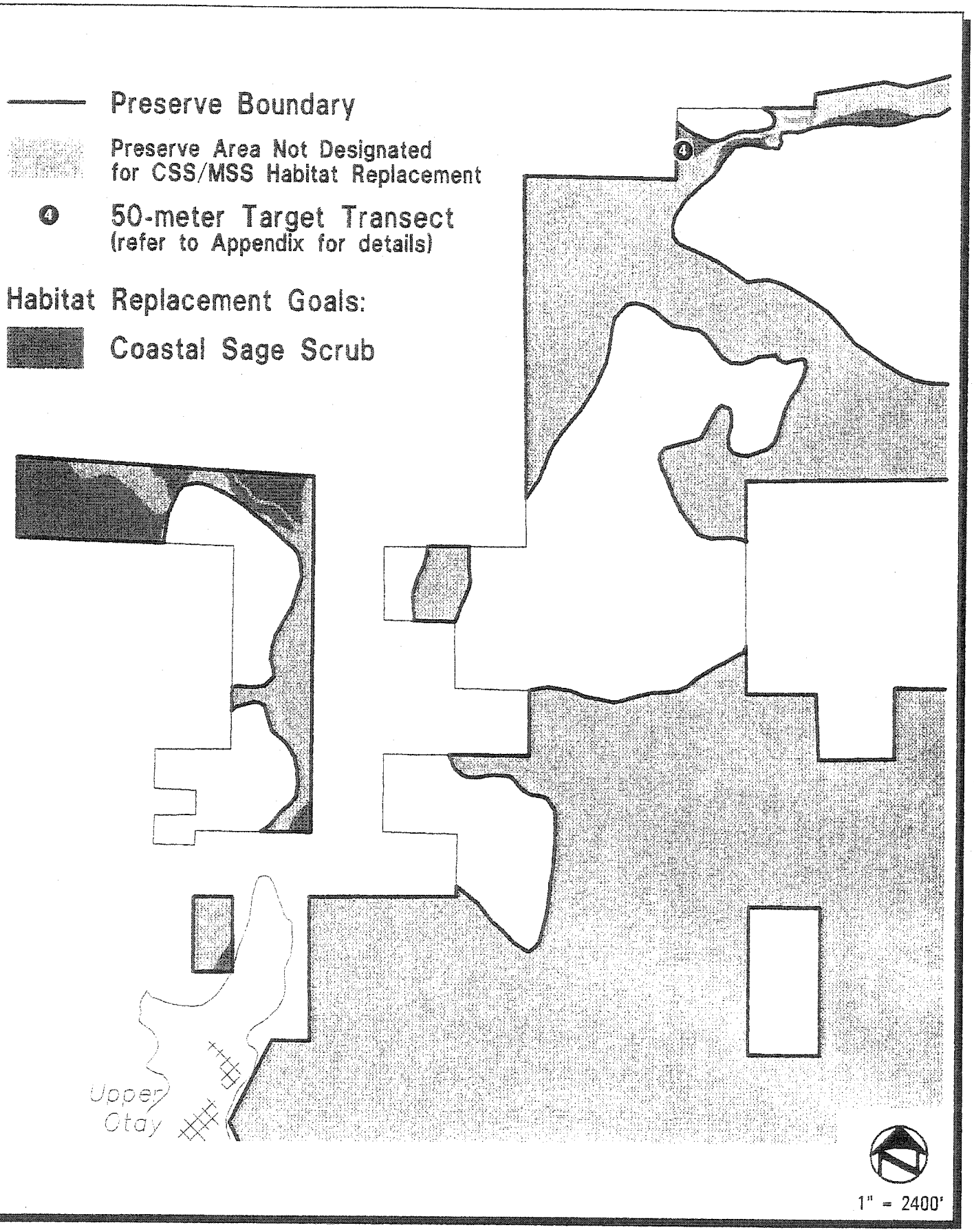
It should be noted that no target transects are located near the habitat replacement areas of the "upside down L" in the Jamul Mountains Parcel. This is because there is no high quality habitat located on the slope near the area requiring treatment.



Otay Ranch CSS/MSS Habitat Replacement Master Plan

Otay Valley Parcel - Habitat Replacement Goals/Transects

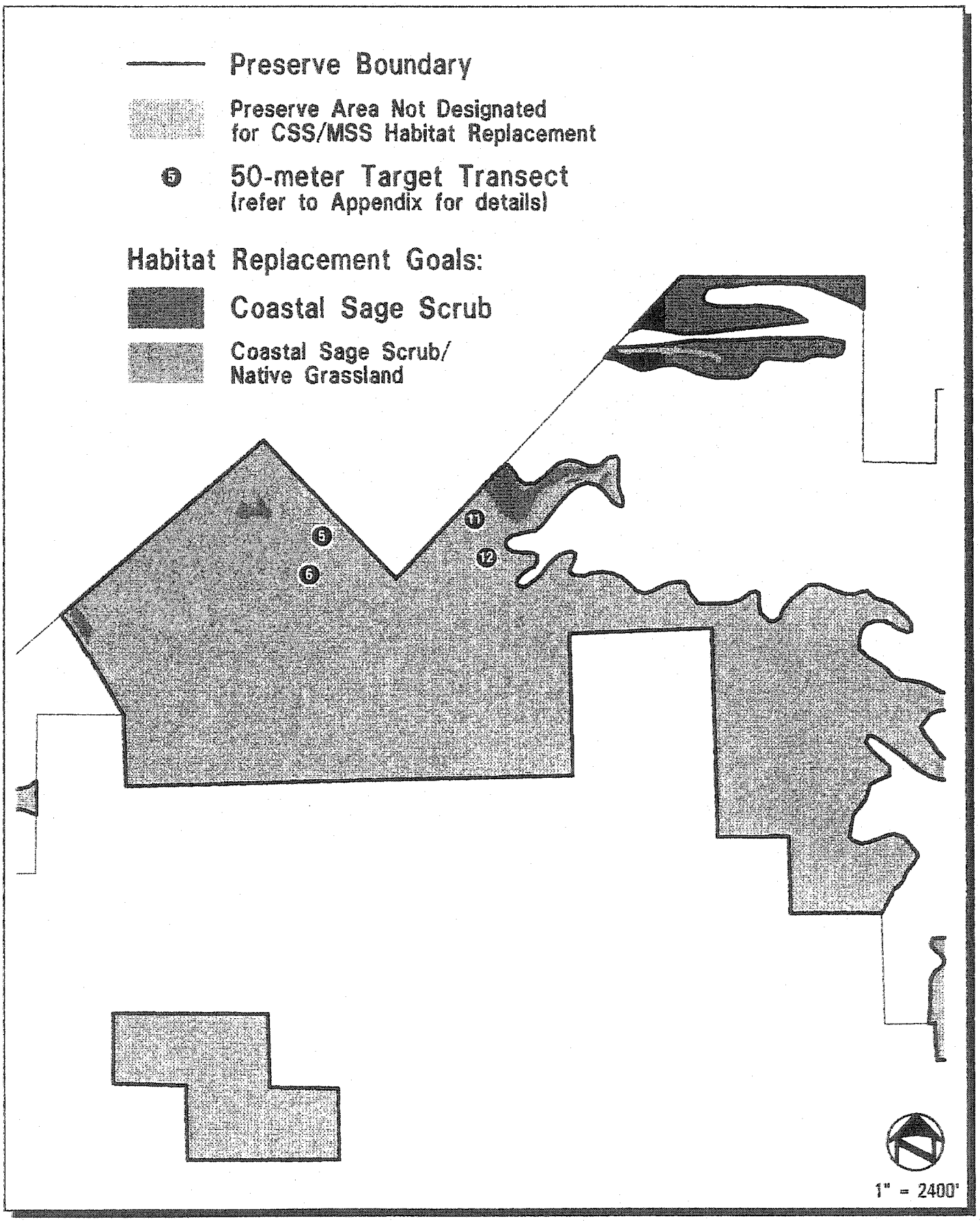
FIGURE 7



Otay Ranch CSS/MSS Habitat Replacement Master Plan

Jamul Mtns. Parcel - Habitat Replacement Goals/Transects

FIGURE 8



Otay Ranch CSS/MSS Habitat Replacement Master Plan

San Ysidro Mtns. Parcel - Habitat Replacement Goals/Transects

FIGURE 9

TABLE 2
TARGET TRANSECT SUMMARY

Transect #	Habitat Type	Location	Slope	Aspect	Target for: (Polygon #)
1	MSS	Otay Valley	15:1	south	15, 16, 17, 19
2	MSS	Otay Valley	2.5:1	south	7, 8
3	CSS	Otay Valley	2:1	south	6, 7, 20
4	CSS	Jamul Mountains	10:1	southwest	33, 34, 35
5	CSS	San Ysidro Mountains	3:1	east	25, 26
6	CSS	San Ysidro Mountains	3:1	north	25, 26
7	MSS	Poggi Canyon	5:1	south	14
8	CSS	Poggi Canyon	3:1	north	14
9	CSS	Wolf Canyon	3:1	west	10, 11, 12, 13
10	MSS/CSS	Wolf Canyon	2:1	east	10, 11, 12, 13
11	CSS	San Ysidro Mountains	3:1	north	27, 28, 29
12	CSS	San Ysidro Mountains	3:1	south	27, 28, 29
13	CSS	Salt Creek	5:1	east	22, 23, 24, 38–42
14	CSS	Salt Creek	5:1	west	21, 43–47
15	CSS	Otay Valley	5:1	north	1, 2, 3, 4, 5, 6, 7, 8
16	CSS	Otay Valley	4:1	south	7, 9, 15–19

4.2 Habitat Goals

The habitat goals for each polygon are guided by the two field programs. The polygon database was analyzed using GIS to determine the habitat goals by combining several factors for each polygon. The habitat goals were categorized into three habitat types, one of which is a subtype of CSS and should be given at least partial credit as CSS habitat replacement. The three habitat types include: CSS, MSS, and CSS/native grassland (NG). Although the native grassland restoration program will be operating separately from the current program for CSS and MSS replacement, areas that are suitable for the CSS/NG mosaic habitat have been identified. Some of these areas may result in habitat that is more clearly native grassland and should be given credit as such. The criteria for categorizing each polygon into the three habitat types/subtypes was largely dependent on the existing habitat type and presence of habitat indicator species. The analysis was also based on the soil type, type of adjacent habitat, slope, aspect, and type of disturbance.

The polygon field visit program indicates the existing conditions and presence of plant species indicators that may serve to direct the goals. The presence of California sagebrush indicates the suitability for CSS habitat replacement; the presence of cactus indicates the suitability for MSS replacement; the presence of native grass species, such as *Nassella,* indicates the potential suitability of the area for native grassland replacement or habitat replacement towards a CSS/native grassland mosaic habitat.

Soil types served to indicate the presence of heavy clay soils that may be most suitably directed toward a CSS/NG habitat, as is seen for polygon 6B. Steep, south-facing slopes typically are a MSS goal habitat, and drainages may be goal directed toward a *Rhus* -dominated CSS.

Areas potentially suitable for the habitat goal of CSS dominate the preserve polygons (*Table 3*). A total of 1,068.6 acres is potentially suitable for CSS replacement. These areas are typically located along the flat bench areas along the Otay River, within the Salt Creek and Wolf Canyon drainages, and in the Jamul Mountains and San Ysidro Mountains parcels (*Figures 7, 8 and 9*).

TABLE 3
HABITAT REPLACEMENT GOALS

Parcel	Habitat Goal	Number of Polygons	Acres
Otay Valley	CSS	64	841.8
	CSS/NG	40	699.0
	MSS	24	58.6
Total for Parcel			***1,599.4***
Jamul Mountains	CSS	11	114.8
San Ysidro Mountains	CSS	19	112.1
	CSS/NG	7	184.1
Total for Parcel			***411.0***
TOTAL FOR ALL PARCELS			***2,010.4***

Areas potentially suitable for the habitat goal of MSS occur on steep slope areas adjacent to existing MSS habitat. These areas are located along the north side of the Otay River and within Wolf and Johnson canyons. A total of 58.6 acres is potentially suitable for MSS replacement.

Areas potentially suitable for the habitat goal CSS/NG occur on north-facing slope areas on the south side of Otay River. The other area suitable for CSS/NG is the polygon adjacent to the vernal pool area near Brown Field. These potential grassland areas are typically located on heavy clay soils that probably could

not support a typical shrub habitat or were identified as containing native grass species during the field visits. These areas are potentially best suited to a CSS/NG mosaic habitat where gaps in the shrub canopy consist of native grassland or, conversely, native grassland patches interdigitate with patches of CSS. A total of 883.1 acres is potentially suitable for CSS/NG habitat replacement. The location and amount of the native grassland habitat replacement will be coordinated with the native grassland revegetation plan at a later date.

4.3 Plant Palette

The list of recommended and potential species are shown in the following three tables (*Tables 4, 5 and 6*) for each habitat goal. The plant palettes should not be restricted to the species on each list but should be guided by the species list. The lists were developed from biological surveys conducted in conjunction with the preparation of the Final Program EIR (Ogden 1992).

TABLE 4
PLANT PALETTE FOR COASTAL SAGE SCRUB HABITAT GOAL

Scientific Name	Common Name	*Scientific Name*	Common Name
Achillea millefolium	Yarrow	*Isocoma veneta*	Coast goldenbush
Achnatherum diegoensis	San Diego County needlegrass	*Lonicera subspicata*	Wild honeysuckle
Allium praecox	Early onion	*Lotus scoparius*	Deerweed
Allium haematochiton	Red-skin onion	*Malosma laurina*	Laurel sumac
Artemisia californica	California sagebrush	*Mimulus aurantiacus*	Bush monkeyflower
Baccharis sarothroides	Broom baccharis	*Nasella pulchra*	Purple needlegrass
Bloomeria crocea	Common golden-star	*Opuntia littoralis*	Mesa prickly pear
Calochortus splendens	Mariposa lily	*Opuntia parryi* var. *serpentina*	Snake cholla
Chlorogalum parviflorum	Amole	*Opuntia prolifera*	Coast cholla
Cleome isomeris	Bladderpod	*Rhus integrifolia*	Lemonadeberry
Corethrogyne filaginifolia	Cudweed aster	*Rhamnus crocea*	Redberry
Dichelostemma pulchella	Wild hyacinth	*Salvia apiana*	White sage
Dudleya edulis	Ladies fingers	*Salvia munzii*	Munz's sage
Dudleya pulverulenta	Chalk lettuce	*Sambucus mexicana*	Mexican Elderberry
Encelia californica	California encelia	*Sisyrinchium bellum*	Blue-eyed grass
Eriogonum fasciculatum	California buckwheat	*Yucca whipplei*	Mohave yucca
Eriophyllum confertiflorum	Golden yarrow	*Viguiera laciniata*	San Diego County viguiera
Heteromeles arbutifolia	Toyon		

TABLE 5 PLANT PALETTE FOR MARITIME SUCCULENT SCRUB HABITAT GOAL			
Scientific Name	Common Name	*Scientific Name*	Common Name
Achillea millefolium	Yarrow	*Hemizonia fasciculata*	Fascicled tarweed
Allium praecox	Early onion	*Isocoma veneta*	Coast goldenbush
Allium haematochiton	Red-skin onion	*Isomeris arborea*	Bladderpod
Ambrosia chenopodifolia	San Diego bur-sage	*Lotus scoparius*	Deerweed
Artemisia californica	California sagebrush	*Lupinus succulentus*	Arroyo lupine
Bloomeria crocea	Common golden-star	*Mammillaria dioica*	Fish-hook cactus
Calochortus splendens	Mariposa lily	*Nasella pulchra*	Purple needlegrass
Chlorogalum parvilflorum	Amole	*Opuntia littoralis*	Mesa prickly pear
Cordylanthus orcuttianus	Orcutt's bird's-beak	*Opuntia parryi* var. *serpentina*	Snake cholla
Dichelostemma pulchella	Wild hyacinth	*Opuntia prolifera*	Coast cholla
Dichondra occidentalis	Western dichondra	*Rhus integrifolia*	Lemonadeberry
Dudleya variegata	Variegated dudleya	*Salvia apiana*	White sage
Dudleya pulverulenta	Chalk lettuce	*Salvia mellifera*	Black sage
Encelia californica	California encelia	*Selaginella cinerascens*	Mesa club moss
Eriogonum fasciculatum	California buckwheat	*Sisyrinchium bellum*	Blue-eyed grass
Eriophyllum confertiflorum	Golden yarrow	*Simmondsia chinensis*	Jojoba
Euphorbia misera	Cliff spurge	*Yucca schidigera*	Mohave yucca
Ferocactus viridescens	San Diego barrel cactus	*Viguiera laciniata*	San Diego County viguiera
Hemizonia conjugens	Otay tarweed		

TABLE 6 PLANT PALETTE FOR COASTAL SAGE SCRUB/NATIVE GRASSLAND HABITAT GOAL			
Scientific Name	Common Name	*Scientific Name*	Common Name
Achillea millefolium	Yarrow	*Dichelostemma pulchella*	Wild hyacinth
Achnatherum diegoensis	San Diego County needlegrass	*Dodecatheon clevelandii*	Cleveland's shooting-star
Allium praecox	Early onion	*Dudleya edulis*	Ladies fingers
Allium haematochiton	Red-skin onion	*Dudleya pulverulenta*	Chalk lettuce
Artemisia californica	California sagebrush	*Encelia californica*	California encelia
Baccharis sarothroides	Broom baccharis	*Eriogonum fasciculatum*	California buckwheat
Bloomeria crocea	Common golden-star	*Eriophyllum confertiflorum*	Golden yarrow
Calochortus splendens	Lilac mariposa lily	*Fritillaria biflora*	Chocolate lily
Calochortus weedii	Weed's mariposa lily	*Gutierrezia californica*	Matchweed
Castilleja affinis	Indian paintbrush	*Hemizonia fasciculatum*	Fascicled tarweed
Chlorogalum parviflorum	Amole	*Isocoma veneta*	Coast goldenbush
Cleome isomeris	Bladder pod	*Lonicera subspicata*	Wild honeysuckle
Corethrogyne filaginifolia	Cudweed aster	*Lotus scoparius*	Deerweed
Malosma laurina	Laurel sumac	*Salvia apiana*	White sage
Mimulus aurantiacus	Bush monkeyflower	*Salvia munzii*	Munz's sage
Nasella lepida	Foothill needlegrass	*Selaginella cinerascens*	Mesa club moss
Nasella pulchra	Purple needlegrass	*Sisyrinchium bellum*	Blue-eyed grass
Opuntia littoralis	Mesa prickly pear	*Viola pedunculata*	Yellow johnny jump-up
Opuntia parryi var. serpentina	Snake cholla	*Yucca whipplei*	Mohave yucca
Opuntia prolifera	Coast cholla	*Viguiera laciniata*	San Diego County viguiera
Rhus integrifolia	Lemonadeberry		

An initial seed mix application for any of the three habitat replacement goal areas should include but not be limited to: *Astragalus* sp., *Castilleja affinis, Dichelostemma pulchellum, Lathyrus laetifloros, Lathyrus splendens, Lotus scoparius, Lupinus bicolor, Lupinus succulentus, Nasella pulchra, Nasella lepida,* and *Sisyrinchium bellum.*

For areas suitable for restoration habitat replacement, sensitive plant species located in areas to be impacted may be salvaged and included in the plant palette for the appropriate habitat goal. Salvage of plant materials should occur prior to the grading of each SPA area. Sensitive species suitable for salvage and the habitat goal for which they would be appropriate are listed in *Table 7.*

TABLE 7
SENSITIVE PLANT SPECIES SUITABLE FOR SALVAGE TO RESTORATION AREAS

Scientific Name	Common Name	Habitat Goal
Acanthomintha ilicifolia	San Diego thorn-mint	CSS/NG
Achnatherum diegoensis	San Diego County stipa	CSS/NG
Adolphia californica	California adolphia	CSS
Ambrosia chenopodiifolia	San Diego bur-sage	MSS
Brodiaea orcuttii	Orcutt's brodiaea	CSS/NG
Chorizanthe procumbens albiflora	Fallbrook spine-flower	CSS
Clarkia delicata	Campo clarkia	CSS
Cordylanthus orcuttianus	Orcutt's bird's-beak	CSS, MSS
Dichondra occidentalis	Western dichondra	CSS, MSS
Dudleya variegata	Variegated dudleya	CSS, MSS, CSS/NG
Ferocactus viridescens	San Diego barrel cactus	CSS, MSS
Harpagonella palmeri	Palmer's grappling-hook	CSS, MSS
Hemizonia conjugens	Otay tarplant	CSS/NG
Lepidium latipes	Dwarf pepper-grass	CSS/NG
Muilla clevelandii	San Diego goldenstar	CSS/NG
Ophioglossum lusitanicum ssp. *californicum*	California adder's tongue fern	CSS/NG
Opuntia parryi var. *serpentina*	Snake cholla	MSS
Physalis greenei	Greene's ground-cherry	CSS
Romneya coulteri	Coulter's matilija poppy	CSS
Salvia munzii	Munz's sage	CSS
Selaginella cinerascens	Mesa club moss	CSS, MSS
Viguiera laciniata	San Diego County viguiera	CSS, MSS

4.4 Coordination with Other Uses of the Preserve

The Otay Valley Regional Park Conceptual Plan illustrates potential locations for active recreation within the Otay Ranch portion of the park. These locations have been identified as Special Study Areas. The symbols on *Figures 3, 4, and 7* indicate a conceptual location for each study area. The ultimate siting of the active recreation areas has not yet been determined. The location has been initially indicated for the flat benches of non-native grassland habitat located on the north side of the Otay River. The RMP indicates that up to 400 acres of the preserve will be designated for use for active recreation.

The active recreation areas may occupy portions of areas in the vicinity of the symbols shown as potential CSS/MSS habitat replacement opportunities. Active recreation areas would not be suitable for habitat replacement. At such time when the location and amount of acreage is designated for active recreation, those areas will be removed from the areas of potential CSS/MSS replacement.

A nature interpretive center is planned for one of three sites within the preserve (*Figure 3*). Currently, the final location for the center has not been decided. At such time when the location of the center has been chosen, that area will be removed from the areas of potential CSS/MSS replacement.

A reclaimed water treatment plant has been potentially located in the flat non-native grassland areas on the south side of Otay River (*Figure 3*). This area has been omitted from the analysis for CSS/MSS habitat replacement.

The RMP has identified that 198 acres within the preserve shall be restored to native grassland. In some cases, this will be in the form of a habitat mosaic with CSS as discussed above. The proportion of credit given for restoration of the native grassland will be determined at the time the treatment is undertaken. In other cases, it may be determined that a polygon previously identified as CSS/NG will support only native grassland. In this case, the polygon will be omitted from the CSS/MSS habitat replacement analysis.

5.0 PROTOCOL AND STRATEGIES

The following protocols for the habitat replacement program are specific to each of the habitat effort opportunities described in *Section 3.0*. The habitat goals described in *Section 4.0* necessitate additional protocols and determine the specific plant species palettes for each polygon.

5.1 Natural Regeneration with Management

Existing habitat with less than 10% coverage of non-native species requires relatively little replacement effort. The non-native intrusion may have directly resulted from disturbances such as fire and flood, or indirectly from disturbance on adjacent land that was caused by human activities. In either case, the strategy of natural regeneration is to remove or cease the disturbance activity, if possible, and to attempt to reverse any trend toward further intrusion by non-native species. This strategy relies on the regeneration

of the native species populations through normal annual seed production, dispersal, and germination. To augment the success of natural regeneration, a limited weed control program will be conducted annually to interrupt the life cycle of weed species such that seed production of non-native species is minimized and eliminated. Weed eradication is essential to create a site condition conducive to seedling production and should continue until 1) annual weed growth is reduced to 25% of former seedling densities and, 2) native species cover has substantially expanded into formerly non-native areas. Disturbance to the soil surface shall be minimized. Weeds will be cut off at ground level prior to flowering, leaving roots and the soil surface intact. Cut weeds will be removed if they contain flower parts. Where barren areas are a normal part of the vegetation structure, a weed-free organic mulch with high lignin content may be used to shade the open ground surface and thus reduce weed seed germination.

5.2 Habitat Enhancement

A native habitat area will be enhanced when the existing percent coverage of native species is significant and an asset in re-establishing a native vegetation association. A 20% native species cover is considered significant. These surviving individuals, while occupying only a small area, are important seed sources of local genetic material. These areas are typically occupied by vegetation that is uniformly interspersed with native and non-native vegetation. Often distinct patches of lemonadeberry shrubs occur in a matrix of closely cropped non-native grassland, a direct result of cattle grazing. Given these site conditions, habitat enhancement will occur between existing patches or individuals of native species.

A strategy of habitat enhancement will include an active annual weed eradication program, application of a native species seed mix, and when soil and slope conditions allow, container plant material will be installed. The weed eradication program will involve mechanical and hand removal of weed species that compete through shading. These species include sweet fennel (*Foeniculum vulgare*), mustard (*Brassica* sp.), castor bean (*Ricinis communis*), tree tobacco (*Nicotiana glauca*), and tamarisk (*Tamarix* sp.). Direct seeding of native species will occur in conjunction with the weed eradication program and will be conducted so that one program does not adversely affect the other. Seed selection will be determined by the existing species composition, habitat goals, and site conditions. Those native species that are absent and are necessary to complete the full vegetative association, or that are best adapted to the site conditions will be used. For example, on a site where a thin soil mantle is present on dry slopes, the seed of native grasses and/or pioneer species may be used even though the final habitat goal is coastal sage scrub. In many cases, these intermediate steps may be required in order to establish the final habitat goal.

Seed mixes will typically be applied after the hot summer months but prior to the onset winter rains. Seed mix applications subsequent to the initial application will be necessary to increase habitat continuity and species diversity. Enhancement seed applications may occur annually over a period of five years. Each seed mix will be refined in response to success or failure of each species previously applied to the site. Where species have failed to germinate and survive, the new seed mix should include new species that are better adapted to the site condition. Areas will be subsequently seeded with the desired shrub species where pioneer species are successfully competing against non-native species.

Container plant installation may be a technique used where site soils, slope and aspect are conducive to plant survival without irrigation. Planting densities and species selection will be determined by the prevailing site conditions and shall be defined in a more detailed and site specific Pre-Design Habitat Replacement Plan.

5.3 Habitat Revegetation

Many areas of Otay Ranch are devoid of native plants, the areas being wholly dominated by non-native grasses and other weedy species. Areas that have poor access, steep slopes, a southerly aspect, poor soils, or a combination of these factors will be revegetated to a level of coverage that may be realistically expected. Habitat replacement to a level of "restoration" is not expected in these areas. Therefore, species diversity may remain low, coverage will be low, and weedy species will remain a component of the final habitat structure.

The strategy for revegetating these areas will rely primarily on seed application of appropriate species in a sequential time frame that mimics successional habitat development. For example, the initial year of treatment may involve only weed removal combined with a seed mix of pioneer species, annuals and perennials. Depending upon the success for this treatment, it may be repeated the following year to further reduce weed coverage, expand pioneer species coverage, and to improve soil organic content and nutrient balance. Successful reduction of weed cover and replacement with pioneer species will initiate the next level of treatment: the introduction of dominant shrub and sub-shrub species. The initial seed mix application of shrubs should include the full diversity of the target species composition for any given habitat type. Subsequent seed mix applications will be refined to increase the presence of certain species that did not germinate or survive in the previous year's seed application.

Erosion control techniques using silt fence and sand bags filled with native soil shall be in place prior to any soil disturbance. Wheeled and tracked vehicles are prohibited on revegetation sites. Topsoil placement shall be prohibited on slopes over a 10:1 gradient. Site preparation of revegetation sites will be limited to mechanical removal of weed species using hand tools and equipment that minimize soil disturbance. Weed material that has not set seed may be left in place after cutting to act as a mulch over freshly seeded areas. Seed applications will be hand raked into the top ½ inch of soil.

Revegetation areas will not be irrigated unless special circumstances apply. Weed removal should commence in early fall and continue through the spring of each year. Seed applications will occur within winter months, i.e., November 15th through February 15th. Replacement sites shall be treated sequentially, not simultaneously. Revegetation activities will proceed and be dependent on current weather conditions and site conditions.

5.4 Habitat Restoration

Habitat replacement sites having slope gradients under 10:1, a northern, western, and eastern slope aspect, and vehicular access will be restored to the full diversity and coverage of adjacent, relatively undisturbed habitat. Although these sites are wholly dominated by non-native weeds, the more forgiving slope gradient and aspect allow for greater site manipulation than conditions found on revegetation sites. Restoration sites are typically more mesic, have better soil development, and are less prone to erosion. The use of farm and earth moving equipment on these sites allows for more radical treatments that address weed and soil issues. Salvaged native plant species and/or topsoil may be imported to sites where previous disturbance has removed the native topsoil mantle. Often, a well developed topsoil horizon of significant depth is present on restoration sites, offering a greater water holding capacity that may support container grown shrub species. A program of sensitive species introductions will occur on restoration sites. The seed or propagated plant material of sensitive species will be collected from either areas to be impacted or existing habitat on the preserve. Restoration sites will receive only species that are appropriate to the area and habitat goal. A minimum period of three years will typically be necessary to establish populations of each sensitive species, however, less time may be required and significant growth of a population over a two year period will void any further treatments of the selected sensitive species. Placement of native topsoil and mulched CSS vegetation is strongly recommended. However, this technique requires careful coordination between project impacts and restoration activities.

Site preparation may include mowing, discing, and/or the placement of native salvaged topsoil. Erosion control structures, such as sand bags filled with native soil, silt fence and waterbars should be in place prior to any soil disturbance. Restoration sites may be irrigated by a temporary irrigation system if appropriate conditions dictate. The treatment may include seed mix application in conjunction with land imprinting and the installation of container plants to increase the development of habitat structure.

5.5 Monitoring

Monitoring of CSS/MSS habitat replacement sites will be the responsibility of the Preserve Owner/Manager. Monitoring will include data gathering, recommendations for remedial actions, and reporting.

Permanent vegetation sampling stations will be established within the habitat replacement sites at appropriate locations following the protocol of the California Native Plant Society (CNPS) Plant Communities Project. The sampling method used by the CNPS Plant Communities Project is based on a 50-meter point-transect centered in a 50 meter x 5 meter plot which is randomly located in a patch of relatively homogeneous vegetation. The CSS/MSS habitat replacement effort should be assessed in September following the first summer after planting to determine mortality of individuals, initial success of seeding, and functioning of irrigation. The number, size, and species of dead plants should be recorded, along with percent cover. Mortality judged to be the result of competition for resources with other native species (as judged by close proximity to the other species) or a result of inappropriate soil moisture

conditions will not require replacement planting. The treated sites should be checked monthly between the onset of winter rains until June of the year following planting to monitor and control invasion by exotic weeds. Thereafter, the treated sites should be monitored twice per year for three to five years. Monitoring shall consist of a field check during the spring by a qualified biologist (The Wildlife Society or Ecological Society of America certification or recommendation by U. S. Fish and Wildlife Service) to assess percent cover, size of individuals, and use of the revegetated area by wildlife species. Spring monitoring sessions should determine the need to continue the temporary irrigation (if used) through the following year. Fall monitoring should be conducted to determine mortality as described above. Permanent photo-documentation stations shall be established along each vegetation transect to record the progress of the habitat replacement sites over the three to five year period.

Performance Standards – Habitat Replacement Sites

The success of the CSS/MSS habitat replacement will be measured by its ability to replace habitat values lost, and directly by its ability to support native plant and wildlife species typical of CSS/MSS. The following are preliminary success criteria from the RMP that are subject to revision based on empirical field data:

> The shrub layer within each treated patch will consist of a least four site-typical native shrub species (*Table 8*), and the herb layer will consist of at least four native grass or herb species.

TABLE 8
RECOMMENDED GOALS FOR COVER

Vegetation Type	Coverage Goal	Coverage Range
Shrubs	50%	40-65%
Herbs	30%	20-30%
Bare Ground	20%	10-30%

> The percent cover of the shrub layer in a target patch of high quality vegetation will be determined by quantitative analysis following the protocol of the CNPS Plant Communities Project as discussed previously. Factors that reflect habitat quality of the target patch will be measured, including total species, shrub, and herb density. Vegetation success standards for the restoration area will incorporate the presence of at least 60% of the shrub species determined to occur in the preferred habitat type within the target patch of vegetation. Thus, there will be no net loss of CSS habitat quality.
>
> Wildlife use will be measured using birds. In a patch greater than 25 acres, there will be use (as defined by providing food, nest sites, or roost sites) by at least 80% of the species found to be

resident in the baseline study or at least five scrub-requiring bird species from the following list of resident species, whichever is greater.

Bewick's wren (*Thryomanes bewickii*)
Cactus wren (*Campylorhynchus brunneicapillus sandiegensis*)
Coastal California gnatcatcher (*Polioptila californica californica*)
California quail (*Lophortyx californicus*)
California thrasher (*Toxostoma redivivum*)
California towhee (*Pipilo crissalis*)
Rufous-crowned sparrow (*Aimophila ruficeps canescens*)
Rufous-sided towhee (*Pipilo erythrophthalmus*)
Bells' sage Sparrow (*Amphispiza belli belli*)
Scrub jay (*Aphelocoma coerulescens*)
Wrentit (*Chamaea fasciata*)

In addition to the above performance standards from the RMP, the habitat replacement treatments should be tracked over time to quantify percentage of native- and non-native species cover and species diversity. The results should be compared to the appropriate target transect sites.

5.6 Predesign Plans

The RMP requires an overall concept and strategy plan to address biological impacts resulting from project implementation over the 30-year development schedule of Otay Ranch. The CSS/MSS Habitat Replacement Master Plan represents the first phase of habitat replacement planning that will describe the overall framework for the habitat replacement program. The second phase of planning will include preparation of more detailed Pre-design Habitat Replacement Plans (HRP) for each Village as detailed site development plans are completed. Each HRP will document impacts to biological resources at a more detailed scale of planning than was conducted at the RMP level. Each HRP will recalculate the biological impact acreage based on the site development plan and calculate the associated habitat replacement requirement.

Because development must remain within the RMP development envelopes, biological impacts from development should not exceed the biological impacts estimated for each Village at Otay Ranch (Table 10). These acreages should be viewed as maximum allowable impact acreages. Development that would exceed the previously established maximum biological impact will require a supplemental Environmental Impact Report to address this issue. However, through careful site design, fewer impacts may be possible through greater avoidance of existing biological resources. Therefore, the acreage of habitat replacement required in the RMP may decrease, if the site development plan avoids previously identified biological impacts.

From the newly calculated biological impacts, the HRP will calculate the actual habitat replacement acreage required, using the original habitat replacement ratio identified in the RMP (Table 10). A direct impact to vegetation permanently removes the vegetation from the location in which the vegetation naturally occurred. For coastal sage scrub, the replacement ratio is 0.4 acre of habitat replacement for

every one acre (0.4:1) of native vegetation directly impacted. For maritime succulent scrub, the replacement ratio is 1:1.

The HRP will describe the exact location and size of habitat replacement, define the target vegetation community, and include a plant palette(s), propagation and planting methods, a long-term maintenance program, and a long-term monitoring program. A complete list of required topics to be addressed in detail by each HRP is included in Section 5.6. HRP's must be prepared and approved by the Preserve Owner/Manager (POM) prior to onsite disturbance of identified biological resources within the Village area. Due to the timing of circulation element implementation in relation to residential development, a separate HRP will be required to mitigate biological impacts associated with the construction of circulation elements.

Statement of Conformance

Each pre-design report shall provide a written evaluation of the replacement site that compares the current site condition with field data presented in the CSS/MSS Habitat Replacement Master Plan. The pre-design report author shall be responsible for incorporating an analysis of the prevailing site conditions and the appropriateness of Master Plan goals and success criteria. Situations may occur that will supersede and invalidate Master Plan proposals. A statement of compliance and/or deviation from the Master Plan program must be included in each pre-design report and approved by the Preserve Owner Manager. Recommendations for habitat goals and replacement protocols that deviate from the Master Plan must be supported with field data of prevailing site conditions.

Each pre-design plan for habitat replacement on a village by village basis shall include the following information as a minimum. A background and purpose section should address the following topics as appropriate to each replacement project:

quality of habitat to be impacted
project goals and design criteria
mitigation site conditions
owner's responsibility
project biologist responsibilities
landscape architect responsibilities
grading contractor responsibilities
installation contractor's responsibilities
maintenance contractor responsibilities
contractor personnel education
performance bonds, assurities and penalties

Implementation topics for the pre-design plan may include:

implementation strategy
special seed collections
restoration activity sequence
biological monitoring schedule
plant salvage
weed eradication
protection fence installation
topsoil salvage and vegetation mulching
restoration site preparation
placement of salvaged topsoil
plant and seed installation
site preparation and grading
erosion control features

Plant materials and installation specification discussion should include topics such as:

commercial plant materials and seed
sensitive species propagation
species composition
planting arrangement
planting procedures
timing of plant installation
replacement plants and seed
irrigation requirements

Maintenance, management and monitoring discussions of the pre-design plan should include topics such as:

general maintenance responsibilities
weed abatement
clearing and trash removal
irrigation
monitoring methodology
monitoring schedule
monitoring reports
performance criteria and project certification

Graphic information should include the location of each habitat replacement site at a scale large enough to provide detailed locational and physiographic information (at least 1"=400').

5.7 Timing of Habitat Replacement

When available information is insufficient to assess actual biological impacts throughout an entire Village area, the total predicted habitat replacement acreage, as calculated from the total estimated biological impacts identified in the RMP, shall be implemented for the Village (Table 10). Habitat replacement shall be implemented upon initial impacts to biological resources within each Village, even if additional future subdivision development is contemplated in the Village, yet lacks a detailed development site plan. Habitat replacement that has satisfied performance criteria shall be considered pre-mitigation for future sub-division development within a given Village. Successfully completed habitat replacement acreage in excess of the total habitat replacement requirement for a Village, at buildout, may be applied against the habitat replacement requirement of another Village. The transfer of replacement credit may occur only when an excess of successful habitat replacement acreage is present at Village buildout.

5.8 Biological Impact and Habitat replacement Tracking

Biological impact acreage and habitat replacement acreage shall be tracked separately by Village as each HRP is prepared. For each HRP, the acreage of biological impacts and of the habitat replacement requirement shall be calculated and subtracted from the total corresponding maximum allowable biological impact and habitat replacement acreage requirement as defined in the RMP (Table 10). The calculation shall be a required element for HRP approval. Any transfer of habitat replacement credit from a built out Village to another Village shall be clearly noted in this calculation. In the course of project implementation, if the acreage of biological impacts exceeds the total acreage impact defined in the RMP, an EIR amendment will be required before additional biological impacts are approved. The amendment shall address future additional biological impacts resulting from implementation of each remaining Village and the proposed habitat replacement requirement.

5.9 Habitat replacement Acreage and Replacement Credit Calculations

A requirement of each HRP is the recalculation of habitat replacement acreage based upon biological impacts identified in future detailed site development plans. Habitat replacement acreage calculations shall use the habitat replacement ratios for direct impacts to intact and disturbed vegetation as described in the RMP. Successful replacement habitat shall be credited at a 1:1 ratio against the required replacement acreage.

5.10 Responsible Parties

The CSS/MSS Habitat Replacement Master Plan was prepared by Dudek & Associates, Inc. The address, telephone number, and contact person are provided on the cover page of this document. The plan was prepared for The Baldwin Company, the Owner of Otay Ranch. The address, telephone number, and contact person are provided on the cover page of this document.

Project Owner/Developer

The Owner/Developer shall be fiscally responsible for the cost of habitat replacement planning, implementation, construction monitoring, long-term maintenance, long-term biological monitoring, and contingency measures. The Owner is ultimately responsible for the success of all required habitat replacement. The Owner also shall be responsible for coordination and management of habitat replacement projects with the assistance of the Project Biologist. The Owner will provide an experienced work force that is adequate for implementing each habitat replacement project. The Owner shall be solely responsible for administration of contracts for the project including the Project Biologist, Installation Contractor, and Maintenance Contractor. Decisions to stop work, suspend payment or terminate such contracts is the responsibility of the Owner except where noted herein. This includes all phases of project installation, construction monitoring, long-term maintenance, and long-term biological monitoring. The Owner may, with sole discretion and at any time, replace any of these parties, if necessary.

Preserve Owner/Manager (POM)

The POM will be responsible, under the CSS/MSS Habitat Replacement Master Plan, for tracking total biological impacts and habitat replacement requirements on a village-by-village basis and for the entire RMP area. The POM shall review and approve all pre-design Habitat Replacement Plans and shall ensure that the plans conform to the Master Plan. The POM shall review the proposed treatments and habitat replacement goals, and shall be responsible for locating and coordinating each habitat replacement project within the preserve. If high quality CSS/MSS habitat occurs within a Village area, the POM shall ensure that restoration treatments take full advantage of the existing biological material that will be impacted by project implementation through topsoil and vegetation salvage methods. The POM, in consultation with the project biologist, shall certify habitat replacement project success at the conclusion of the longterm biological monitoring period.

Project Biologist

The project biologist shall be an individual or firm that has significant experience with the design and implementation of CSS and MSS restoration projects. The project biologist shall have demonstrated knowledge of the ecology, biology, flora, and fauna of these plant communities. The project biologist shall have demonstrated involvement in at least three restoration projects involving CSS and/or MSS.

The project biologist shall be responsible for the preparation of the pre-design Habitat Replacement Plan, the preparation of plans and specifications intended for project construction, the interpretation of said plans and specifications, field monitoring of the installation contractor's work, monitoring maintenance activities during the 120-day maintenance period, and for conducting biological monitoring throughout the long-term monitoring period. Construction monitoring shall occur on a weekly basis throughout the construction period. The Project Biologist shall have authority to stop work in situations where biological resources, not permitted to be impacted, are in eminent danger of impacts from construction activities. Three formal site observations shall occur during the 120-day plant establishment period. Biological monitoring during the long-term monitoring period will occur on a quarterly basis. During construction, each site visit will be documented in a daily observation report that shall note construction activities relating to habitat replacement and any project deficiencies. Biological monitoring site visits will be documented with a checklist of project deficiencies and recommendations for remedial measures. All documentation shall be provided to the POM for distribution to the Owner and to resource agencies.

Installation Contractor

A qualified installation contractor shall be an individual or firm that has a valid C-2 contractor's license, and demonstrated knowledge and direct experience with the construction of CSS and/or MSS restoration projects. The installation contractor shall have constructed a minimum of three projects involving CSS restoration. The contractor shall have experience with plant salvage and transplantation techniques where sensitive species and/or restoration treatments are involved. The contractor shall have knowledge of irrigation system construction and maintenance.

The Installation Contractor shall be responsible for the performance of the habitat replacement contract documents that shall include detailed graphic plans and written specifications that are in substantial compliance with the information and direction contained in the CSS/MSS Habitat Replacement Master Plan and the HRP. The scope of work includes, but is not limited to, site preparation, weed control, installation of plant and seed material and installation of a rental irrigation system. The Installation Contractor's project responsibilities shall cease upon successful completion of the scope of work involved with installation together with maintenance services performed throughout the 120-day Plant Establishment Period. The Contractor shall not be released from his/her contractual obligation until written notification is received from the Project Biologist and the POM certifying satisfactory completion of all required installation tasks as defined in the installation contract.

Maintenance Contractor

The maintenance contractor shall have demonstrated successful performance of maintenance responsibilities on a minimum of three CSS restoration projects. The contractor shall have a valid C-2 contractors license and shall employ a licensed pest control applicator.

After initial installation and completion of the 120-day Plant Establishment Period, a Maintenance Contractor shall be hired by the Owner or Developer to implement project maintenance during the long-term monitoring period. The Maintenance Contractor may be the Installation Contractor if deemed appropriate by the Owner. The Maintenance Contractor shall be responsible for maintenance of habitat replacement areas. Upon termination of the maintenance contract, the Contractor shall be responsible for completing all requests for work specified by the Project Biologist via the POM before receiving final payment.

Contractor Personnel Education

Before any construction activity begins, all contractors involved with development construction and the habitat replacement project will meet on-site with the Project Biologist and the POM to review plans and specifications (contract documents). The Owner will provide copies of all contract documents, including the CSS/MSS Habitat Replacement Master Plan and the appropriate HRP, to the Contractors and will review all aspects of the plan including, but not limited to, site protection, submittals, scheduling of formal site observations, lines of communication, and persons with stop work authority.

6.0 PHASING AND IMPLEMENTATION

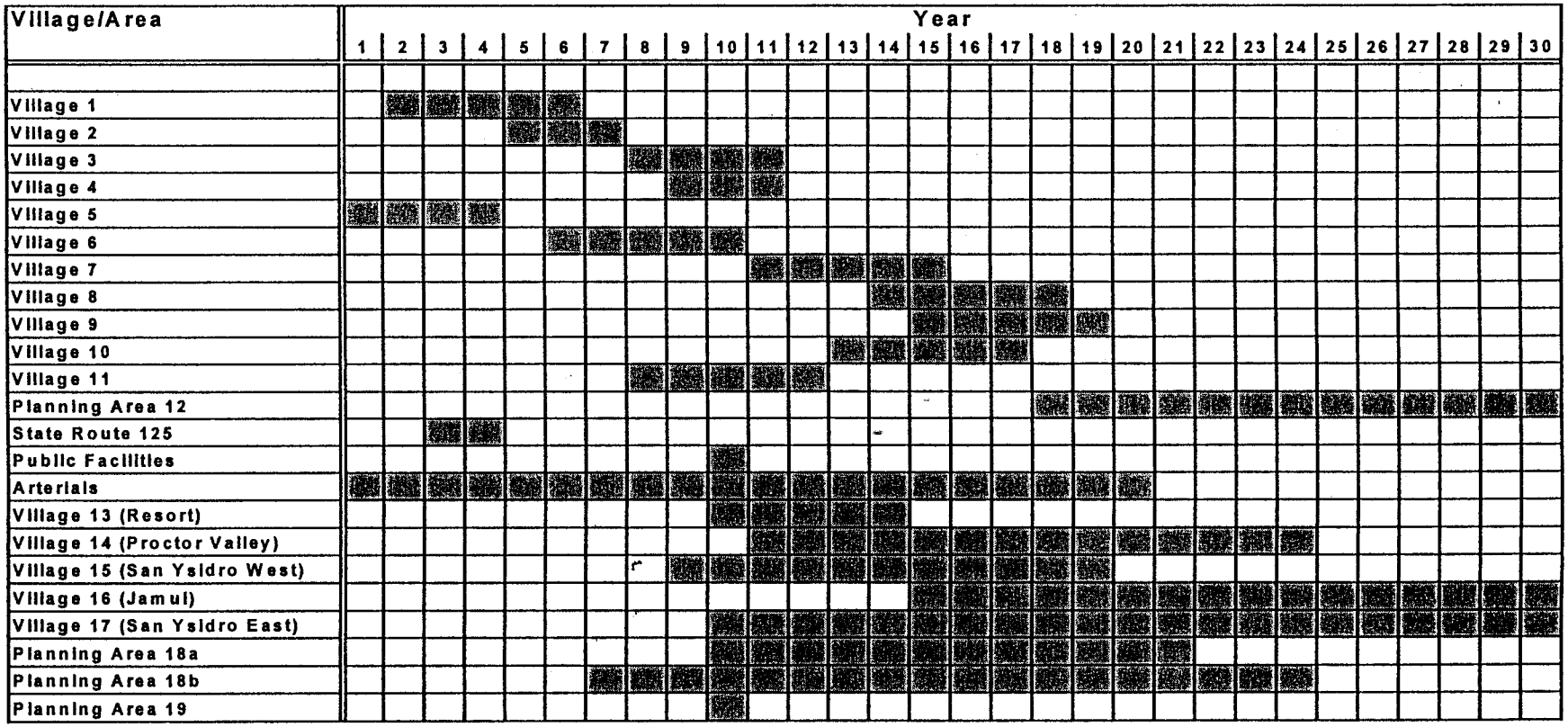
Phasing of the CSS/MSS habitat replacement activities will be coordinated with development scheduling of Otay Ranch. To avoid disturbance of habitat replacement areas by grading activities, it is preferable to schedule replacement activities after or concurrently with grading for development. If grading for development may involve disturbance of native habitat containing candidate species for salvage, it would be preferable to schedule habitat replacement activities concurrently with grading for development. This avoids the need for storage of the salvaged plant materials.

The phasing of development of Otay Ranch was determined using the Fiscal Impact of New Development Model (*Table 9*). This table provides an approximation of when impacts to CSS/MSS may occur. Impacts to CSS may occur in all villages except Villages 5, 6, 7, and Planning Area 12 which do not contain any CSS habitat. Maritime succulent scrub is present in only a few villages: Villages 1, 2, 3, 4, 9, and 10, and thus impacts may occur only in these areas. The development of each village or planning area occurs over a number of years, however, prior to the occurrence of significant impacts to California gnatcatcher occupied CSS/MSS, the habitat replacement program for the resulting impacts must be initiated and have met the success criteria outlined in the RMP. This will encourage the development design to minimize impacts to sensitive habitats.

The first area scheduled to be developed is SPA One, which includes Villages One and Five. Impacts to CSS and MSS have been estimated for Villages 1 and 5 but do not include the potential future development impacts occurring in the western portion of Village 1. Village 1 impacts are estimated at 15.9 acres of CSS or disturbed CSS and 10.5 acres of MSS or disturbed MSS. Village 5 results in no impacts to CSS or MSS.

TABLE 9

PHASING OF VILLAGE DEVELOPMENT FOR OTAY RANCH – YEAR 1 EQUALS 1996



Note: Gray shading denotes the development period of each Village or Area.

Impacts to CSS/MSS due to the development of the remaining villages and planning areas can only be roughly estimated and are based on the Otay Ranch GDP/SRP land use plans (*Table 10*). Impacts will be quantified more accurately when the grading plans for each area are developed. Mitigation for the impacts to sensitive habitats are based on the following mitigation ratios: 0.4:1 for impacts to CSS, 1:1 for impacts to MSS. These impact ratios will be applied to the quantification of impacts once the development plans are finalized. This also encourages the avoidance or minimization of impacts to CSS/MSS.

TABLE 10
IMPACTS TO CSS/MSS BY VILLAGE OR PLANNING AREA

Village/Planning Area	Habitat Type	Acres Impacted (Estimate)	Mitigation Requirement (Acres)[1]
Village 1 (Current SPA One plans)	CSS	16	6
	MSS	11	11
Village 1 (Potential future development)	CSS	41	16
Village 2	CSS	30	12
	MSS	3	3
Village 3	CSS	5	2
	MSS	2	2
Village 4	CSS	75	30
	MSS	12	12
Village 8	CSS	25	10
Village 9	CSS	5	2
	MSS	3	3
Village 10	CSS	5	2
	MSS	12	12
Village 13	CSS	330	132
	Disturbed CSS	55	21
Village 14	CSS	190	76
	Disturbed CSS	150	58
Village 15	CSS	475	190
	Disturbed CSS	45	18
Village 16	CSS	380	152
	Disturbed CSS	250	97
Village 17	CSS	540	216
	Disturbed CSS	40	16
Planning Area 18a	CSS	15	6
Planning Area 18b	CSS	10	4
Planning Area 19	Disturbed CSS	20	8
Circulation Elements	CSS	636	254
	MSS	14	14

[1] Mitigation requirements are based on a constant replacement ratio of 0.4:1 for CSS and MSS impacts per the RMP.

Habitat replacement will be done in blocks of a minimum size of 10 acres. The locations of the treatments will be coordinated with the development phasing in order to salvage topsoil and plant materials of native habitats within development areas. Salvaged material will be transported to treatment locations within the parcel. Treatment locations will be centered in the Otay River Valley, Salt Creek, and Wolf Canyon areas. Grazing activities will be removed one year prior to the start of habitat replacement treatment.

A pilot CSS habitat replacement project of approximately 10 acres will be started prior to or concurrent with approval of the first SPA within Otay Ranch. This will satisfy the requirements of Policy 3.4 of the RMP. The location of the 10-acre pilot project is best suited for the Otay River Valley area, on the north side of the river near the mouth of Salt Creek. The proposed treatment area would be a portion of polygon 19G. This polygon is located adjacent to high quality California gnatcatcher and cactus wren occupied habitat. It is currently a relatively flat area composed of non-native grassland habitat that requires habitat restoration treatment (treatment 4).

7.0 COST ESTIMATE

A number of activities or tasks are involved with each habitat replacement opportunity type. The tasks that are required for each opportunity type differ depending on the existing condition of the habitat. A cost estimate for each habitat replacement opportunity type was determined based on the tasks that would be involved. A cost, or range of costs, was assigned to each task as shown below. The cost of the tasks were typically based on a per acre unit, however for fencing costs, which are determined by the shape of the area, the cost is based on a linear foot unit. The unit costs for activities or tasks include:

	TASK DESCRIPTION	COST	UNIT
1.	Disking	$300.00	AC
2.	Mowing w/ slash removal	$350.00	AC
3.	Weed Removal by hand w/ slash removal	$435-$871	AC
4.	Weed removal - Weed Whip w/o slash removal	$500.00	AC
5.	Seed broadcast & rake-in by hand	$2,178.00	AC
6.	Seed broadcast and Rake-in w/ spring harrow	$871.00	AC
7.	Hydroseed - seed separate from fiber mulch	$5,227.00	AC
8.	Irrigation sys. - Pvc w/ large rad heads on-grade	$2,178-$6,534	AC
9.	Topsoil salvage - assume 634 cy/ac	$1,900-$3,800	AC
10.	Topsoil stockpile - same quantity as above	$1,900.00	AC
11.	Rabbit fence - Chicken wire & T posts (10' o.c.)	$2.00	LF
12.	Chain Link fence - 6" tall (per SDRSD)	$10.00	LF
13.	Barbed wire fence - 3-strand w/posts @ 10' o.c.	$4.50	LF

Notes:

A. Costs do not reflect prevailing wage.
B. Disking will include two passes at 90 degree angles
C. Rake-in requires top ½" of soil to be scarified with hand rake or machine.
D. Irrigation will be a temporary system for 1-2 years use. Very minimal.

The cost per acre for each replacement opportunity was prepared by determining the need for the various tasks. For example, natural regeneration typically requires only weed removal and seed broadcast. In contrast, habitat restoration requires the full range of tasks, from disking and mowing, to seed broadcast and container plant installation. The following table (*Table 11*) illustrates how the replacement opportunities differ from each other in the tasks or activities that are required and the costs associated with each task. The cost per acre for each opportunity may then be summed for each activity that is required.

TABLE 11

PRELIMINARY COST ESTIMATE FOR HABITAT REPLACEMENT TECHNIQUES

Task Description	Natural Regeneration	Habitat Enhancement	Habitat Revegetation	Habitat Restoration	Cost/ Acre
Disking					$300.00
Mowing with slash removal					$350.00
Weed removal by hand					$435-$871
Weed removal - Weed Whip					$500.00
Seed Broadcast & rake-in by hand					$3,475.00
Seed Broadcast & rake-in w/ Machinery					$2,200.00
Hydroseed - seed separate from fiber mulch					$5,227.00
Irrigation system				A	$2,178-$6,534
Salvaged Topsoil Placement				B	$1,900-$3,800
Topsoil Stockpile				B	$1,900.00
Salvage Plant Installation		C			$200.00
Container Plant Installation			D		$6,334.00
Rabbit Fence (per linear foot)	E	E	E		$2.00
Chain Link Fence - 6-foot tall (per linear foot)	F	F	F	F	$10.00
Barbed Wire Fence - 3 strand (per linear foot)		G	G	G	$4.50
Pre-Design Report					H
Construction Drawings & Specifications					H
Construction Monitoring					H
Biological Monitoring					H

NOTES:

Dark grey denotes that the technique should be used to achieve the habitat replacement goal.

Light grey denotes that the technique may be appropriate and should be considered on a case basis.

A. Irrigation system may be as simple as on-grade mainline pipe with ball valves for hose connection that would allow for hand irrigation. High end system would use large radius plastic stream rotors with on-grade PVC pipe.

B. Topsoil salvage, stockpiling, and placement may or may not be desirable. Factors that would recommend this technique include availability of a source area at the time of restoration. Receptor site conditions that favor this technique include the extent of erosion, topsoil degradation, shallow slopes, extent of onsite weed seed bank, and site access. Not all restoration sites will be suitable for topsoil transfer.

C. Salvage plant installation may be used on enhancement areas if the technique will accelerate and ensure the enhancement goals. Not all enhancement sites will receive this treatment.

D. Container plant installations will occur on restoration sites as a means to create a multi-aged habitat, to accelerate vegetative cover, and to increase onsite seed production and natural recruitment. Container plant installation may occur on revegetation areas where soil depth, water holding capacity, and slope aspect are capable of sustaining the plant material without irrigation.

E. Rabbit fence will be desirable where high levels of small herbivore activity are anticipated. These fences are not suitable as a cattle barrier. Installation of rabbit fence should occur on a case basis.

F. Chain link fence should be used wherever unauthorized entry is anticipated or becomes a problem. The decision to use chain link fence should be made on a case basis.

G. Barbed wire fence is appropriate for controlling cattle movement and may be appropriate in remote locations of the Ranch where the chance of unauthorized entry is low.

H. The cost of habitat replacement planning, design, and monitoring at the project level cannot be properly estimated until the specifics of each project become known. Factors that will effect the cost of these work efforts include the areal extent of the treatment area, the number of different habitats being replaced, and the replacement techniques used.

The total cost per acre for each replacement opportunity was based on a five year treatment program. Typically, not all of the tasks will take place each year, but will be spread out over a time period to take advantage of winter rains and periods of dormancy for the annual exotic plant species. The cost over the five year period decreases during the final two years as the number of tasks are minimized and the habitat improves as a result of the treatment. The estimated cost per year over a five year period for each habitat replacement opportunity is as follows:

OTAY RANCH HABITAT REPLACEMENT – PRELIMINARY ESTIMATED COST PER YEAR

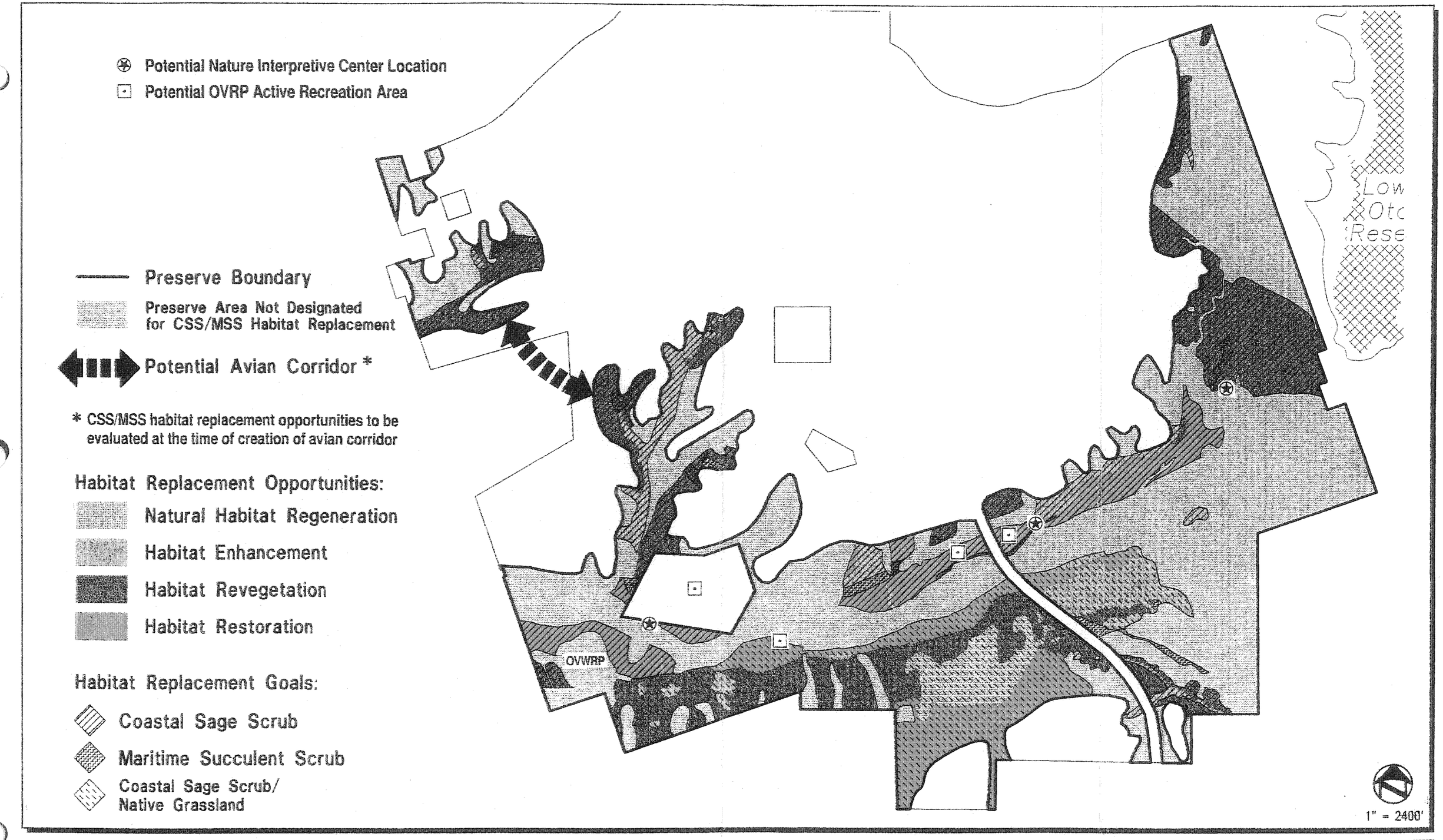
HABITAT REPLACEMENT OPPORTUNITY	ESTIMATED COST PER YEAR					TOTAL
	1	2	3	4	5	
Natural Regeneration	$2,613	$3,113	$1,171	*	*	$6,897
Habitat Enhancement	$3,549	$3,113	$3,113	$1,371	$1,371	$12,517
Habitat Revegetation	$3,549	$4,856	$3,113	$2,678	$1,371	$15,567
Habitat Restoration	$5,821	$13,368	$7,790	$2,242	$1,371	$30,592

* A declining habitat at the end of year three will require these areas to be treated as Habitat Enhancement Areas.

8.0 SUMMARY

The database and GIS analysis of CSS/MSS habitat replacement opportunities and goals indicates that 2,010.4 acres is available. This amount is adequate to provide the required replacement of 1,300 acres of CSS and 57 acres of MSS. The habitat replacement will be coordinated with other uses and needs of the preserve including the 400 acres of active recreation and the 198 acres needed for native grassland restoration. The following table and *Figures 10, 11 and 12* summarize the habitat replacement opportunities and goals for Otay Ranch.

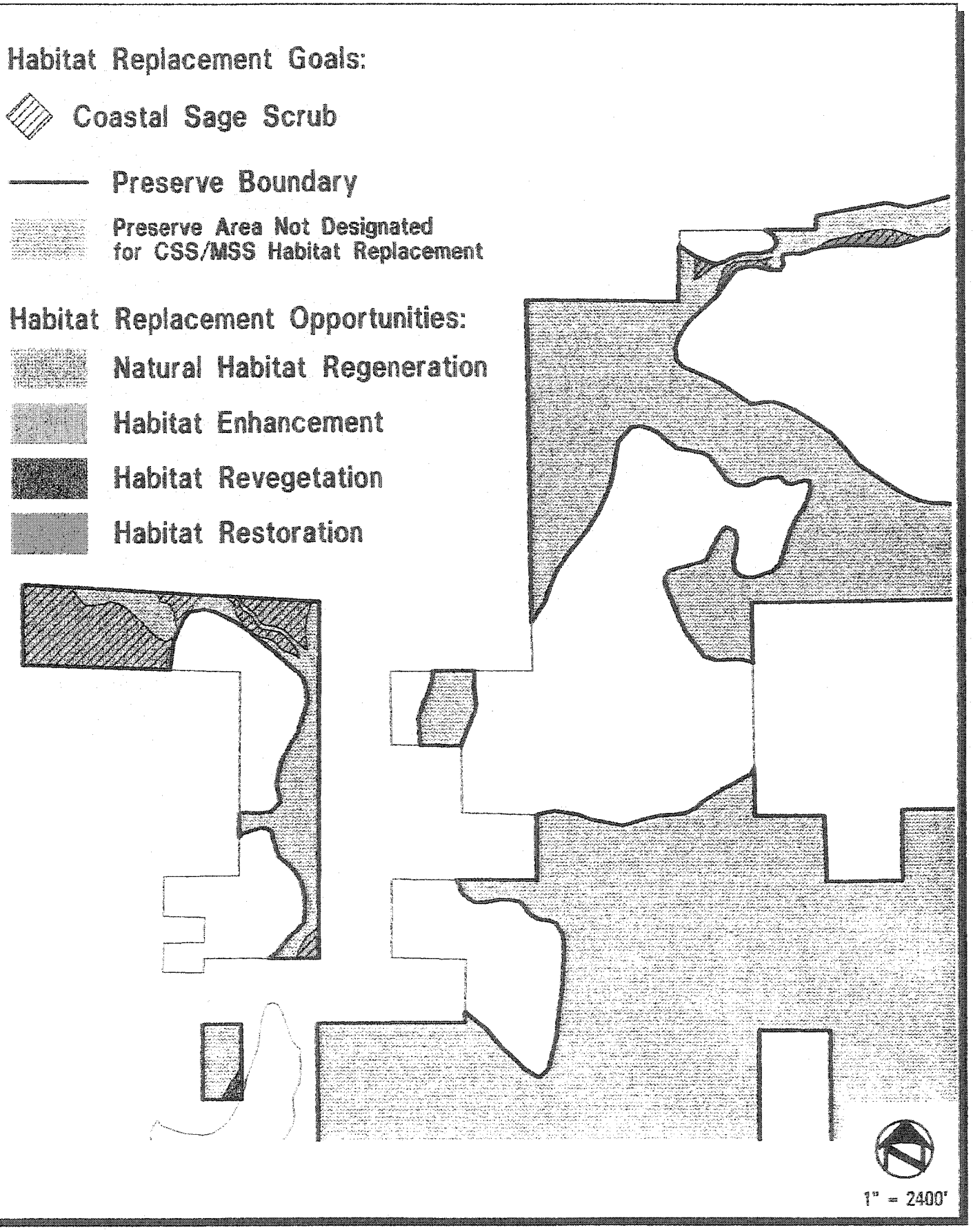
CSS/MSS Habitat Goals for Each Habitat Replacement Opportunity for Otay Ranch		
Habitat Opportunity	**Habitat Goal**	**Acres**
Natural Regeneration with Management	CSS	126.0
	CSS/NG	56.6
	MSS	10.5
Habitat Enhancement	CSS	196.3
	CSS/NG	168.9
	MSS	15.8
Habitat Revegetation	CSS	508.8
	CSS/NG	386.2
	MSS	32.3
Habitat Restoration	CSS	237.6
	CSS/NG	271.4
	MSS	0.0
TOTAL HABITAT REPLACEMENT OPPORTUNITIES		***2,010.4***



Otay Ranch CSS/MSS Habitat Replacement Master Plan

Otay Valley Parcel - Replacement Opportunities & Goals

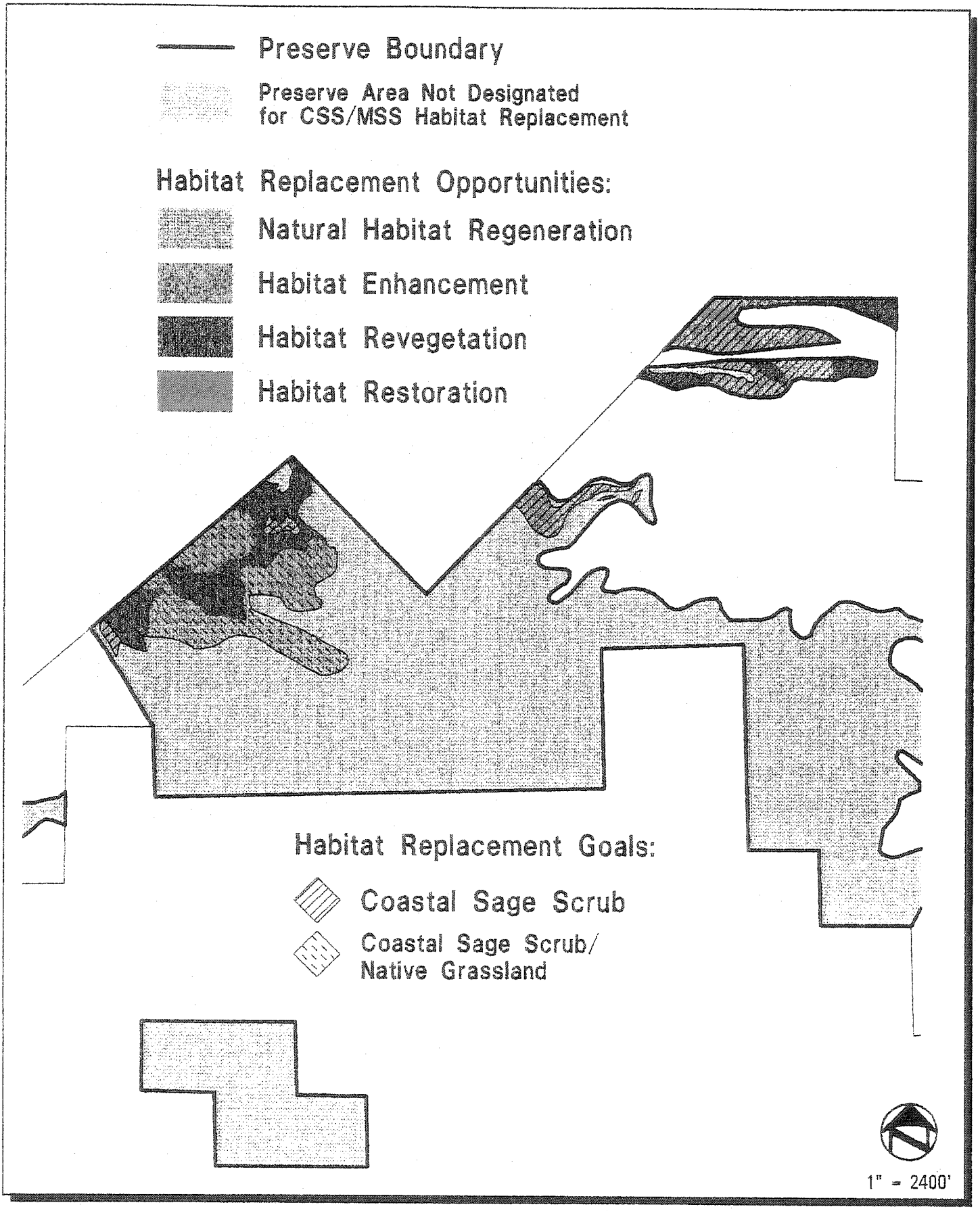
FIGURE 10



Otay Ranch CSS/MSS Habitat Replacement Master Plan

Jamul Mtns. Parcel - Replacement Opportunities & Goals

FIGURE 11



Otay Ranch CSS/MSS Habitat Replacement Master Plan

San Ysidro Mtns. Parcel - Replacement Opportunities & Goals

FIGURE 12

APPENDIX A

DATA FORMS FOR CSS/MSS HABITAT REPLACEMENT FIELD PROGRAMS

EXHIBIT 4

OTAY RANCH REVEGETATION INFORMATION DATA SHEET

POLYGON NUMBER _____ **Requires subdivision** _____
Slope _____ **Aspect** _____ **Soil Type** _____
Date of Survey _____ **Surveyor** _____
Access (quality and direction) - 4WD _____ **2WD** _____ **All Weather Road** ____
Pavement _____ **River Crossing** _____

Habitat type _____

Percent Native Shrub Cover _____
Dominant shrubs _____
_____
_____

0-10% = 1
11-30% = 2
31-60% = 3
> 60% = 4

Percent Exotic Cover _____
Dominant weeds _____
_____
_____

Percent Bare Ground _____

Cryptogrammic soil present _____

Eroded Soils (circle one)
0 - no soil erosion
1 - eroded soil without rills
2 - eroded soil with small rills
3 - eroded soil with major rills
4 - eroded soil with "canyons"
Percent area of polygon effected _____

Evidence of other disturbance
Agriculture _____

Grazing _____

Mining _____

Sensitive Wildlife Species
Species present within polygon (field) _____
Species present within polygon (lab) _____
Species present adjacent to polygon (field) _____
Species present adjacent to polygon (lab) _____
Where _____

Sensitive Plant Species
Species present within polygon (field) _____
Species present within polygon (lab) _____

EXHIBIT 2

TARGET CSS TRANSECT DATA SHEET PROTOCOL

The sampling method is based on a 50 meter long point-transect centered in a 50 meter X 5 meter plot. At each 0.5 meter interval along the transect, a point is projected vertically down into the vegetation and up into the canopy. A "round bar" (rebar, dowel, etc.) provides a line which can be projected into the vegetation layer serving as the interception point. Only interceptions which fall within the canopy outline of a tree or shrub, including inflorescences, or which directly hit an herb, are valid. Each species intercepted at the projected point is recorded within the appropriate layer category in the native or non-native column. It is important not to bias the location of the point to include a plant; this will result in an overestimation of plant cover.The vegetation at each point is divided into three layers dependent on height: surface = <0.5 m; shrub = >0.5 m and < 4 m; and canopy = >4 m. Within a layer, if no plant is intercepted, record a no vegetation category (R = rock, B = bare). If two or more species within a single layer are intercepted by a point, all are recorded for that layer. The ground layer column indicates the type of soil surface (R = rock, L = litter, B = bare, C = cryptogrammic).

On the last page of the form, record all additional plant species encounterd within a 5 meter wide plot along the length of the 50 meter transect.

EXHIBIT 2

TARGET CSS TRANSECT DATA SHEET

Date _____

Parcel _____ Polygon # _____
Investigator _____ Transect # _____
General Location _____
Elevation _____ Slope (degrees) _____ Site aspect (degrees) _____
Transect Orientation (degrees from north) _____

COMMENTS:

Vegetation Type/Description _____

Total Shrub Cover (Estimate) _____ Soil Type (from USDA) _____
Sensitive Species? Yes ☐ No ☐ List _____
Soil Sample Taken? Yes ☐ No ☐ Label _____
Evidence of Disturbance (Describe) _____

No.	Ground Layer R, L, B or C	Surface Layer (0-0.5m)	Shrub Layer (0.5-4m)	Canopy Layer (>4m)	Notes
.5					
1.0					
1.5					
2.0					
2.5					
3.0					
3.5					
4.0					
4.5					
5.0					
5.5					
6.0					
6.5					
7.0					
7.5					
8.0					
8.5					
9.0					
9.5					
10.0					
10.5					
11.0					
11.5					
12.0					

EXHIBIT 2

Transect No. _____

No.	Ground Layer R, L, B or C	Surface Layer (0-0.5m)	Shrub Layer (0.5-4m)	Canopy Layer (>4m)	Notes
12.5					
13.0					
13.5					
14.0					
14.5					
15.0					
15.5					
16.0					
16.5					
17.0					
17.5					
18.0					
18.5					
19.0					
19.5					
20.0					
20.5					
21.0					
21.5					
22.0					
22.5					
23.0					
23.5					
24.0					
24.5					
25.0					
25.5					
26.0					
26.5					
27.0					
27.5					
28.0					
28.5					
29.0					
29.5					
30.0					

EXHIBIT 2

Transect No. _____

No.	Ground Layer R, L, B or C	Surface Layer (0-0.5m)	Shrub Layer (0.5-4m)	Canopy Layer (>4m)	Notes
30.5					
31.0					
31.5					
32.0					
32.5					
33.0					
33.5					
34.0					
34.5					
35.0					
35.5					
36.0					
36.5					
37.0					
37.5					
38.0					
38.5					
39.0					
39.5					
40.0					
40.5					
41.0					
41.5					
42.0					
42.5					
43.0					
43.5					
44.0					
44.5					
45.0					
45.5					
46.0					
46.5					
47.0					
47.5					
48.0					

EXHIBIT 2

Transect No. _____

No.	Ground Layer R, L, B or C	Surface Layer (0-0.5m)	Shrub Layer (0.5-4m)	Canopy Layer (>4m)	Notes
48.5					
49.0					
49.5					
50.0					
TOTAL	R: L: B: C:	Native: Non-Native:	Native: Non-Native:	Native: Non-Native:	
GRAND TOTAL					

Additional Species Encountered in 250 m^2 Plot:

LIVE	DEAD

APPENDIX B

COASTAL SAGE SCRUB AND MARITIME SUCCULENT SCRUB HABITAT REPLACEMENT POLYGON ANALYSIS SPREADSHEET

OTAY RANCH CSS/MSS HABITAT REPLACEMENT MASTER PLAN POLYGON ANALYSIS.

POLYGON NUMBER	SLOPE	ASPECT	SOIL TYPE	ACCESS	HABITAT TYPE	NATIVE	EXOTIC	BARE	EROSION	DISTURB	SENSITIVE SPECIES	EFFORT	CSS SPECIES	NATIVE GRASS	HABITAT GOAL	PARCEL	ACRES
	RATIO	F=FLAT	USDA	0=none		1=0-10%			99=none			1=nat regen	see below				
	X:1			1=4WD		2=11-30%			1=no rills			2=enhance	for species				
				2=2WD		3=31-60%			2=small			3=revege	abbrev				
						4=>60%			3=major			4=restore					
									4=canyons								
1A	25	N	SB	2	NNG	1	4	1	99	AG	NO	4	NONE	NO	CSS	OTAY	21.19
1B	25	N	SB	2	NNG	1	4	1	99	GRAZE	NO	4	NONE	NO	CSS	OTAY	35.90
1C	3	N	SB	2	NNG	1	4	1	99	GRAZE	NO	3	CACTUS	NO	CSS	OTAY	9.70
2A	3	NE	DA	2	NNG/CSS	2	3	1	99	GRAZE	YES	3	ARCA	YES	CSS/NG	OTAY	18.14
2B	2	SW	DA	2	NNG/CSS	2	3	1	99	GRAZE	YES	3	ARCA	YES	CSS/NG	OTAY	15.85
2C	2	NE	DA	2	NNG/CSS	1	4	1	99	GRAZE	YES	3	RHUS	YES	CSS/NG	OTAY	8.07
2D	3	W	DA	2	NNG/CSS	2	3	1	99	GRAZE	YES	3	ARCA	NO	CSS/NG	OTAY	17.97
2E	2	NE	DA	2	NNG/CSS	1	4	1	99	GRAZE	YES	3	ARCA	NO	CSS/NG	OTAY	14.70
3A	25	N	DA	2	NNG/CSS	1	4	1	99	GRAZE	YES	4	ARCA	NO	CSS/NG	OTAY	33.49
3B	4	NE	DA	2	NNG	1	4	1	99	GRAZE	YES	3	ARCA	YES	CSS/NG	OTAY	13.91
3C	3	W	DA	2	CSS/NNG	2	3	1	99	GRAZE	YES	3	ARCA	YES	CSS/NG	OTAY	7.88
3D	5	NE	DA	2	NNG/CSS	1	4	1	99	GRAZE	YES	3	ARCA	YES	CSS/NG	OTAY	15.41
3E	5	W	DA	2	NNG/CSS	3	2	1	99	GRAZE	YES	2	ARCA	NO	CSS/NG	OTAY	15.07
3F	4	NW	DA	2	NNG/CSS	2	3	1	99	GRAZE	YES	3	ARCA	YES	CSS/NG	OTAY	12.53
4B	25	S	DA	2	NNG	1	4	1	99	GRAZE	YES	4	HYMOCLEA	NO	CSS/NG	OTAY	14.42
4C	5	N	DA	2	NNG	1	4	1	99	GRAZE	YES	3	RHUS	NO	CSS/NG	OTAY	32.71
4D	5	S	DA	2	NNG	1	4	1	99	GRAZE	YES	3	ARCA	NO	CSS/NG	OTAY	26.46
4E	5	N	DA	2	NNG/CSS	2	4	1	99	GRAZE	YES	3	ARCA	NO	CSS/NG	OTAY	15.23
5A	15	N	DA	2	NNG	1	4	1	4	GRAZE	YES	4	NONE	NO	CSS/NG	OTAY	36.87
5B	3	N	DA	2	NNG	1	4	1	99	GRAZE	YES	3	ARCA	NO	CSS/NG	OTAY	19.13
5C	8	NE	DA	2	NNG	1	4	1	99	GRAZE	YES	3	ARCA	NO	CSS/NG	OTAY	29.25
5D	6	W	DA	1	NNG	1	4	1	99	GRAZE	YES	3	ARCA	NO	CSS/NG	OTAY	3.73
6A	100	F	SU	1	NNG	1	4	1	99	GRAZE	NO	4	NONE	YES	CSS/NG	OTAY	102.56
6B	100	F	SU	1	VP/CSS	1	4	1	99	GRAZE	YES	4	CACTUS	NO	CSS/NG	OTAY	62.00
7A	2	NE	OH	1	CSS	4	1	1	99	GRAZE	YES	1	ARCA	NO	CSS	OTAY	1.16
7B	100	F	OH	1	DRAIN	2	4	2	99	GRAZE	YES	2	RHUS	NO	CSS	OTAY	4.21
7D	2.5	S	OH	1	CSS	3	2	1	99	GRAZE	YES	2	ARCA	NO	CSS	OTAY	6.01
7E	3	NE	OH	1	NNG	1	4	1	99	GRAZE	NO	3	ARCA	YES	CSS/NG	OTAY	27.42

OTAY RANCH CSS/MSS HABITAT REPLACEMENT MASTER PLAN POLYGON ANALYSIS.

POLYGON	SLOPE	ASPECT	SOIL	ACCESS	HABITAT	NATIVE	EXOTIC	BARE	EROSION	DISTURB	SENSITIVE	EFFORT	CSS	GRASS	GOAL	PARCEL	ACRES
7F	15	SW	OH	1	MSS	3	3	1	99	GRAZE	YES	2	CACTUS	YES	MSS	OTAY	5.89
7G	2.5	SW	OH	1	NNG	1	4	1	99	GRAZE	NO	3	ARCA	YES	CSS	OTAY	15.15
8A	2	NE	DA	1	CSS	4	1	1	99	GRAZE	NO	1	ARCA	NO	CSS/NG	OTAY	2.86
8B	100	F	DA	1	DRAIN	2	4	2	99	GRAZE	YES	2	RHUS	NO	CSS	OTAY	1.46
8C	2	S	DA	1	MSS	4	1	1	1	GRAZE	YES	1	CACTUS	NO	MSS	OTAY	5.35
8D	5	N	DA	1	CSS/MSS	3	3	1	99	GRAZE	YES	2	CACTUS	NO	CSS/NG	OTAY	86.72
8E	8	N	DA	1	NNG	1	4	1	99	GRAZE	NO	3	ARCA	YES	CSS/NG	OTAY	10.38
8F	2	W	DA	1	MSS	4	1	1	1	GRAZE	YES	1	CACTUS	NO	MSS	OTAY	0.52
8G	100	F	DA	1	CSS/MSS	3	3	1	99	GRAZE	YES	2	CACTUS	NO	CSS/NG	OTAY	4.65
8H	100	F	DA	1	CSS/MSS	3	3	1	99	GRAZE	YES	2	CACTUS	NO	CSS/NG	OTAY	6.11
8J	15	N	DA	1	NNG	1	4	1	99	GRAZE	NO	4	ARCA	NO	CSS/NG	OTAY	22.09
8K	2.5	NE	DA	1	NNG	1	4	1	99	GRAZE	NO	3	ARCA	NO	CSS/NG	OTAY	23.01
8L	2.5	NE	DA	1	NNG	1	4	1	99	GRAZE	NO	3	ARCA	NO	CSS/NG	OTAY	0.32
9	15	S	G	2	DIST	1	1	4	3	MINING	NO	4	NONE	NO	CSS	OTAY	11.13
10A	100	F	SB	2	NNG	1	4	1	99	GRAZE	NO	4	ARCA	NO	CSS	OTAY	3.05
10B	100	F	SB	2	DIST	1	1	4	99	MINING	NO	4	NONE	NO	CSS	OTAY	1.31
10C	5	SW	SB	2	CSS	3	3	1	99	GRAZE	YES	2	ARCA	NO	MSS	OTAY	1.24
10D	5	SW	SB	2	CSS	2	1	4	3	NONE	NO	3	ARCA	NO	MSS	OTAY	0.34
10E	3	SE	SB	2	NNG	1	4	1	99	GRAZE	NO	3	ARCA	NO	MSS	OTAY	0.47
10F	5	S	SB	2	DIST	1	1	4	99	MINING	NO	3	NONE	NO	MSS	OTAY	0.89
11A	5	W	DA	1	NNG	1	4	1	99	GRAZE	NO	3	RHUS	NO	CSS	OTAY	41.96
11B	3	W	DA	1	CSS/NG	2	3	1	99	GRAZE	YES	3	ARCA	YES	MSS	OTAY	3.33
11C	3	S	DA	1	MSS/CSS	4	1	1	99	NONE	YES	1	CACTUS	NO	MSS	OTAY	2.89
11D	3	N	DA	2	CSS/NNG	2	3	1	1	NONE	YES	3	ARCA	NO	CSS	OTAY	1.02
12A	2	W	DA	2	NNG	1	4	1	99	GRAZE	NO	3	NONE	NO	CSS	OTAY	36.21
12B	2	W	DA	1	CSS	1	1	3	1	GRAZE	YES	3	RHUS	NO	CSS	OTAY	1.23
12C	2	SE	DA	1	NNG	1	4	1	1	GRAZE	NO	3	NONE	NO	MSS	OTAY	3.23
12D	100	F	DA	2	DRAIN	3	2	1	99	GRAZE	NO	2	RHUS	NO	CSS	OTAY	1.08
12E	2	S	DA	2	NNG	1	4	1	99	GRAZE	NO	3	NONE	NO	MSS	OTAY	4.16
12F	2	E	DA	2	NNG	1	4	1	99	GRAZE	NO	3	NONE	NO	CSS	OTAY	2.31
13A	2	W	DA	2	NNG	1	4	1	99	GRAZE	NO	3	NONE	NO	CSS	OTAY	19.91
13B	2	W	DA	2	MSS/CSS	4	2	1	1	GRAZE	YES	1	CACTUS	NO	MSS	OTAY	0.90
13C	100	F	SB	2	NNG	3	3	1	99	GRAZE	NO	2	NONE	NO	CSS	OTAY	62.25
13D	2	E	DA	2	MSS/CSS	4	2	1	1	GRAZE	YES	1	CACTUS	NO	MSS	OTAY	0.81

OTAY RANCH CSS/MSS HABITAT REPLACEMENT MASTER PLAN POLYGON ANALYSIS.

POLYGON	SLOPE	ASPECT	SOIL	ACCESS	HABITAT	NATIVE	EXOTIC	BARE	EROSION	DISTURB	SENSITIVE	EFFORT	CSS	GRASS	GOAL	PARCEL	ACRES
14A	5	N	SB	2	NNG	1	4	2	99	GRAZE	YES	3	JOJOBA	NO	CSS	OTAY	65.28
14C	3	W	LS	2	CSS	4	3	1	99	GRAZE	YES	1	JOJOBA	NO	CSS	OTAY	1.81
14D	5	S	LS	2	MSS	3	3	1	99	GRAZE	YES	3	CACTUS	NO	MSS	OTAY	5.44
14E	5	S	LS	2	MSS	4	3	2	99	GRAZE	YES	2	CACTUS	NO	MSS	OTAY	1.16
15A	15	S	OH	1	NNG	1	4	1	99	GRAZE	YES	4	NONE	NO	CSS	OTAY	2.79
15B	15	SW	OH	1	NNG	2	4	1	99	GRAZE	NO	2	NONE	NO	CSS	OTAY	16.88
16A	25	S	HR	2	NNG	1	4	1	99	GRAZE	NO	4	RHUS	NO	CSS	OTAY	15.39
16B	15	S	HR	2	DRAIN	2	2	2	4	GRAZE	NO	2	RHUS	NO	CSS	OTAY	1.34
16C	25	S	HR	2	NNG	1	4	1	2	GRAZE	NO	4	NONE	NO	CSS	OTAY	17.26
16D	10	S	OH	2	NNG	1	4	1	99	GRAZE	YES	3	ARCA	NO	MSS	OTAY	1.77
16E	15	S	OH	2	NNG	1	4	1	99	GRAZE	YES	4	NONE	NO	CSS	OTAY	8.24
16F	15	S	HR	2	DRAIN	1	4	1	1	GRAZE	NO	4	RHUS	NO	CSS	OTAY	0.99
16G	4	S	OH	1	MSS	3	2	1	99	GRAZE	NO	2	CACTUS	NO	MSS	OTAY	7.53
16H	25	S	SB	2	NNG	1	4	1	99	GRAZE	NO	4	VIGUERA	NO	CSS	OTAY	18.76
16I	2	S	TE	2	NNG/CSS	2	3	1	2	GRAZE	NO	3	CACTUS	NO	MSS	OTAY	2.49
17A	5	SW	OH	1	CSS	2	3	1	99	GRAZE	NO	3	ARCA	NO	MSS	OTAY	1.92
17B	10	S	OH	1	NNG	1	4	1	99	GRAZE	YES	3	NONE	NO	CSS	OTAY	19.15
18	4	S	OH	1	CSS	3	2	1	99	GRAZE	NO	2	ARCA	NO	CSS	OTAY	28.62
19A	25	S	SB	2	NNG	1	4	1	99	GRAZE	NO	4	NONE	NO	CSS	OTAY	12.39
19B	15	S	SB	2	DRAIN	2	3	1	2	GRAZE	NO	2	RHUS	NO	CSS	OTAY	0.31
19C	100	F	SB	1	NNG	1	4	1	99	GRAZE	NO	4	BASAR	NO	CSS	OTAY	34.91
19D	2	S	TE	2	NNG/MSS	2	3	1	3	GRAZE	NO	3	CACTUS	NO	MSS	OTAY	2.36
19F	3	SE	HR	1	NNG	1	4	1	99	GRAZE	YES	3	NONE	NO	CSS	OTAY	2.93
19G	100	F	HR	1	NNG	2	3	1	99	GRAZE	YES	4	BASAR	NO	CSS	OTAY	47.36
20	100	F	OH	1	MSS/CSS	2	3	1	1	GRAZE	NO	2	CACTUS	NO	CSS	OTAY	4.31
21A	2	W	HR	2	NNG/CSS	1	4	1	99	GRAZE	YES	3	ARCA	YES	MSS	OTAY	5.91
21B	5	S	HR	2	CSS/NNG	2	3	2	99	GRAZE	YES	3	ARCA	NO	CSS	OTAY	5.32
21C	5	E	HR	2	CSS	2	3	2	99	GRAZE	YES	3	ARCA	NO	CSS	OTAY	3.48
22	100	F	OH	1	DRAIN	2	3	1	99	GRAZE	NO	2	RHUS	NO	CSS	OTAY	1.49

OTAY RANCH CSS/MSS HABITAT REPLACEMENT MASTER PLAN POLYGON ANALYSIS.

POLYGON	SLOPE	ASPECT	SOIL	ACCESS	HABITAT	NATIVE	EXOTIC	BARE	EROSION	DISTURB	SENSITIVE	EFFORT	CSS	GRASS	GOAL	PARCEL	ACRES
23A	5	E	DO	1	NNG	1	4	1	99	GRAZE	NO	3	NONE	NO	CSS	OTAY	6.35
23B	5	SE	DO	1	NNG	1	4	1	99	GRAZE	NO	3	NONE	NO	CSS	OTAY	2.43
24	100	F	DO	1	DRAIN	2	3	1	99	GRAZE	NO	3	ARCA	NO	CSS	OTAY	2.47
25A	100	F	VB	1	DRAIN	3	3	1	99	GRAZE	YES	2	MALOSMA	NO	CSS	SAN YSID	2.73
25B	3	W	FX	1	NNG/CSS	1	4	1	99	NONE	YES	3	ARCA	YES	CSS/NG	SAN YSID	15.27
25C	5	E	FX	0	CSS	3	3	1	99	GRAZE	YES	2	ARCA	YES	CSS/NG	SAN YSID	3.54
25D	2	E	FX	0	CSS	3	3	1	1	BURN	YES	1	ARCA	YES	CSS/NG	SAN YSID	53.76
25E	5	E	FX	0	NNG/CSS	1	4	1	99	GRAZE	YES	3	ARCA	YES	CSS/NG	SAN YSID	20.17
26A	2.5	NW	FX	1	CSS	3	2	1	1	GRAZE	YES	2	ARCA	YES	CSS/NG	SAN YSID	32.46
26B	3	E	FX	0	CSS	3	3	1	99	GRAZE	YES	2	ARCA	YES	CSS/NG	SAN YSID	20.31
26C	3	W	FX/AU	1	NNG	1	4	1	1	GRAZE	YES	3	ARCA	YES	CSS/NG	SAN YSID	38.56
26D	3	W	FX	1	CHP/CSS	4	1	1	1	GRAZE	YES	1	ARCA	NO	CSS	SAN YSID	3.77
27A	2	SW	FX	1	CSS	3	3	2	1	GRAZE	NO	2	ARCA	NO	CSS	SAN YSID	10.34
27B	4	SE	FX	1	CSS	4	3	1	1	GRAZE	YES	1	ARCA	NO	CSS	SAN YSID	6.31
27D	3	N	FX	1	CSS	4	2	1	99	GRAZE	YES	1	ARCA	NO	CSS	SAN YSID	0.26
27E	4	NW	FX	1	CSS	4	3	1	99	GRAZE	NO	1	ARCA	NO	CSS	SAN YSID	0.50
28A	3	N	FX	1	CSS	2	3	2	1	GRAZE	YES	3	ARCA	NO	CSS	SAN YSID	6.64
28B	3	N	FX	1	CSS	3	2	1	99	GRAZE	NO	2	ARCA	NO	CSS	SAN YSID	13.49
28C	2.5	NW	FX	1	CSS	2	3	1	99	GRAZE	NO	3	ARCA	NO	CSS	SAN YSID	3.90
28D	2.5	N	FX	1	CSS	4	3	1	99	GRAZE	NO	1	ARCA	NO	CSS	SAN YSID	9.20
28E	4	N	FX	1	NNG/CSS	2	4	1	99	GRAZE	NO	3	ARCA	NO	CSS	SAN YSID	5.80
29A	2.5	S	FX	1	CSS	4	3	3	2	GRAZE	YES	2	ARCA	NO	CSS	SAN YSID	17.64
29B	2.5	SW	FX	1	CSS	4	3	1	1	GRAZE	NO	1	ARCA	NO	CSS	SAN YSID	0.85
29C	2.5	SW	FX	1	CSS	4	2	1	1	GRAZE	NO	1	ARCA	NO	CSS	SAN YSID	0.56
29D	100	F	FX	1	NNG/CSS	1	4	2	99	GRAZE	NO	4	ARCA	NO	CSS	SAN YSID	2.82
29E	2	S	FX	1	CSS	4	2	1	99	GRAZE	NO	1	ARCA	YES	CSS	SAN YSID	5.69
29F	2	S	FX	1	CSS	3	4	2	99	GRAZE	NO	2	ARCA	NO	CSS	SAN YSID	4.87
29G	2.5	N	FX	1	CSS	2	4	1	99	GRAZE	NO	3	ARCA	NO	CSS	SAN YSID	9.69
29H	2.5	N	FX	1	CSS	4	3	3	2	GRAZE	YES	2	ARCA	NO	CSS	SAN YSID	6.98

OTAY RANCH CSS/MSS HABITAT REPLACEMENT MASTER PLAN POLYGON ANALYSIS.

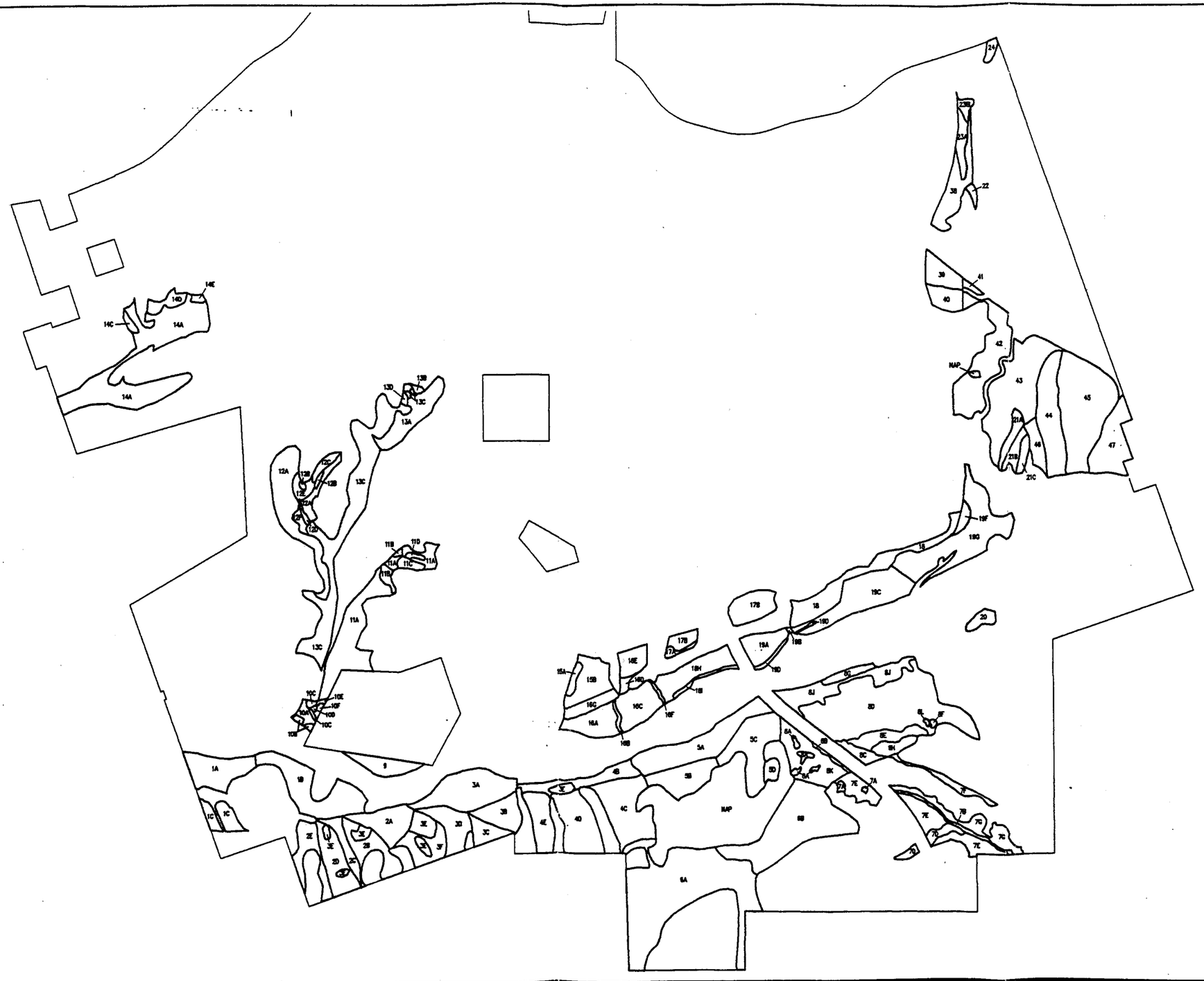
POLYGON	SLOPE	ASPECT	SOIL	ACCESS	HABITAT	NATIVE	EXOTIC	BARE	EROSION	DISTURB	SENSITIVE	EFFORT	CSS	GRASS	GOAL	PARCEL	ACRES
30A	2	S	SN	1	CSS	3	3	2	1	BURN	YES	1	ARCA	YES	CSS	JAMUL MTS	70.17
30C	2	S	SN	1	CSS	3	3	2	1	BURN	YES	1	ARCA	NO	CSS	JAMUL MTS	5.44
31	2	NE	SN	1	CSS	3	3	1	99	BURN	YES	1	ARCA	NO	CSS	JAMUL MTS	6.15
32	2	SW	SN	1	CSS	3	2	2	99	BURN	YES	1	ARCA	NO	CSS	JAMUL MTS	14.1
33	10	SW	PF	2	CSS	4	3	2	1	GRAZE	NO	2	ARCA	NO	CSS	JAMUL MTS	2.02
34	10	N	FX	2	CSS	4	3	2	1	GRAZE	YES	2	ARCA	NO	CSS	JAMUL MTS	3.17
35A	100	F	WM	2	NNG	1	4	1	99	GRAZE	NO	4	BASAR	NO	CSS	JAMUL MTS	4.1
35B	100	F	WM	2	DRAIN	4	3	2	99	GRAZE	NO	2	BASAR	NO	CSS	JAMUL MTS	2.82
35C	10	N	WM	2	NNG	2	4	2	99	GRAZE	NO	2	MALOSMA	NO	CSS	JAMUL MTS	0.86
36	3	SE	DO	2	CSS	2	3	1	1	GRAZE	YES	3	ARCA	NO	CSS	JAMUL MTS	2.62
37	100	F	VB	2	DRAIN	4	3	2	1	GRAZE	NO	2	BASAR	NO	CSS	JAMUL MTS	3.33
38	4	E	DO	1	NNG	1	4	1	99	AG	NO	3	NONE	NO	CSS	OTAY	17.51
39	4	S	DO	1	NNG	1	4	1	99	AG	NO	3	NONE	NO	CSS	OTAY	10.27
40	5	N	DO	1	NNG	1	4	1	99	AG	NO	3	NONE	NO	CSS	OTAY	8.96
41	4	S	DO	1	NNG/CSS	1	4	1	99	BURN	NO	3	ARCA	NO	CSS	OTAY	1.31
42	5	E	DO	1	NNG/CSS	1	4	1	99	BURN	NO	3	ARCA	NO	CSS	OTAY	35.46
43	4	W	DO	1	NNG/CSS	1	4	1	99	BURN	NO	3	ARCA	NO	CSS	OTAY	50.97
44	4	E	DO	1	NNG/CSS	1	4	1	99	BURN	NO	3	ARCA	NO	CSS	OTAY	30.59
45	4	W	DO	1	NNG/CSS	1	4	1	99	BURN	NO	3	ARCA	NO	CSS	OTAY	58.04
46	8	W	DO	1	NNG/CSS	1	4	1	99	BURN	NO	3	CACTUS	NO	CSS	OTAY	7.77
47	4	E	DO	1	NNG/CSS	1	4	1	99	BURN	NO	3	ARCA	NO	CSS	OTAY	24.29

LEGEND: **SLOPE** is measured as a ratio of run:rise or n:1; **ASPECT** is recorded as the compass direction with F=flat; **SOIL** is recorded as the USDA soil type abbreviation; **ACCESS** is 0=none, 1=4-WD, 2=2-WD or better; **NATIVE**, **EXOTIC**, and **BARE** are recorded as **%** cover and 1=0-10%, 2=11-30%, 3=31-60%, 4=>61%; **EROSION** is recorded as 99=none, 1=no rills, 2=small rills, 3=major rills, 4="canyons"; **DISTURB** recorded the type of habitat disturbance present in the polygon; **SENSITIVE** refers to the presence (1) or absence (0) of sensitive species; **EFFORT** is the results of the database analysis where: 1=natural regeneration, 2=enhancement, 3=revegetation, 4=restoration; **CSS** indicates the major species recorded and aids in the habitat goal determination, with ARCA=*Artemisia californica* RHUS=*Rhus integrifolia*, CACTUS=any cactus species, BASAR=*Baccharis sarothroides*, GRASS=*Nassella* or other native grass species, MALOSMA=*Malosma laurina*, JOJOBA=*Simmondsia chinensis*, VIGUERA=*Viguera laciniata*, HYMOCLEA=*Hymenoclea*, and NONE=no native shrubs or grass species present to indicate; former habitat type; **GRASS** indicates the presence or absence of native grassland species and is used to aid in the habitat goal determination; **GOAL** is the result of the database analysis to determine the habitat type of the habitat replacement polygon.

OTAY RANCH CSS/MSS HABITAT REPLACEMENT MASTER PLAN POLYGON ANALYSIS.

U.S. DEPARTMENT OF AGRICULTURE SOILS CLASSIFICATION AND LIST OF ABBREVIATIONS

SB	Salinas Clay Loam: Well drained soil on alluvial fans.
DA	Diablo Clay: Well drained deep clays derived from solft, calcareous sandstone and shale.
G	Gravel pit
OH	Olivenhain Cobbly Loam: Well drained moderately deep soil that have a very cobbly clay subsoil.
HR	Huerhuero Loam: Moderately well drained soil with a clay subsoil. The soil developed in sandy marine sediments.
TE	Terrace escarpments: Steep to very steep escarpments and escarpment-like landscapes.
DO	Diablo-Olivenhain Complex: This complex is 50% Diablo clay and 45% Olivenhain cobbly loam.
VB	Visalia Gravelly Sandy Loam: Moderately well drained very deep soil derived from granitic alluvium.
FX	Friant Rocky Fine Sandy Loam: Shallow, well drained soil in material weathered from fine grained metasedimentary rock.
PF	Placentia Sandy Loam: Moderately well drained soil that have a sandy clay subsoil which formed in a granitic alluvium.
WM	Wyman Loam: Well drained very deep soils that formed in alluvium derived from basic igneous rock.
SU	Stockpen Gravelly Clay Loam: Moderately well drained and moderately deep soils on marine terraces.
LS	Linne Clay Loam: Well drained, moderately deep clay soil derived from soft calcareous sandstone and shale.
AU	Anderson Very Gravelly Sandy Loam: Excessively drained soil on granitic alluvial fans.
SN	San Miguel-Exchequer Rocky Silt Loam: This complex occurs on mountainous uplands and is about 50% San Miguel silt loam and 40% Exchequer silt loam.
	These soils are derived from metavolcanic rock.

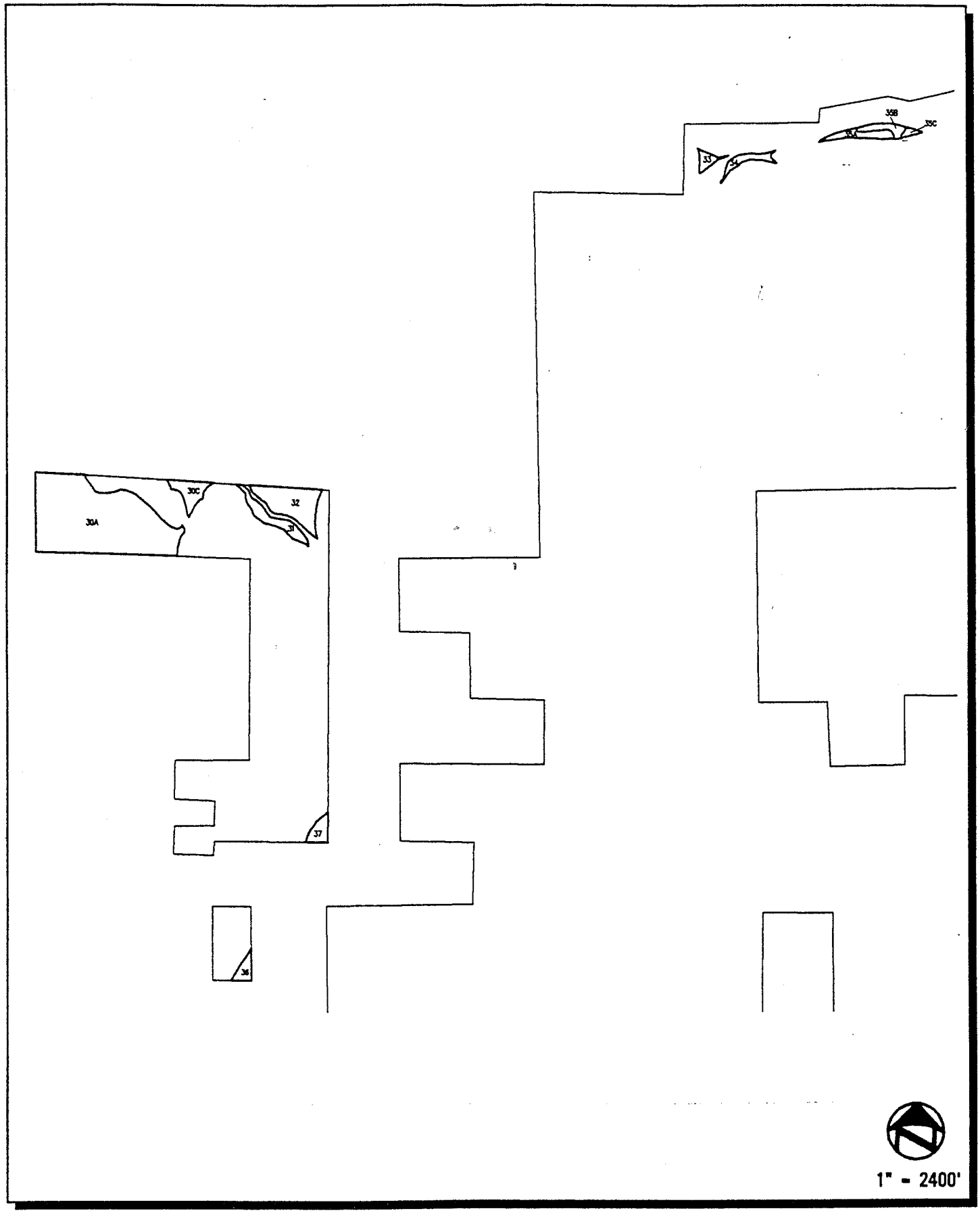


1" = 2400'

Otay Ranch CSS/MSS Habitat Replacement Master Plan - Appendix B

Otay Valley Parcel - Habitat Replacement Polygons

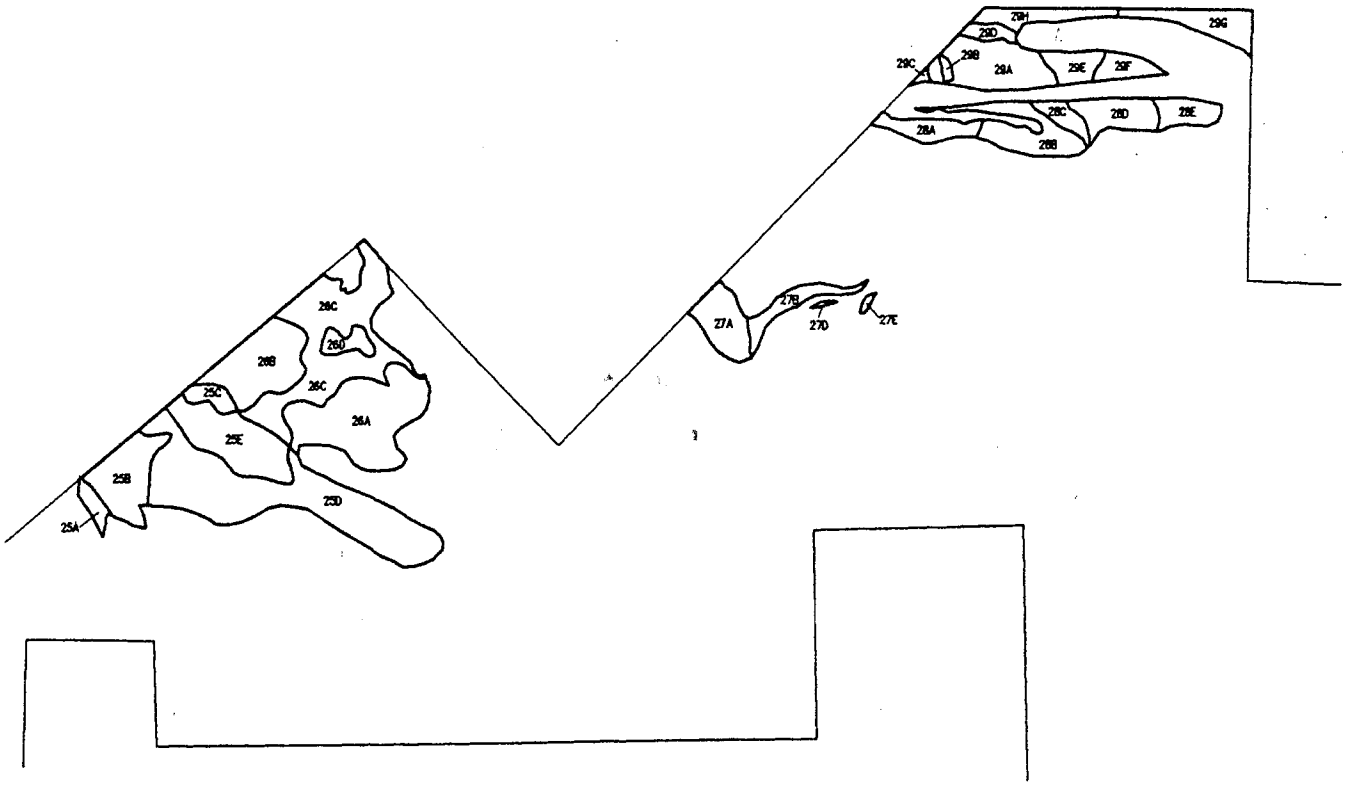
FIGURE 1B



Otay Ranch CSS/MSS Habitat Replacement Master Plan - Appendix B

Jamul Mtns. Parcel - Habitat Replacement Polygons

FIGURE 2B



1" = 2400'

Otay Ranch CSS/MSS Habitat Replacement Master Plan - Appendix B

San Ysidro Mtns. Parcel - Habitat Replacement Polygons

FIGURE 3B

APPENDIX C

TARGET TRANSECT DATA RESULTS

TARGET TRANSECT CALCULATIONS

The locations of the target transects for the habitat replacement activities are shown on Figures 7, 8, and 9 of the text of this document. In general, the locations of target transects matched the slope, aspects, and soil types of neighboring polygons requiring treatment. Target transects were chosen in high quality, undisturbed habitat. The details of each target transect appear in the following pages and are summarized in Table 2 of the text.

The calculations of each target transect are very simply based on: total % open ground + total % herb layer + total % shrub layer must equal 100%. Because there are 100 points taken for each transect, each "hit" of a pant species on the point intercept represents one percentage point. The total % cover by layer value frequently exceeds 100% since there is usually more than one layer. To adjust this, the absolute propertions of each % cover layer are corrected to a relative % cover layer and shown as the "corrected % cover by layer" value.

Transects 1 and 10 differ from this methodology due to the extremely high density of cover of cactus species. Although the total % vegetative cover could not be split by herb and shrub layers, a relatively accurate representation of the vegetative composition was attained.

VEGETATION TARGET TRANSECT DATA

Vegetation transect sampling was conducted in March and April, 1995 by Dudek habitat restoration specialist Jeff Thomas and restoration assistant Mike Komula. Transect methodology followed the California Native Plant Society protocol as seen on Exhibit 1.

TRANSECT 1 **Maritime Succulent Scrub/Cholla Thicket**
Location: **Otay River Valley, south-facing slope**

This is a rough qualitative estimate of cover. Did not follow the same quantitative protocol as with other transects.

Cryptogamic Crusts	3%
TOTAL OPEN	5%
Eriogonum fasciculatum	10%
Ferocactus viridescens	0.5%
Mammillaria dioica	0.5%
Opuntia littoralis	5%
Opuntia prolifera	35%
Rhus integrifolia	3%
Sambucus mexicana	1%
Simmondsia chinensis	40%
TOTAL % COVER 95%	

TRANSECT 2 **Maritime Succulent Scrub**
Location: **Johnson Canyon, west-facing slope**

Bare	17%
Litter	4%
Rock	2%
TOTAL OPEN	23%

	HERB LAYER	SHRUB LAYER
Annual Grass*	3%	0%
Artemisia californica	2%	10%
Encelia californica	0%	2%
Eriogonum fasciculatum	27%	26%
Rhus integrifolia	2%	13%
Viguera laciniata	2%	7%
TOTAL % COVER	77%	
% cover by layer	36%	58%
CORRECTED % COVER BY LAYER	30%	47%

Others: *Dichelostemma capitatum*, *Ferocactus viridescens*, *Isomeris arborea*, *Mirabilis californica*, *Nassella* sp., *Opuntia prolifera*

* indicates non-native species

Annual grasses observed include introduced species such as slender wild oat (*Avena barbata*), cultivated oat (*Avena sativa*), Ripgut grass (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), and annual bluegrass (*Poa annua*).

TRANSECT 3 **Coastal Sage Scrub**
Location: **Johnson Canyon, south to southeast-facing slope**

Bare	4%
Cryptogamic Crusts	5%
Litter	10%
Rock	5%
TOTAL OPEN	24%

	HERB LAYER	SHRUB LAYER
Annual Grass*	18%	0%
Artemisia californica	3%	49%
Dichelostemma capitatum	5%	0%
Eriogonum fasciculatum	1%	0%
Erodium sp.*	1%	0%
Eucrypta chrysanthemifolia	2%	0%
Lupinus sp.	1%	0%
Mirabilis californica	1%	0%
Nassella sp.	3%	0%
Viguera laciniata	5%	10%
TOTAL % COVER	76%	
% cover by layer	40%	59%
CORRECTED % COVER BY LAYER	30%	46%

Others: *Encelia californica* (<1%), *Isomeris arborea* (<2%), *Lotus scoparius*, *Marah macrocarpus Opuntia littoralis*, *Opuntia prolifera*

* indicates non-native species

Annual grasses observed include introduced species such as slender wild oat (*Avena barbata*), cultivated oat (*Avena sativa*), Ripgut grass (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), and annual bluegrass (*Poa annua*).

TRANSECT 4 **Coastal Sage Scrub**
Location: **Proctor Rd./Melody Rd., southwest-facing slope**

Bare	4%
Litter	9%
TOTAL OPEN	13%

	HERB LAYER	SHRUB LAYER
Annual Grass*	8%	0%
Artemisia californica	4%	14%
Eriogonum fasciculatum	3%	11%
Erodium sp.*	40%	0%
Malosma laurina	1%	12%
TOTAL % COVER	87%	
% cover by layer	56%	37%
CORRECTED % COVER BY LAYER	52%	35%

Others: *Brassica* sp.*

* indicates non-native species

Annual grasses observed include introduced species such as slender wild oat (*Avena barbata*), cultivated oat (*Avena sativa*), Ripgut grass (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), and annual bluegrass (*Poa annua*).

TRANSECT 5 **Coastal Sage Scrub**
Location: **Minnewana Truck Trail, east-facing slope**

Bare	7%	
Cryptogamic Crusts	10%	
Litter	10%	
Rock	2%	
TOTAL OPEN	29%	
	HERB LAYER	SHRUB LAYER
Annual Grass*	10%	0%
Artemisia californica	0%	1%
*Cerastium arvense**	1%	0%
Eriogonum fasciculatum	1%	0%
Eriophyllum confertiflorum	6%	2%
Erodium sp.*	2%	0%
Galium angustifolium	5%	4%
Isocoma menziesii	2%	0%
Lotus scoparius	1%	0%
Malosma laurina	0%	4%
Mimulus aurantiacus	0%	1%
Nassella sp.	16%	0%
Pentagramma triangularis ssp. *viscosa*	2%	0%
Rhamnus crocea	4%	16%
Salvia apiana	3%	9%
Sidalcea malvaeflora	4%	0%
Sysrinchium bellum	1%	0%
Xylococcus bicolor	0%	2%
TOTAL % COVER	71%	
% cover by layer	58%	39%
CORRECTED % COVER BY LAYER	42%	29%

Others: *Arctostaphylos* sp., *Baccharis sarothroides*, *Ceanothus* sp., *Dichelostemma capitatum*, *Dudleya pulverulenta*, *Hazardia squarrosa*, *Heteromeles arbutifolia*, *Quercus agrifolia*, *Ribes indecorum*, *Silybum marianum**, *Yucca whipplei*

* indicates non-native species

Annual grasses observed include introduced species such as slender wild oat (*Avena barbata*), cultivated oat (*Avena sativa*), Ripgut grass (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), and annual bluegrass (*Poa annua*).

TRANSECT 6 **Coastal Sage Scrub**
Location: **Minnewawa Truck Trail, north-facing slope**

Bare	18%
Cryptogamic Crusts	14%
Litter	10%
Rock	6%
TOTAL OPEN	48%

	HERB LAYER	SHRUB LAYER
Annual Grass*	9%	0%
Adenostoma fasciculatum	3%	13%
Allium praecox	2%	0%
Artemisia californica	1%	0%
Dichelostemma capitatum	1%	0%
Eriophyllum confertiflorum	2%	0%
Marah fabaceus	0%	1%
Nassella sp.	1%	0%
Pentagramma triangularis ssp. *viscosa*	1%	0%
Xylococcus bicolor	8%	15%
Yucca whipplei	4%	1%
TOTAL % COVER	52%	
% cover by layer	32%	30%
CORRECTED % COVER BY LAYER	27%	25%

Others: *Erodium* sp.*, *Mimulus aurantiacus*, *Pellaea mucronata*, *Sidalcea malvaeflora*

* indicates non-native species

Annual grasses observed include introduced species such as slender wild oat (*Avena barbata*), cultivated oat (*Avena sativa*), Ripgut grass (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), and annual bluegrass (*Poa annua*).

TRANSECT 7 **Maritime Succulent Scrub**
Location: **Poggi Canyon, south-facing slope**

Bare	8%
Litter	2%
TOTAL OPEN	10%

	HERB LAYER	SHRUB LAYER
Brassica sp.*	27%	0%
*Centaurea melitensis**	22%	0%
Marah macrocarpus	3%	0%
Opuntia prolifera	6%	1%
Simmondsia chinensis	12%	36%
*Urtica dioica**	2%	0%
Yucca schidigera	4%	3%
TOTAL % COVER	90%	
% cover by layer	76%	40%
CORRECTED % COVER BY LAYER	62%	28%

Others: *Mammillaria dioica, Opuntia littoralis, Rhus integrifolia, Viguera laciniata*

* indicates non-native species

TRANSECT 8 **Coastal Sage Scrub**
Location: **Poggi Canyon, north-facing slope**

	HERB LAYER	SHRUB LAYER
Annual Grass*	45%	0%
Allium praecox	1%	0%
Artemisia californica	6%	39%
Brassica sp.*	4%	0%
*Centaurea melitensis**	7%	0%
*Cerastium arvense**	1%	0%
Eriogonum fasciculatum	6%	13%
Erodium sp.*	2%	0%
Isocoma menziesii	1%	0%
Nassella sp.	2%	0%
Opuntia littoralis	1%	0%
Opuntia prolifera	0%	1%
Sanicula sp.	2%	0%
Sysrinchium bellum	2%	0%
TOTAL % COVER	100%*	
% cover by layer	80%	53%
CORRECTED % COVER BY LAYER	64%	36%

Others: *Baccharis sarothroides*, *Foeniculum vulgare**, *Isomeris arborea*, *Marah macrocarpus*, *Rhus integrifolia*

* indicates non-native species

Annual grasses observed include introduced species such as slender wild oat (*Avena barbata*), cultivated oat (*Avena sativa*), Ripgut grass (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), and annual bluegrass (*Poa annua*).

TRANSECT 9 **Coastal Sage Scrub**
Location: **Wolf Canyon, west-facing slope**

Bare	8%
Litter	7%
TOTAL OPEN	15%

	HERB LAYER	SHRUB LAYER
Artemisia californica	9%	37%
Encelia californica	3%	1%
Rhus integrifolia	2%	23%
Simmondsia chinensis	2%	17%
TOTAL % COVER	85%	
% cover by layer	16%	78%
CORRECTED % COVER BY LAYER	11%	74%

Others: *Nassella* sp.

TRANSECT 10 **Maritime Succulent Scrub/Coastal Sage Scrub**
Location: **Wolf Canyon, east-facing slope**

This is a rough qualitative estimate of cover. Did not follow the same quantitative protocol as with other transects.

Artemisia californica	50%
Marah macrocarpus	10%
Opuntia littoralis	<5%
Opuntia prolifera	40%
Rhus integrifolia	5%
Simmondsia chinensis	30%
TOTAL % COVER	100%

TRANSECT 11 **Coastal Sage Scrub**
Location: **Cedar Canyon, north-facing slope**

Cryptogamic Crusts	3%
Litter	1%
TOTAL OPEN	4%

	HERB LAYER	SHRUB LAYER
Annual Grass*	37%	0%
Artemisia californica	2%	6%
*Cerastium arvense**	1%	0%
Claytonia perfoliata	2%	0%
Eriogonum fasciculatum	5%	4%
Eriophyllum confertiflorum	1%	0%
Galium angustifolium	2%	5%
Gnaphalium californicum	3%	0%
Isocoma menziesii	5%	0%
*Lathyrus vestitus**	1%	0%
Lonicera subspicata	0%	1%
Malosma laurina	0%	19%
Mimulus aurantiacus	6%	3%
Nassella sp.	11%	0%
*Oxalis pes-caprae**	1%	0%
Pentagramma triangularis ssp. *viscosa*	2%	0%
Rhamnus crocea	0%	7%
Salvia apiana	5%	23%
TOTAL % COVER	96%	
% cover by layer	84%	68%
CORRECTED % COVER BY LAYER	53%	43%

Others: *Ribes indecorum, Sanicula* sp., *Sysrinchium bellum, Toxicodendron diversilobum, Viola pedunculata*

* indicates non-native species

Annual grasses observed include introduced species such as slender wild oat (*Avena barbata*), cultivated oat (*Avena sativa*), Ripgut grass (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), and annual bluegrass (*Poa annua*).

TRANSECT 12 **Coastal Sage Scrub**
Location: **Cedar Canyon, south-facing slope**

Bare	10%
Litter	4%
Rock	2%
TOTAL OPEN	16%

	HERB LAYER	SHRUB LAYER
Annual Grass*	10%	0%
Artemisia californica	6%	4%
*Convolvulus arvensis**	2%	2%
Cryptantha sp.	1%	0%
Encelia californica	2%	3%
Eriogonum fasciculatum	15%	18%
Erodium sp.*	1%	0%
Lotus scoparius	0%	2%
Malosma laurina	0%	7%
Mirabilis californica	12%	2%
Nassella lepida	7%	2%
Viguera laciniata	14%	15%
TOTAL % COVER	84%	
% cover by layer	70%	65%
CORRECTED % COVER BY LAYER	44%	40%

Others: *Lupinus spectabilis*?

* indicates non-native species

Annual grasses observed include introduced species such as slender wild oat (*Avena barbata*), cultivated oat (*Avena sativa*), Ripgut grass (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), and annual bluegrass (*Poa annua*).

TRANSECT 13 **Coastal Sage Scrub/Native Grassland**
Location: **Jeep Trail (N. of Polygon 6), north-facing slope**

Bare	2%
Litter	1%
Rock	1%
TOTAL OPEN	4%

	HERB LAYER	SHRUB LAYER
Achillea millefolium	4%	0%
Annual Grass*	55%	0%
Artemisia californica	2%	12%
*Brassica nigra**	1%	0%
Circium occidentale	13%	0%
Claytonia perfoliata	4%	0%
Delphinium parryi	1%	0%
Dichelostemma capitatum	3%	0%
Eriogonum fasciculatum	2%	0%
Eriophyllum confertiflorum	1%	0%
Erodium sp.*	1%	0%
Galium angustifolium	4%	1%
Heteromeles arbutifolia	0%	4%
Nassella sp.	35%	1%
Pentagramma triangularis ssp. *viscosa*	1%	0%
TOTAL % COVER	96%	
% cover by layer	128%	18%
CORRECTED % COVER BY LAYER	84%	12%

Others: *Allium praecox, Brodiaea jolonensis, Clematis pauciflora, Rhus integrifolia, Stachys ajugoides*

* indicates non-native species

Annual grasses observed include introduced species such as slender wild oat (*Avena barbata*), cultivated oat (*Avena sativa*), Ripgut grass (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), and annual bluegrass (*Poa annua*).

TRANSECT 14 **Coastal Sage Scrub**
Location: **North of Otay Valley (N. of Johnson Canyon), south-facing slope**

Bare	7%
Litter	5%
Rock	3%
TOTAL OPEN	15%

	HERB LAYER	SHRUB LAYER
Annual Grass*	10%	1%
Artemisia californica	1%	29%
*Centaurea melitensis**	5%	0%
Eriogonum fasciculatum	19%	16%
Erodium sp.*	1%	0%
Nassella sp.	15%	0%
Opuntia prolifera	1%	4%
Viguera laciniata	4%	18%
TOTAL % COVER	85%	
% cover by layer	56%	68%
CORRECTED % COVER BY LAYER	37%	48%

Others: *Allium praecox*, *Bloomeria crocea*, *Calystegia macrostegia*, *Dichelostemma capitatum*, *Ferocactus viridescens*, *Isomeris arborea*, *Mammallaria dioica*, *Marah macrocarpus*, *Mirabilis californica*, *Pentagramma triangularis* spp. *viscosa*, *Sonchus arvensis**

* indicates non-native species

Annual grasses observed include introduced species such as slender wild oat (*Avena barbata*), cultivated oat (*Avena sativa*), Ripgut grass (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), and annual bluegrass (*Poa annua*).

TRANSECT 15 **Coastal Sage Scrub**
Location: **Salt Creek, west-facing slope**

Bare	10%
Litter	8%
TOTAL OPEN	18%

	HERB LAYER	SHRUB LAYER
Annual Grass*	57%	0%
Artemisia californica	1%	26%
*Centaurea melitensis**	5%	0%
Dichelostemma capitatum	2%	0%
Erodium sp.*	23%	0%
Mirabilis californica	2%	1%
TOTAL % COVER	82%	
% cover by layer	90%	27%
CORRECTED % COVER BY LAYER	63%	19%

Others: *Opuntia littoralis*, *Opuntia prolifera*, *Viguera laciniata*

* indicates non-native species

Annual grasses observed include introduced species such as slender wild oat (*Avena barbata*), cultivated oat (*Avena sativa*), Ripgut grass (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), and annual bluegrass (*Poa annua*).

TRANSECT 16 **Coastal Sage Scrub**
Location: **Salt Creek, east-facing slope**

Litter	7%
TOTAL OPEN	7%

	HERB LAYER	SHRUB LAYER
Annual Grass*	52%	0%
Artemisia californica	11%	26%
Dichelostemma capitatum	1%	1%
Eriogonum fasciculatum	10%	11%
Erodium sp.*	10%	0%
Mirabilis californica	1%	2%
Nassella sp.	7%	0%
TOTAL % COVER	93%	
% cover by layer	92%	40%
CORRECTED % COVER BY LAYER	65%	28%

Others: *Isocoma menziesii*, *Opuntia prolifera*, *Viguera laciniata*

* indicates non-native species

Annual grasses observed include introduced species such as slender wild oat (*Avena barbata*), cultivated oat (*Avena sativa*), Ripgut grass (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), and annual bluegrass (*Poa annua*).

Otay Ranch

Phase 2
Resource Management Plan

Appendix F9
SPA One 1994/1995
Biological Data Base

APPENDIX F9

SPA ONE 1994/1995 BIOLOGICAL DATA BASE

A. SPA One Focused Survey for California Gnatcatcher and Cactus Wren

B. Wetland Delineation Report for Otay Rach, SPA One

C. SPA One Updated Vegetation Map

D. Results of Focused Biological Surveys and Review of Biological Data Base for Otay Ranch - SPA One

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1995

APPENDIX F9 A

SPA ONE 1995 FOCUSED SURVEY FOR CALIFORNIA GNATCATCHER AND CACTUS WREN

Introduction

This report documents the results of a focused survey conducted by Dudek & Associates, Inc. (DUDEK) for the federally-listed threatened coastal California gnatcatcher (*Polioptila californica californica*, CAGN) and federally-listed category 3b coastal cactus wren (*Campylorhynchus brunneicapillus couesi*, CAWR). The survey was conducted under Permits No. PRT-778585 and PRT-781086 issued by the U. S. Fish & Wildlife Service, within the scrub habitats (coastal sage scrub, maritime succulent scrub) that occur on Otay Ranch, SPA One, San Diego County, California, south of Telegraph Canyon Road. The survey area was divided into two polygons that could be covered in a morning. The polygons include all of the scrub habitat within SPA One.

Project Location

The SPA One project area, including five "not a part" parcels, is situated between Telegraph Canyon Road, Poggi Canyon, the Sunbow property, and the center of Section 3. The project area lies in the U.S. Geological Survey (USGS) 7.5 minute topographic maps, Imperial Beach, Otay Mesa, and National City quadrangles in unsectioned lands and NW¼ of Section 17 and N½NE¼ of Section 18; T18S, R1W (SBBM).

General Existing Conditions

Most of SPA One is grazed by cattle or cultivated for grain crops. A small amount of coastal sage scrub and maritime succulent scrub occurs along the edges and tributary canyons of Poggi Canyon.

The site has rolling hills in the northern portion and relatively steep tributary canyons in the southern portion. Numerous drainages run north to south into Poggi Canyon Creek and south to north into the channel that parallels Telegraph Canyon Road. Elevations range from approximately 290 feet above mean sea level (AMSL) in the western portion to 620 feet AMSL in the eastern portion.

Methods

Each of the two polygons were visited on three occasions by DUDEK biologists Brock A. Ortega or Anita M. Hayworth, between 27 January and 16 February 1995. The surveys consisted of walking meandering transects so as to completely cover all available habitat. While walking the transect, an audio tape of male gnatcatcher vocalizations was played approximately every 75-100 feet, depending on the amount of excess attenuation due to topography or vegetation, to induce responses by California gnatcatcher (CAGN).

Binoculars (10x50) were used where necessary to detect and identify birds. All CAGN and CAWR occurrences were mapped onto a 1"=400' "true color" aerial photograph and a 1"=200' topographic map of the project area.

The surveys were conducted in conformance with adopted survey guidelines for CAGN (Mock et al. 1990) during favorable weather conditions as shown below:

OBSERVER	DATE	TIME	% CLOUD COVER	TEMP
Anita Hayworth	27 January 1995	0800-1200 hours	99-10%	54-61° F
Anita Hayworth	30 January 1995	0815-1130 hours	20-0%	58-62° F
Brock Ortega	6 February 1995	0630-1100 hours	100-20%	55-65° F
Brock Ortega	7 February 1995	0630-1030 hours	100-60%	58-63° F
Brock Ortega	15 February 1995	0630-1115 hours	100-40%	62-67° F
Brock Ortega	16 February 1995	0700-1100 hours	100-30%	60-73° F

Results

Vegetation Characteristics

Scrub vegetation onsite is a diverse mix of common coastal sage scrub species: flat-top buckwheat (*Eriogonum fasciculatum*), deerweed (*Lotus scoparius*), California sagebrush (*Artemisia californica*), black sage (*Salvia mellifera*), bush mallow (*Malacothamnus fascicalatum*), elderberry (*Sambucus mexicanus*), and lemonadeberry (*Rhus integrifolia*). Additionally, in some areas, common maritime succulent scrub species co-dominate: such as bladderpod (*Isomeris arborea*), jojoba (*Simmondsia chinensis*), prickly pear cactus (*Opuntia litoralis*), coast cholla (*Opuntia prolifera*), and fishhook cactus (*Mammalaria dioica*). On the steeper slopes, the vegetation occurs in dense to open stands, whereas on the top of the slopes the vegetation is sparse due to continued disturbance. Throughout, historical cattle grazing is evident to varying degrees.

Survey Results

A total of 5 pairs of CAGN was found on SPA One and an additional pair was observed on the northern slope of Poggi Canyon just south of SPA One. All pairs were detected during each survey. All pairs were easily detected and responded readily to taped vocalizations.

Only adults were located and no young or nests were found. Figure 1 (map pocket) presents the locations of sightings.

A total of 13 pairs of CAWR was found on SPA One. Most pairs were detected during each survey and when detected were very vocal and easily observed. *Figure 1* presents the locations of sightings.

Other sensitive species were also detected during the CAGN and CAWR surveys. These include: at least two northern harrier (*Circus cyanus*) pairs, one Cooper's hawk (*Accipiter cooperii*) pair, one or two white-tailed kite (*Elanus caeruleus*) pairs, one prairie falcon (*Falco mexicanus*), two burrowing owl (*Athene cunicularia*) pairs, one loggerhead shrike (*Lanius ludovicianus*) pair, one blue-gray gnatcatcher (*Polioptila caerulea*), two to three grasshopper sparrows (*Ammodramus savannarum*), and American badger (*Taxadea taxus*). Locations of these sightings are presented in *Figure 2* (map pocket).

Literature Cited

Mock, P., B. Jones, and J. Konecny. 1990. "California gnatcatcher survey guidelines." ERC Environmental and Energy Services Co., 2 pp.

APPENDIX F9 B

WETLAND DELINEATION REPORT FOR OTAY RANCH, SPA ONE SAN DIEGO COUNTY, CALIFORNIA

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August 24, 1995

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SUMMARY OF FINDINGS

A routine wetland delineation was conducted of the Otay Ranch, SPA One project area in southwestern San Diego County, California. U. S. Army Corps of Engineers jurisdictional wetland habitat is present in two well defined drainages: parallel to Telegraph Canyon Road, in the bottom of Poggi Canyon. All wetland areas are highly disturbed, supporting primarily freshwater marsh vegetation dominated by cattail (*Typha* sp.) and bulrush (*Scirpus* sp.), with scattered individuals of willow (*Salix* sp.), and small patches of mule fat (*Baccharis salicifolia*). Approximately 13.35 acres of Army Corps of Engineers jurisdictional wetland habitat is present, which includes approximately 0.41 acre of unvegetated drainage channels considered "waters of the United States." Impacts to U.S. Army Corps of Engineers (ACOE) jurisdictional areas that total greater than 1.0 acre would require a Section 404 Permit pursuant to the Clean Water Act. Impacts to California Department of Fish and Game (CDFG) jurisdictional area would necessitate a Streambed Alteration Agreement pursuant to Section 1603 of the California Fish and Game Code.

The total acres of habitat under the jurisdiction of the ACOE is 13.35 acres of freshwater marsh and 0.41 acre of unvegetated channels. The total acres of habitat under the jurisdiction of the CDFG is 13.31 acres.

1.0 DESCRIPTION OF PROJECT

SPA One is the first of several proposed developments on the approximately 9,000-acre Otay Valley parcel of the Otay Ranch property. The project area is situated between Telegraph Canyon Road (to the north) and Poggi Canyon (to the south), extending from approximately 1.5 miles east of Interstate Highway 805 (I-805) to approximately 4.5 miles east of I-805, within the City of Chula Vista, San Diego County, California (Figures 1 and 2). The proposed project involves the development of the majority of SPA One for mixed residential and commercial uses.

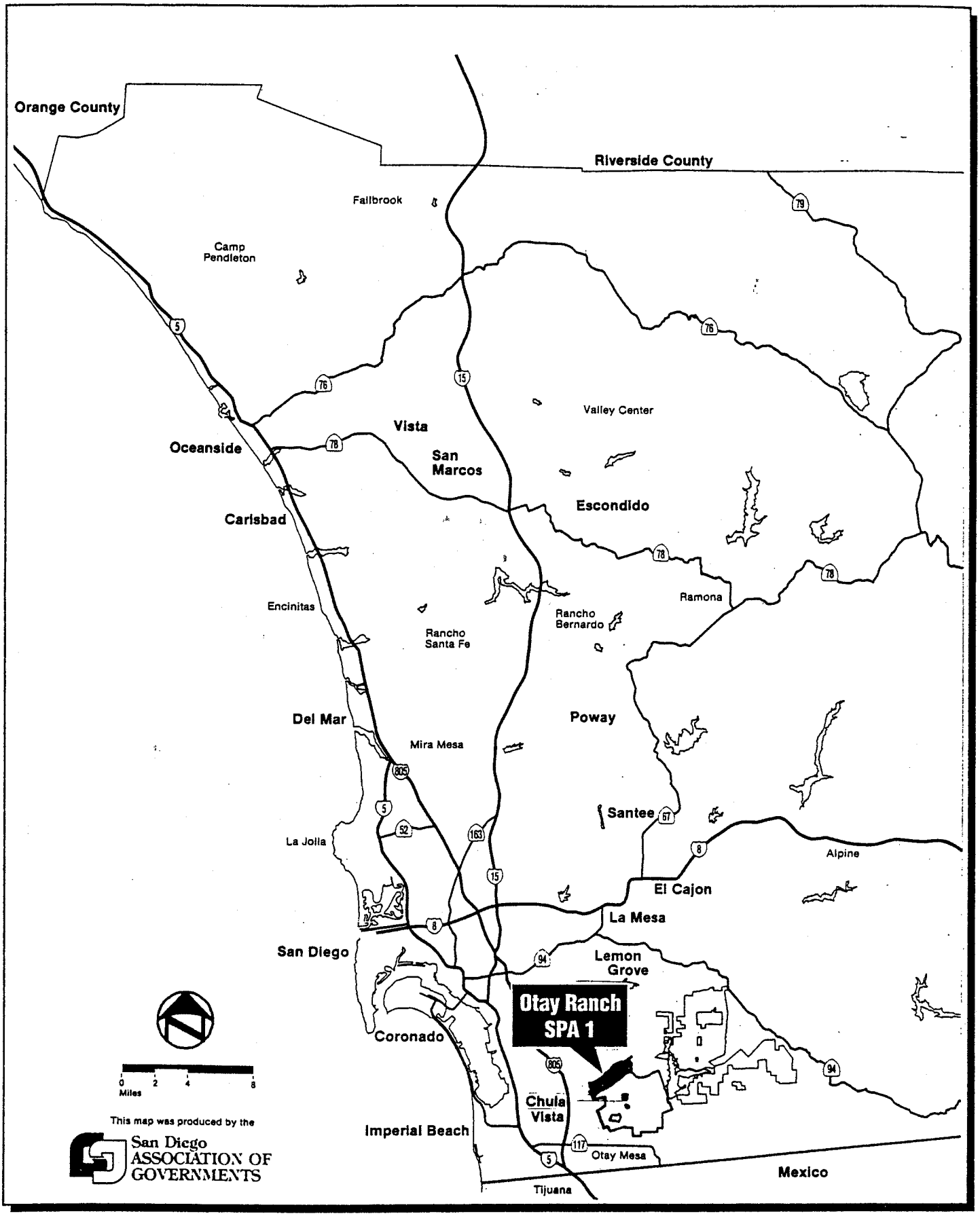
2.0 PURPOSE OF ASSESSMENT

The purposes of this assessment are to determine the boundary of U.S. Army Corps of Engineers (ACOE) Section 404 jurisdiction and the boundary of the California Department of Fish and Game (CDFG) Section 1600 jurisdiction within the study area, and to provide a general assessment of the habitat quality.

3.0 ENVIRONMENTAL SETTING

The SPA One project area is situated to the immediate south of Telegraph Canyon Road, east of Interstate 805, just east of the City of Chula Vista, San Diego County, California. The site occupies the rolling hills and mesas between Telegraph Canyon and Poggi Canyon. Nearly all of the site has been used historically for farming. Native vegetation is restricted to the extreme western portion of the site and some of the steep south-facing slopes above Poggi Canyon. Elevation onsite ranges from approximately 200 feet above mean sea level (AMSL) at the western end of Poggi Canyon to just over 600 feet AMSL on the higher hills in the eastern portion of the site.

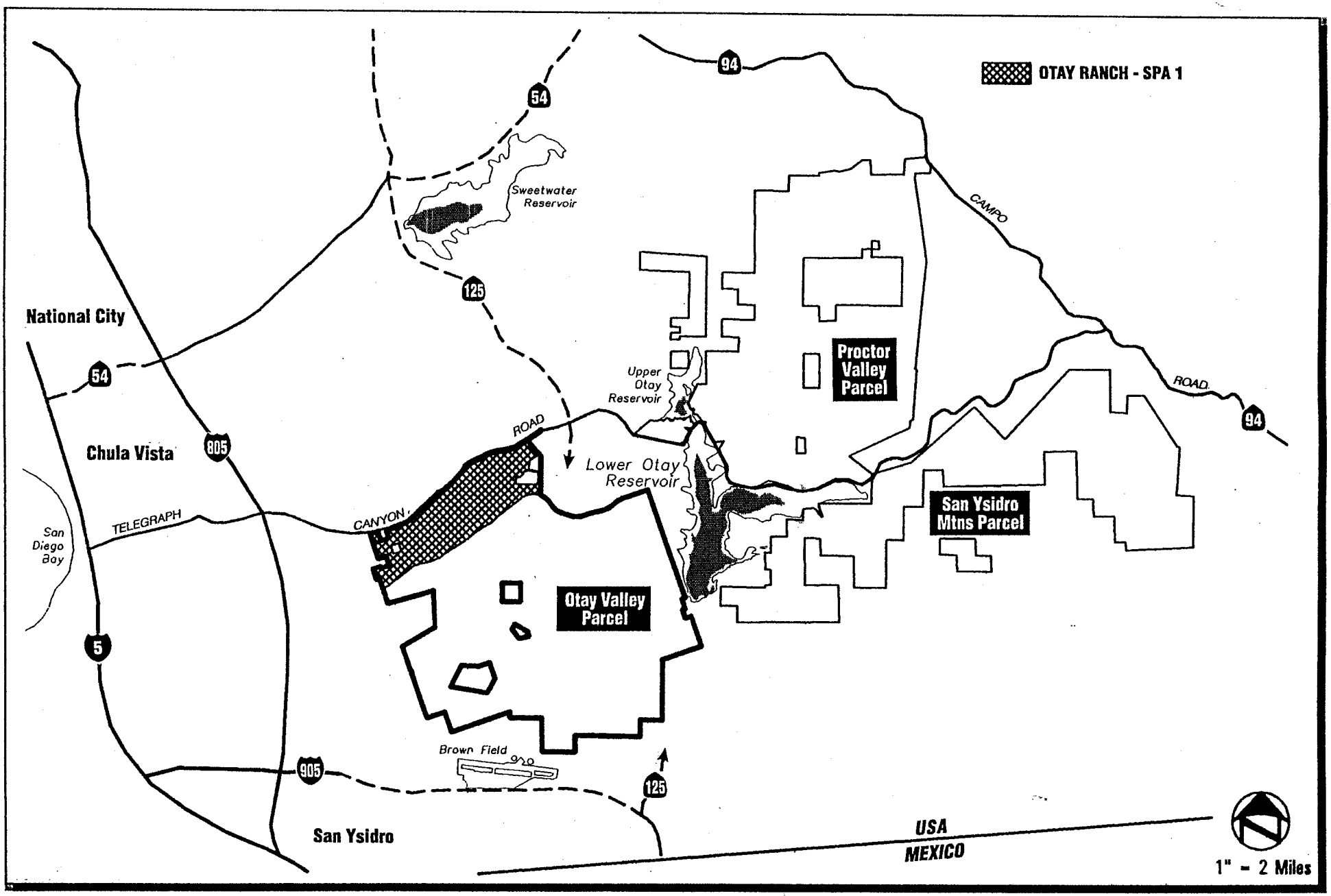
Soils mapped for the site include Olivenhain cobbly loam (OhC, OhE), Diablo clay (DaE), Linne clay loam (LsE, LsF), and Salinas clay loam (Bowman 1973). Olivenhain soils consist of well-drained, deep cobbly loam that have a very cobbly clay subsoil. These soils formed in old gravelly and cobbly alluvium, and are found on dissected marine terraces. Diablo and Linne soils consist of well-drained, moderately deep clays derived from soft, calcareous sandstone and shale. Linne clay loam is found along the steep south-facing slopes of Poggi Canyon that support coastal sage scrub vegetation. Salinas soils consist of well drained clay loams that formed in sediments washed from Diablo, Linne, Las Flores, Huerhuero, and Olivenhain soils. Onsite, this soil type is restricted to the bottom of Poggi Canyon. Present land uses on SPA One site include vacant land and agriculture. Nearby offsite land uses are commercial, residential, mineral extraction, and open space.



Otay Ranch SPA 1 - Biological Technical Studies

Regional Map

FIGURE 1



Otay Ranch SPA 1 - Biological Technical Studies

Vicinity Map

FIGURE 2

4.0 METHODS

The wetland survey was conducted on 27 January, and 2 and 4 February 1995, by Dudek & Associates, Inc., biologist John W. Brown, Ph.D. Notes were taken on the plant communities present, and boundaries between communities were mapped on 200-scale (1"=200') topographic maps of the study area. All areas supporting a predominance of hydrophytic vegetation were either inundated with water or saturated, hence data on soils were not collected. The U.S. Army Corps of Engineers Wetland Delineation Manual (1987) was used to determine whether jurisdictional wetlands occurred within the study area. The manual requires that positive indicators of hydric soils, wetland hydrology, and hydrophytic vegetation all be present to classify an area as a jurisdictional wetland. Waters of the United States, as defined by the ordinary high water mark of streams or drainages, also were identified and mapped in the field.

To determine whether the plant community at each study site met the hydrophytic vegetation criterion, the dominant species were listed along with their wetland indicator status from the National List of Plant Species That Occur in Wetlands: Region 0 (Reed 1988). For each site, if 50% or more of the dominant plant species were obligate wetland, facultative wetland, or facultative, as described in the list, the site was determined to meet the hydrophytic vegetation criterion.

All dry washes, tributary canyons, and intermittent drainages onsite were considered "waters of the United States." The area of jurisdictional habitat was estimated by measuring the width of each drainage/wash at its bottom along irregular intervals where vegetation and topography allowed access, and multiplying this value by the length of the associated section of the drainage.

5.0 RESULTS

5.1 WETLAND DETERMINATION AND DELINEATION

5.1.1 ACOE Jurisdiction

The spatial distribution of jurisdictional habitat is presented in the Wetland Delineation Map (see map pocket). Jurisdictional wetlands are restricted to two locations: the northern edge of the property along Telegraph Canyon Road and the bottom of Poggi Canyon. Additional waters of the U.S., in the form of unvegetated, incised drainages, are present throughout the SPA One area, but mostly in Poggi Canyon.

Wetland habitat along Telegraph Canyon Road is primarily disturbed freshwater marsh, some of which appears to be the result of revegetation efforts associated with recent road improvements. This habitat is patchy and dominated by cattail (*Typha* sp.) and bulrush (*Scirpus* sp.) of varying density; a few weedy upland and wetland species also occur. Within and immediately adjacent

to the marsh are small scattered patches of mule fat (*Baccharis salicifolia*) and a very few young few willow trees (*Salix* sp.). The willows are found primarily in the eastern one-fourth of the channel. Near the eastern boundary of SPA One, the drainage crosses beneath the road. The entire channel is punctuated by large (25-50 feet wide) sections of rip-rap at irregular intervals. A majority of the channel is bordered by stands of fennel (*Foeniculum vulgare*) and other non-native vegetation that occurs at the edge of an extensive agricultural area lying to the south of the channel. A small amount of water was present within the channel during the time of the surveys, hence, soil pits were not excavated. The edge of the delineated wetland is demarcated conspicuously by an abrupt change from a predominance of hydrophytic vegetation to a predominance of upland vegetation.

Wetland in Poggi Canyon is represented by a small patch of freshwater marsh and a small pond. The pond is situated behind an earthen berm. Because the surveys were conducted following considerable rainfall, the area of ponded water present is likely to be significantly greater than the normal high water mark. Owing to the paucity of hydrophytic vegetation around the pond, it is suspected that this aquatic feature may be ephemeral in nature. Two old willow trees are present in the middle of the pond; both appeared to be dead.

A total of approximately 13.35 acres of jurisdictional wetland are present onsite: 12.50 acres of freshwater marsh along Telegraph Canyon Road; and 0.14 acre of freshwater marsh and 0.30 acre of open water/pond in Poggi Canyon. In addition, much, but not all, of the bottom of Poggi Canyon supports a narrow, incised channel, totalling approximately 0.41 acre. Vegetation within and adjacent to the channel is nearly exclusively weedy upland species, including black mustard (*Brassica nigra*), cheeseweed (*Malva parviflora*), and non-native grasses.

5.1.2 CDFG Jurisdiction

CDFG jurisdiction was calculated based upon the area of streambeds, marshes, and adjacent riparian vegetation. The areas of CDFG jurisdiction include all areas described above as freshwater marsh and open water/pond. A total of 12.94 acres of CDFG jurisdictional wetland is present.

5.2 WETLAND FUNCTIONS AND VALUES

A formal wetland function and value analysis was not performed. The wetland habitat along Telegraph Canyon Road is a narrow band, is highly disturbed, and suffers from indirect impacts of adjacent land use - a four-lane road to the immediate north and agricultural fields to the immediate south. No typical southern California riparian bird species (e.g., vireos, flycatchers, woodpeckers) were observed, and none is expected to be present. The most commonly observed wildlife species were house finch (*Carpodacus mexicanus*), red-winged blackbird (*Agelaius phoeniceus*), California ground squirrel (*Spermophilus beecheyi*), and cottontail rabbit (*Sylvilagus* sp.).

The small amount and low quality of wetland habitat in Poggi Canyon does not provide enough resources for the development of a "riparian fauna." In addition, the wetland area is totally surrounded by disturbed habitat and agricultural use. Although two mallards (*Anas platyrhynchos*) and a great blue heron (*Ardea herodias*) were observed at the pond, it is highly unlikely that this open water habitat is present throughout the year. Cattle grazing in Poggi Canyon further diminishes the habitat value of the area.

6.0 DISCUSSION

6.1 REGULATORY REQUIREMENTS

The discharge of dredge or fill material (temporarily or permanently) into areas delineated as "waters of the United States" requires authorization from the ACOE, pursuant to Section 404 of the Clean Water Act. "Waters of the U.S." as defined in CFR 328.2 includes all waters or tributaries to waters, including wetlands, streams, dry washes, seasonal drainages, and other aquatic habitats. Activities that involve regulated discharge of dredge or fill material include grading, placing of riprap for erosion control, pouring concrete, laying sod, and stockpiling excavated material. Activities that generally do not involve regulated discharge, if performed in a manner to avoid discharge, include driving pilings and some methods of vegetation clearing.

The ACOE has 36 nationwide or general permits (NWPs) that pre-authorize specific minor discharges. Generally, use of these NWPs does not require review by the ACOE or other federal agencies. Because impacts have not been calculated as part of this assessment, it is not known whether can move forward under a nationwide permit. When federally-listed endangered species are affected by a project, the ACOE may require the applicant to pursue a Section 7 Agreement pursuant to the U.S. Endangered Species Act.

If ACOE allows the project to move forward under the nationwide permit process, two additional conditions must be met. The applicant must obtain a Section 401 water quality waiver or certification from the Regional Water Quality Board, and the ACOE should be notified in writing for concurrence that the proposed fill is authorized.

If endangered species or significant cultural resources occur on the property and are not adequately mitigated, no activity is considered pre-authorized, and ACOE has the discretionary authority to require an individual permit. The individual permit process involves public comment on the proposed activity and can last 180 days or longer.

The CDFG defines a stream as "a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life. This includes water courses having a surface or subsurface flow that supports riparian vegetation." A CDFG 1603 agreement would be required prior to any alteration of the streambed within CDFG jurisdiction.

An application for a 1603 agreement can occur only after an environmental impact report or negative declaration has been certified. The CDFG generally requires that any impacts to streambeds or adjacent riparian habitats be mitigation at a minimum ratio of at 1:1. Depending on habitat quality and other factors, the ratio may be greater. A streambed alteration application must be submitted to CDFG. It normally takes 30 days for the CDFG to process a 1603 application.

6.2 MITIGATION

Mitigation for impacts to ACOE and CDFG jurisdictions takes several forms, including (1) avoidance of impacts; (2) minimization of impacts; or (3) compensation for impacts. The first two types of mitigation are strongly preferred by the regulatory agencies. Compensation would be in the form of onsite wetland creation or offsite mitigation at a site approved by the resource agencies. Either mitigation option would consist of the creation of wetland habitat at a minimum ratio of 1:1 by area for impacted habitat. Creation would involve the excavation and revegetation of disturbed upland habitat. Mitigation for impacts to ACOE wetlands would satisfy the requirements for CDFG wetlands as well.

Based on previous experience with the resource agencies, it is likely that mitigation for freshwater marsh, open water/pond, and incised channels would require replacement at a ratio of 1:1 by area.

7.0 CONCLUSIONS

A Section 404 Permit from the ACOE and a Section 1603 Streambed Alteration Agreement from the CDFG would be required before implementation of the SPA One project if impacts to wetlands would occur. Prior to application for the permits, a mitigation and monitoring plan must be prepared for submission along with the applications. The application for the 1603 agreement also must be accompanied by the certified EIR.

8.0 LITERATURE CITED

Bowman, R. H. 1973. Soil Survey of San Diego Area, California, Part 1. United States Department of Agriculture, Soil Conservation Service and Forest Service. 104 pp.

Reed, P. B. 1988. National list of plant species that occur in wetlands: California (Region 0). U.S. Fish and Wildlife Service Biological Report 88 (26.10).

U.S. Army Corps of Engineers. 1987. Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1, U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

APPENDIX F9 C

SPA ONE UPDATED VEGETATION MAP

Methods

Vegetation types were mapped in the field between 10 and 24 February 1995 (3 survey visits) by Dudek and Associates, Inc. (DUDEK) biologist Brock A. Ortega. The surveys consisted of walking and or driving the entire site while mapping vegetation types. Communities were mapped onto a 1"=400' "true color" aerial photograph then transferred to a 1"=200' topographic map of the project area. Acreages of each type were determined by CADD. Wetland communities mapped by Dudek biologist John W. Brown Ph.D during the wetland delineation (see Attachment B), were integrated into the final map. Vegetation type classifications used follow Holland (1986), with modifications to accommodate the lack of conformity of the observed communities to those of Holland.

Results

The vegetation types mapped include: agriculture, annual grassland, coastal sage scrub, disturbed coastal sage scrub, developed, disturbed habitat, fresh water marsh, maritime succulent scrub, disturbed maritime succulent scrub, and open water. Acreages are presented in the table below and the Vegetation Map is in the map pocket.

HABITAT TYPE	ACREAGE BY PARCEL		TOTAL
	SPA One	"Not a Part"	
Annual grassland	322.76	16.80	339.56
Agriculture	920.06	39.04	959.10
Coastal sage scrub	87.37	10.96	98.33
Disturbed coastal sage scrub	45.65	4.29	49.94
Developed	6.12	18.24	24.36
Disturbed habitat	2.30	0.00	2.30
Freshwater marsh	12.90	0.15	13.05
Maritime succulent scrub	17.38	0.00	17.38
Disturbed maritime succulent scrub	12.14	0.00	12.14
Open water	0.33	0.00	0.33
TOTALS	*1,427.01*	*89.48*	*1,516.49*

APPENDIX F9 D

RESULTS OF FOCUSED BIOLOGICAL SURVEYS AND REVIEW OF BIOLOGICAL DATA BASE FOR OTAY RANCH — SPA ONE CITY OF CHULA VISTA SAN DIEGO COUNTY, CALIFORNIA

Prepared for:

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August 24, 1995

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1.0 BRIEF DESCRIPTION OF SPA 1

Otay Ranch is a 22,875-acre property situated in the unincorporated area of San Diego County, immediately east of the City of Chula Vista, in the extreme southwestern portion of the County. It consists of three nearby, but non-contiguous, ownership areas generally surrounding Otay Lakes: the Otay River Valley parcel, the Proctor Valley/Jamul Mountains parcel, and the San Ysidro Mountains parcel.

The Environmental Impact Report (EIR) for the project was certified in 1993. As an initial step toward implementation of the proposed development, additional focused surveys for rare plants and animals were conducted during July 1994 within SPA 1, the proposed first phase of development.

SPA 1 occupies the north-central portion of the Otay River Valley parcel. It is situated between Telegraph Canyon Road (to the north) and Poggi Canyon (to the south). For purposes of this study, it is bound on the west by proposed Paseo Ranchero and on the east by the eastern property line. Most of SPA 1 is in agricultural use, either as grazing land for cattle or as active or fallow fields, primarily grain crops. However, a small amount of coastal sage scrub and maritime succulent scrub occurs along the edges and tributary canyons of Poggi Canyon.

The purpose of this document is to provide a brief review of the existing biological data base for the SPA 1 area and present the results of focused surveys conducted in July 1994 for the California gnatcatcher (*Polioptila californica californica*), coastal cactus wren (*Campylorhychus brunniecapillus cousei*), and Otay tarplant (*Hemizonia conjugens*).

2.0 SUMMARY OF EXISTING BIOLOGICAL DATA BASE

Since 1986, Otay Ranch has been the subject of a variety of general and focused biological resource surveys, performed in support of the entitlement process for the development of the ranch. In 1986, under contract to the previous landowner (United Enterprises), Advanced Sciences, Inc. (ASI) completed botanical and zoological surveys of the entire ranch, including the area currently recognized as SPA 1. In 1989, the current landowner (Baldwin Vista Associates) engaged the services of Michael Brandman Associates (MBA) and RECON to conduct further detailed studies of the biological resources present on the site. RECON was responsible for surveys of the Otay River Valley parcel of which SPA 1 is a part. The RECON report on the Otay River Valley parcel was completed and updated in 1991. In 1991-1992 Dudek & Associates, Inc (DUDEK) conducted a thorough analysis of the flora and hydrology of the vernal pools present on the entire ranch. Additional follow-up studies were performed on specific sites throughout the ranch and for specific target species. The data base assembled by OGDEN for the Otay Ranch Environmental Impact Report (1993) included the following documents which contain information relevant to SPA 1:

-- Biological Resources Inventory for the Otay Ranch Property (RECON 1989, with 1991 update).

-- Botanical Resources Report for the Otay Ranch Property, Rare Plant Survey Results, Spring 1990 (RECON).

-- Report on the Flora and Hydrology of the Otay Ranch Vernal Pools, 1990, San Diego County, California (DUDEK 1992).

-- Baldwin Otay Ranch Wildlife Corridor Study: Phase 1 Report (OGDEN 1992).

-- Responses to "Data Gaps" Identified by the Otay Ranch Biological Subcommittee (DUDEK 1991).

2.1 Sensitive Animals

Based on the cumulative data base compiled by OGDEN for the EIR, four bird species recognized as sensitive by local, state, or federal resource agencies have been documented from SPA 1: California gnatcatcher (*Polioptila californica californica*), coastal cactus wren (*Campylorhychus brunniecapillus cousei*), grasshopper sparrow (*Ammodrammus savannarum*), and blue grosbeak (*Guiraca caerulea*). These species are discussed below and their occurrence within SPA 1 is reviewed.

Polioptila californica californica - California gnatcatcher
USFWS: Threatened
CDFG: Species of Special Concern

The California gnatcatcher is a small gray non-migratory bird with black tail markings. During the breeding season the male has a distinct black cap. Gnatcatchers eat insects and build a small, cup-shaped nest of plant material, animal hair, and spider webs. A pair of gnatcatchers use 5 to 20 acres during the breeding season and a larger area at the end of spring. The present known range of the California gnatcatcher extends from a small portion of Los Angeles County south through Orange, western Riverside, and San Diego counties, into northern Baja California, Mexico. It is a near obligate resident of coastal sage scrub and inland sage scrub communities. Individuals of this species are generally found at elevations below 800 feet along the coast, and below 1600 feet in Riverside County (Atwood 1990). Estimates of population sizes within California range from 1,200-2,000 (Atwood 1990) to 1,645-1,800 pairs (MBA 1991). In San Diego County, gnatcatcher populations are known from several sites along the coast and from as far inland as San Pasqual, Poway, Lakeside, and Escondido.

Cumulative historical data indicates that two pairs of gnatcatchers have been observed on the SPA 1 site: one in a tributary canyon to Poggi Canyon in the southwestern third of the SPA, and one near the far southwestern corner of the SPA along proposed Paseo Ranchero. Neither of these locations have been confirmed by recent survey work.

Campylorhynchus brunniecapillus cousei - coastal cactus wren
USFWS: Candidate (Category 2) coastal population
CDFG: Species of Special Concern

The cactus wren (*Campylorhynchus brunneicapillus*) is a widespread and common species of the southwestern deserts, extending to the Pacific coast in southern California and Baja California. Rea and Weaver (1990) recognize a portion of the coastal population as a separate subspecies, *Campylorhynchus brunneicapillus sandiegensis*. According to Rea and Weaver (1990), the range of *C. b. sandiegensis* (the "San Diego" cactus wren) is restricted to the coastal slope of San Diego County and extreme southern Orange County. Populations occurring north of southern Orange County are assigned to the more common and widespread desert subspecies, *C. b. anthonyi*. Originally, all coastal populations from the Mexican border north to Ventura County had been assigned to the subspecies *sandiegensis*, but recently it has been concluded that populations in Orange, Los Angeles, and Ventura counties more closely resemble *anthonyi*. Regardless of taxonomic opinion, the coastal cactus wren is a highly sensitive species. Its habitat has been depleted by housing and associated urban development. Cactus thickets supporting the cactus wren occur primarily in maritime sage scrub Diegan coastal sage scrub, and Venturan sage scrub communities.

OGDEN identified two recent and three historical sightings of cactus wren from SPA 1, all near the southwestern corner of SPA 1 at the edge of Poggi Canyon.

Ammodramus savannarum - grasshopper sparrow
USFWS: None
CDFG: None

The grasshopper sparrow is small sparrow of open fields, native grasslands, disturbed coastal sage scrub, and other habitats dominated by grasses and with song perches. It has a short, sharp tail, flat head, and yellow shoulder. Although not listed as threatened or endangered by the resource agencies, Everett (1979) recognizes this species as sensitive in San Diego County. He indicates that it is restricted to only a few known nesting locales and that it requires suitable grasslands for nesting and foraging. Subsequent to Everett (1979), this species has been found at many more localities.

Historical data includes a single observation of the grasshopper sparrow from the southwestern third of the SPA, near Poggi Canyon.

Guiraca caerulea - blue grosbeak
USFWS: None
CDFG: None

In San Diego County, the blue grosbeak is an uncommon summer resident, rare spring and fall migrant away from breeding localities, and a casual winter visitor (Unitt 1984). This species inhabits riparian woodland edges, and thickets of willows and mule fat growing around streams, ponds, and lakes. It seems to require both dense, low vegetation near riparian zones and nearby grassy or weedy areas. Its primary breeding areas are in the valleys and coastal lowlands, but it may be encountered at higher elevations as well. In San Diego County, this species is declining as a result of loss of habitat.

OGDEN reported one historical observation of the blue grosbeak from the southwestern portion

of SPA 1.

2.2 Sensitive Plants

Based on the cumulative data base compiled by OGDEN for the EIR, three species of plants recognized as sensitive by local, state, or federal resource agencies have been documented from SPA 1: San Diego barrel cactus (*Ferocactus viridescens*), snake cholla (*Opuntia parryi* var. *serpentina*), and San Diego County viguiera (*Viguiera laciniata*).

Ferocactus viridescens - San Diego barrel cactus
USFWS: Candidate (Category 2)
CDFG: None
CNPS: List 2, 1-3-1

San Diego barrel cactus is a low, dome-like, perennial cactus, limited in distribution to San Diego County and adjacent Baja California, Mexico. In San Diego County it occurs commonly on dry slopes in Diegan coastal sage scrub and chaparral communities. Although relatively widespread in the county, San Diego barrel cactus is continuing to decline in numbers as its habitats are reduced. San Diego barrel cactus is threatened primarily by urbanization, off-road vehicles, and commercial exploitation.

One population of San Diego barrel cactus has been reported from the western edge of SPA 1 near the proposed Paseo Ranchero alignment.

Opuntia parryi var. *serpentina* - snake cholla
USFWS: Category 2 candidate
CDFG: None
CNPS: List 1B, 3-3-2

Snake cholla is a prostrate or suberect, spring-blooming (April-May), perennial cactus. It is infrequent in sandy places and dry slopes in coastal sage scrub and mixed chaparral habitats below about 150 m. It is restricted to western San Diego County and adjacent northern Baja California, Mexico. In San Diego County it has been recorded from Balboa Park, Point Loma, Chollas Valley, Chula Vista, Jamacha, Telegraph Canyon, and Boundary Monument No. 258 (Beauchamp 1986).

A single population of snake cholla was reported from a tributary canyon of Poggi Canyon in the southwestern portion of SPA 1 (OGDEN 1993).

Viguiera laciniata - San Diego County viguiera
USFWS: None
CDFG: None
CNPS: List 2, 1-2-1

San Diego County viguiera is a moderate-sized (0.8-1.2 m), yellow-flowered, perennial shrub, that blooms from about January to July. It is restricted to coastal sage scrub habitat below

about 400 m from southern San Diego County to northwestern Baja California, Mexico (Wiggins 1980). In San Diego County, it is locally common south of Mission Valley; it ranges from the international border north to about Scripps Ranch, and extends east from the Pacific coast to Dulzura, Potrero, and Crest. Although many of the former sites of this plant have been lost to development, it is found in sufficient numbers and distributed widely enough that the potential for extinction or extirpation is low at this time.

OGDEN illustrated four populations of San Diego County viguiera in the western portion of SPA 1 along the edge of Poggi Canyon.

3.0 SUMMARY OF CURRENT FOCUSED SURVEYS

As an final step in identifying all potential biological constraints present within on SPA 1, additional focused surveys for rare plants and animals were conducted during July 1994. Reports detailing the findings of these surveys are included as appendices and are summarized below.

California gnatcatcher. California gnatcatchers (one adult male and two independent juveniles) were observed at two locations within SPA 1. These observations probably represent a pair and their offspring. The birds were observed in drainage in which the proposed Paseo Ranchero would be located, and in the small tributary canyon to Poggi Canyon about 600 feet to the east. One of these locations confirms an historical sighting; the second historical sighting location yielded no birds.

Coastal cactus wren. Cactus wrens were observed at six locations within SPA 1, most within the drainage and along the slopes of Poggi Canyon between proposed Paseo Ranchero and the existing dirt access road. These locations conform well with historical sightings of this species.

Otay tarweed. Otay tarweed (*Hemizonia conjugens*) was not observed within SPA 1, although small patches of fascicled tarweed (*Hemizonia fasciculatum*) were observed. This species was not previously reported from the SPA 1 area.

Other sensitive species. Other sensitive species observed during the focused surveys include loggerhead shrike (*Lanius ludovicianus*) and San Diego black-tailed jackrabbit (*Lepus californicus bennettii*), both of which are recognized as category 2 candidates for listing by the U.S. Fish and Wildlife Service. Locations of these observations are illustrated in the appendix.

APPENDICES

Anita M. Hayworth
Biological Consultant

July 31, 1994

Dudek & Associates
Attn. June Collins
605 Third Street
Encinitas, CA 92024

Re: California Gnatcatcher survey for Otay Ranch, SPA 1

A coastal California gnatcatcher (*Polioptila californica californica*) survey was conducted on the Otay Ranch property during July 1994. The survey consisted of a presence/absence survey of approximately 1500 acres of the ranch property. The property is located south of Telegraph Canyon Road, north of Poggi Canyon, and east of the Chula Vista City Limits. The portion of the ranch included in this survey is located between Telegraph Canyon and Poggi Canyon, and is east of the extension of Paseo Ranchero. Most of the property is in agricultural use either as grazing land for cattle, or active or fallow fields. The property is composed of a little in the way of native habitats. A small amount of coastal sage scrub (CSS) or maritime succulent scrub (MSS) is located along the edges and drainages of Poggi Canyon.

A survey was conducted on the property using the currently accepted protocol of the U.S. Fish and Wildlife Service and the Scientific Review Panel except that only two complete visits were made to the area of interest within SPA 1. One visit was made to the western area of SPA 1, west of the extension of Paseo Ranchero. All areas of vegetation were visited by me during the survey. The route used to survey the habitat was arranged to ensure complete coverage of the habitat. Visits to the property were made on the following dates in 1994: June 30, July 8, 14, and 20. The weather conditions were generally pleasant and mild. The air temperature ranged from 67 to 71 °F at the start of the survey and reached 78 °F by the end of the visits. The winds were relatively low (0 - 8 MPH) with clear to completely overcast skies. The time of day of each visit was between 8 a.m. to 12 noon for four hours for each visit. A tape of recorded vocalizations was used to elicit responses from the species, however, the gnatcatchers were very responsive so the tape was used minimally. Once a gnatcatcher responded, the tape was not used again until far enough away from it to avoid it responding. Gnatcatchers were observed for several minutes in order to determine where they were headed, their age and gender.

California gnatcatchers were observed at two locations within the area of interest. The enclosed exhibits include a 7.5 minute U.S.G.S. topographic map which indicates the locations of gnatcatchers, coastal cactus wrens, and other sensitive species observed in the study area. A total of one male and two independent juvenile gnatcatchers was observed. Judging from the amount of habitat available and the close proximity of the observations,

10542 Montego Drive / San Diego CA 92124 / (619) 694-0084

these birds probably comprise one pair and their offspring of the year. The birds were observed in the drainage in which the proposed Paseo Ranchero will be located and in the small ravine just east of it. They were observed using MSS habitat and CSS/MSS ecotone. Although most of the habitat occurs in a narrow band along the slopes, a relatively large patch of habitat is located in the drainage which will be traversed by Paseo Ranchero.

Coastal cactus wrens were observed at six locations within this area of interest. Most of them were observed in MSS habitat within the drainages and the slopes along Poggi Canyon between the proposed Paseo Ranchero and the existing access road to the ranch. One pair was found in a patch of burned MSS east of the access road to the ranch. Most of the cactus wrens were observed with juvenile birds, some of which were still being fed by the adults.

The MSS and CSS habitat occurs in relatively small patches in the form of a strip between the canyon bottom and the mesa top, both of which are currently in agricultural use. The quality of the habitat is relatively high where it does occur. The exception is the area east of the current access road which burned recently so shrub cover is very low. The habitat is dominated by jojoba, California sagebrush, cholla, and lemonadeberry. The shrub vegetative cover is approximately 40% to 70% in the unburned areas.

Although not a part of this study, the SPA 1 area west of the proposed Paseo Ranchero was also surveyed one time. The enclosed exhibits include a separate 7.5 minute U.S.G.S. topographic map which indicate the locations of sensitive species observed in this area west of Paseo Ranchero. The vegetation in this area contains a large amount of CSS and MSS habitat as well as some agricultural land. The native vegetation is generally high quality gnatcatcher/cactus wren habitat. California gnatcatchers were observed at five locations within this area. They were observed on both north- and south-facing slopes and thus were found within drainages that terminate either in Telegraph Canyon or Poggi Canyon. A total of 1 pair, 2 males, 1 female or subadult, and 2 independent juveniles were observed. Coastal cactus wrens were observed at two locations within the area.

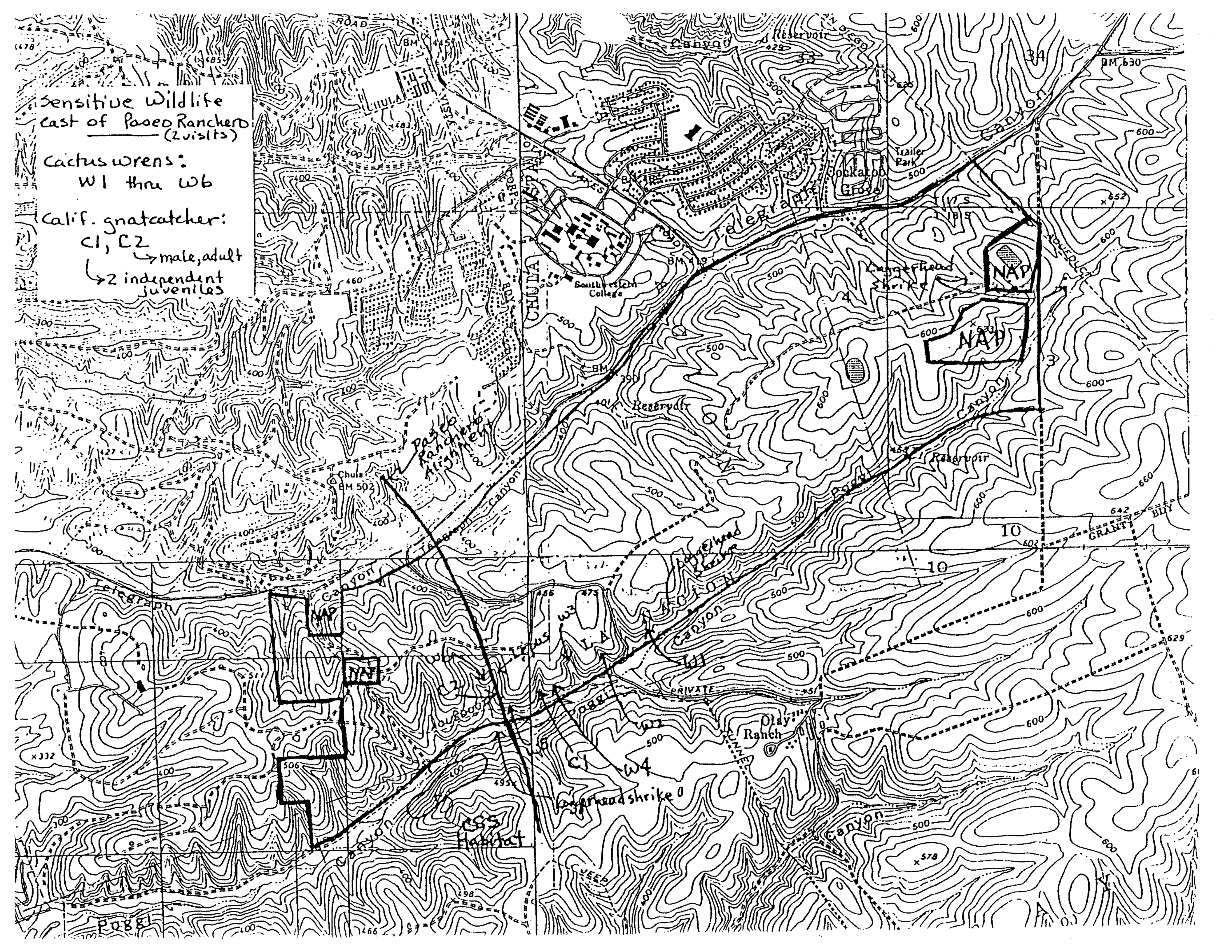
Notes were made as to the presence of other sensitive species which included the loggerhead shrike, San Diego black-tailed jackrabbit, and coastal cactus wren. No brown-headed cowbirds were observed on the property or in the vicinity. I have also included copies of my field data sheets with this letter.

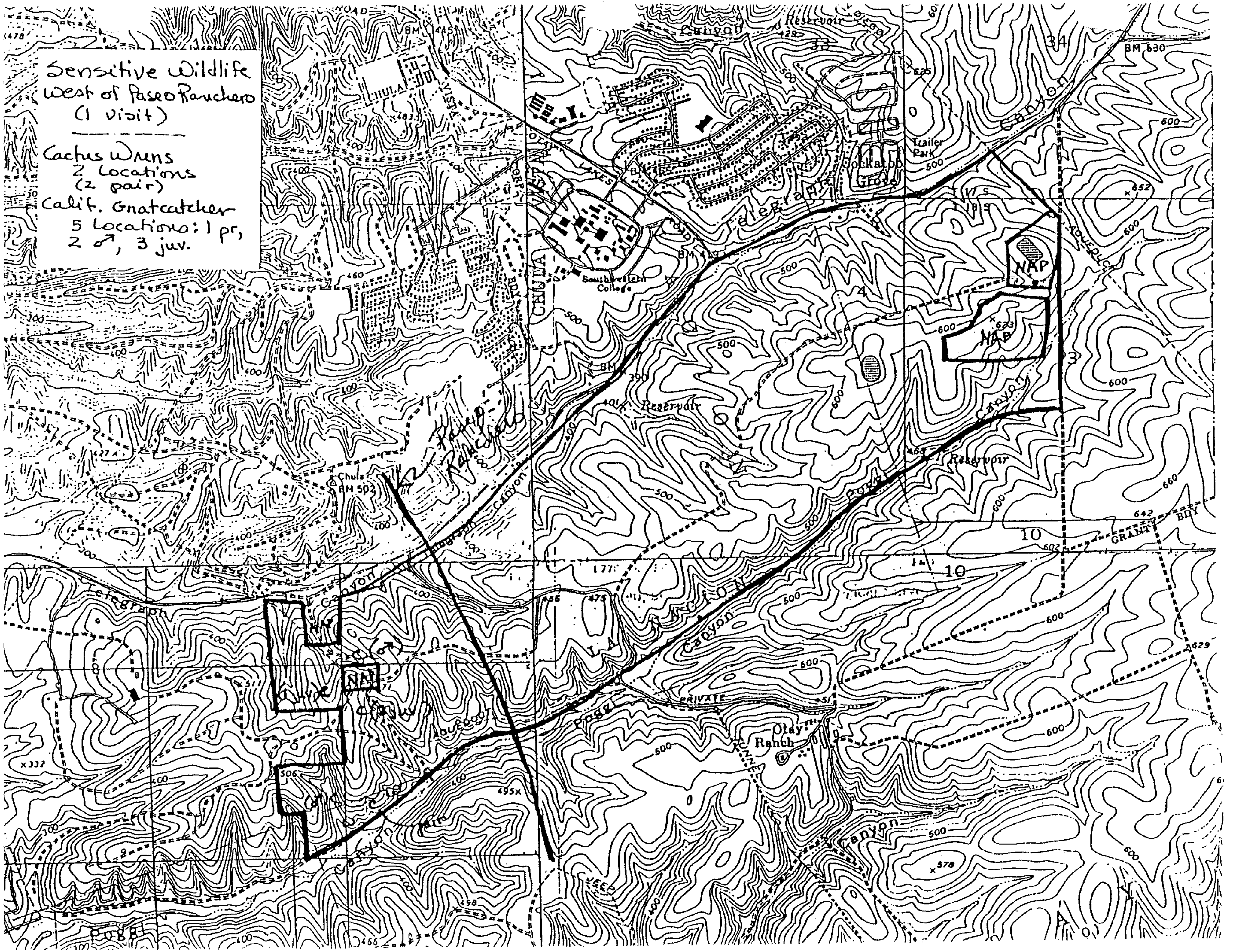
Sincerely,

Anita M. Hayworth

Anita M. Hayworth
Owner/Biologist
Permit No. PRT-781086

10542 Montego Drive / San Diego CA 92124 / (619) 694-0084


Sensitive Wildlife
east of Paseo Ranchero
(2 visits)
Cactus wrens:
W1 thru W6
Calif. gnatcatcher:
C1, C2
→ male, adult
→ 2 independent juveniles
Loggerhead Shrike
NAP
NAP
NAP
NAP
Paseo Ranchero Alignment
Loggerhead Shrike
Loggerhead shrike
CSS Habitat
W1
W2
W3
W4
C1
Telegraph
Canyon
Southwestern College
Chula Vista
Reservoir
Olay Ranch
Trailer Park
Cockatoo Grove
PRIVATE
JEEP
GRANT BDY
Poggi


Sensitive Wildlife
West of Paseo Ranchero
(1 visit)
Cactus Wrens
2 Locations
(2 pair)
Calif. Gnatcatcher
5 Locations: 1 pr,
2 ♂, 3 juv.
Paseo Ranchero
NAP
NAP
Telegraph Canyon
Reservoir
Southwestern College
Trailer Park
Rancho del Rey
Otay Ranch
Canyon
GRANT BDY
AQUEDUCT
CHULA VISTA
CORP BDY
PRIVATE
JEEP

CALIFORNIA GNATCATCHER/CACTUS WREN SURVEY

PROJECT: Otay SPA 1 #: 047 07 CLIENT: Dudek

Investigator: Hayworth
Date: 7/8/94
Region/Location: Otay Ranch, Poggy Cyn
Aerial photo #:
Site visit #: 1

	Start	Stop
Time	0800	
Temp	71	
Wind	0-1	
Cloud cover	100	
Precipitition	0	

Sighting #: 1 Number of individuals: 4-5 Species: CAGN (CAWR)
Sex: female male (pair) Age: (adult) (juvenile) fledgling 2+2 or 3
Vegetation type: MSS - burned

	Dominant Shrub	% Relative Cover	Average Height
1:	Jojoba	30	1.5
2:	Artemisia	30	.75
3:	Lemonadeb.	20	1.5
	Yucca	20	2

Shrub Cover 30% Slope 20° Aspect S Elevation

Sighting #: 2 Number of individuals: ~~4~~ 3 Species: CAGN (CAWR)
Sex: female male (pair) Age: (adult) (juvenile) fledgling 2+1
Vegetation type: MSS lots of cactus in nest ravine to west

	Dominant Shrub	% Relative Cover	Average Height
1:	Yucca	30	1.5
2:	Artemisia	30	1
3:	jojoba	40	1.5

Shrub Cover 30% Slope 30° Aspect S Elevation

Sighting #: 3 Number of individuals: 6 Species: CAGN (CAWR)
Sex: female male (pair) Age: (adult) (juvenile) fledgling 2+4
Vegetation type: MSS

	Dominant Shrub	% Relative Cover	Average Height
1:	Yucca	30	1.25
2:	jojoba	30	1
3:	Artemisia	40	.75

Shrub Cover 40 Slope 30 Aspect E+W (drainage) Elevation

CALIFORNIA GNATCATCHER/CACTUS WREN SURVEY

PROJECT: Otay Ranch SPA 1 #: 047 07 CLIENT: Dudek

Investigator Hayworth
Date 6/30/94
Telegraph ~~to Otay~~ road side
Region/Location SPA1
Aerial photo #
Site visit # 1

	Start	Stop
Time	0800	1100
Temp	67	78
Wind	1-4 mph	3-6
Cloud cover	0	0
Precipitition	0	0

Sighting #: 1 Number of individuals: 2 Species: (CAGN) CAWR
Sex: female male pair Age: adult (independent juvenile) fledgling prob pair here too
Vegetation type: MSS/cactus

	Dominant Shrub	% Relative Cover	Average Height
1:	Artemisia	40	.75 m
2:	Op. prolifera	20	1
3:	lemonadeberry jojoba	20 20	1.25 1

Shrub Cover 70% Slope 20° Aspect S Elevation

Sighting #: 2 Number of individuals: 2 Species: CAGN (CAWR)
Sex: female male (pair) Age: (adult) juvenile fledgling
Vegetation type: MSS/cactus

	Dominant Shrub	% Relative Cover	Average Height
1:	Cholla	40	1 m
2:	jojoba	30	1
3:	lemonade Artemisia	10 20	1.5 .75

Shrub Cover 60% Slope 25° Aspect S Elevation

Sighting #: Number of individuals: Species: CAGN CAWR
Sex: female male pair Age: adult juvenile fledgling
Vegetation type:

	Dominant Shrub	% Relative Cover	Average Height
1:			
2:			
3:			

Shrub Cover Slope Aspect Elevation

CALIFORNIA GNATCATCHER/CACTUS WREN SURVEY

PROJECT: Otay SPA 1 #: ____ CLIENT: Dudek

Investigator: Hayworth
Date: 7/14/94
SPA1, Poggi
Region/Location: west end
Aerial photo #: ____
Site visit #: 1

	Start	Stop
Time	0800	
Temp	68	
Wind	0-2	
Cloud cover	0	
Precipitition	0	

Sighting #: 1 Number of individuals: 1 Species: (CAGN) CAWR
Sex: female (male?) pair Age: (adult) juvenile fledgling
Vegetation type: MSS

	Dominant Shrub	% Relative Cover	Average Height
1:	Artem	30	1
2:	Jojoba	40	1.25
3:	Lemonade	30	2

Shrub Cover 40 Slope 20° Aspect W Elevation ____

Sighting #: 2 Number of individuals: 2 Species: CAGN (CAWR)
Sex: female male (pair) Age: (adult) juvenile fledgling
Vegetation type: MSS (Jack rabbit too)

	Dominant Shrub	% Relative Cover	Average Height
1:	Artem	30	1
2:	Jojoba	40	1.25
3:	Lemonade	30	2

Lots of O. prolifera on S facing slope

Shrub Cover 40 Slope 20 Aspect W Elevation ____

Sighting #: 3? Number of individuals: 2 Species: (CAGN) CAWR
Sex: female male (pair) Age: sub (adult) – independent young of year juvenile fledgling
Vegetation type: ~~MSS~~/ESS

	Dominant Shrub	% Relative Cover	Average Height
1:	Artem	60	1
2:	Eriog	20	.75
3:	Lemonade	20	2

Shrub Cover 70% Slope 15° Aspect SE Elevation ____

CALIFORNIA GNATCATCHER/CACTUS WREN SURVEY

PROJECT: Otay #: ____ CLIENT: Dudek

Investigator AMH
Date 7/14
Otay SPA1
Region/Location westend
Aerial photo # ____
Site visit # 1

	Start	Stop
Time		
Temp	78	
Wind	3-8	
Cloud cover	0	
Precipitition	0	

Sighting #: 4 Number of individuals: 1 Species: (CAGN) CAWR
Sex: (female) male pair Age: (adult or subadult) juvenile fledgling
Vegetation type: CSS

Dominant Shrub	% Relative Cover	Average Height
1: Artem	20	.75
2: Eriog	40	.5
3: lemonade	40	1.5

Shrub Cover 60 Slope 15° Aspect NE Elevation ____

Sighting #: 5 Number of individuals: 2 Species: CAGN (CAWR)
Sex: female male (pair) Age: (adult) juvenile fledgling
Vegetation type: MSS

Dominant Shrub	% Relative Cover	Average Height
1: O. prolifera	20	.5
2: Artem	50	.75
3: jojoba +others	30	1

Shrub Cover 80 Slope 30° Aspect S Elevation ____

Sighting #: 6 Number of individuals: 1 Species: (CAGN) CAWR
Sex: female (male) pair Age: (adult) juvenile fledgling
Vegetation type: CSS/MSS edotone

Dominant Shrub	% Relative Cover	Average Height
1: Artem	50	1
2: Jojoba	40	1
3: yucca	10	1.25

Shrub Cover 80% Slope 20° Aspect W Elevation ____

P3 of 5

Survey No. _____
Polygon No. _____
Mapped Loc. No. ~~7~~
Map or Air Photo No. or USGS Quad _____

CAGN/CAWR SURVEY FORM

Site: Otay SPA 1 [C6]

Investigators: Haywarth

Date: 7/14 Starting Time: _____ Stopping Time: _____

Conditions (Weather & Temperature):

Start: _____

Stop: _____

Species observed: (CAGN) / CAWR

Number observed: Single / (Pair) GROUP - No. individuals 2

Sex: ~~Male~~ / Female

Age: (Adult) / Independent Juvenile / Recently Fledged Juvenile / Nesting / Unknown

Other sensitive species: _____

*Habitat Type: MSS

	Dominant Plant	Rel. Cover	Avg. Height
1	jojoba	60	1
2	yucca	20	1.5
3	O. prolifera	20	1.25
4			

Absolute shrub cover: 30 40 50 60 (70) 80 90 100

% gap: _____ % bare group: _____ % herb cover: _____

Slope: Flat 0-10 (10-35) 35-60 >60

Other important plants: S. facing slope

Comments: _____

* Use Orange County Habitat Classification System dated May 1992 prepared by John Gray and david Bramlet and Methods Used to Survey the Vegetation of Orange County Parks and Open Space Areas and The Irvine Company Property dated February 10, 1993 by Jones & Stokes Associates, Inc.

* All habitat information, including dominant plants, absolute and relative cover, average plant height, % gap, % bare ground, % herb cover, etc., shall be collected within a radius of about 25 meters of each individual bird sighting.

p407 #5

Survey No. _____
Polygon No. _____
Mapped Loc. No. 8
Map or Air Photo No. or USGS Quad _____

CAGN/CAWR SURVEY FORM

Site: Otay [W7]

Investigators: AMH

Date: 7/14 Starting Time: _____ Stopping Time: _____

Conditions (Weather & Temperature):

Start: _____

Stop: _____

Species observed: CAGN / (CAWR)

Number observed: Single / (Pair) GROUP - No. Individuals 2

Sex: ~~Male~~ / Female

Age: (Adult) / Independent Juvenile / Recently Fledged Juvenile / Nesting / Unknown

Other sensitive species: _____

*Habitat Type: MSS

	Dominant Plant	Rel. Cover	Avg. Height
1	jojoba	40	1
2	O. prolifera	40	1
3	yucca	20	1.5
4			

Absolute shrub cover: 30 40 50 (60) 70 80 90 100

% gap: _____ % bare group: _____ % herb cover: _____

Slope: Flat 0-10 (10-35) 35-60 >60

Other important plants: SW facing

Comments: _____

* Use Orange County Habitat Classification System dated May 1992 prepared by John Gray and david Bramlet and Methods Used to Survey the Vegetation of Orange County Parks and Open Space Areas and The Irvine Company Property dated February 10, 1993 by Jones & Stokes Associates, Inc.

* All habitat information, including dominant plants, absolute and relative cover, average plant height, % gap, % bare ground, % herb cover, etc., shall be collected within a radius of about 25 meters of each individual bird sighting.

CALIFORNIA GNATCATCHER/CACTUS WREN SURVEY

PROJECT: Otay SPA 1 #: ____ CLIENT: ____

Investigator: AJM
Date: ~~7/7~~ 7/14
Region/Location: ____
Aerial photo #: ____
Site visit #: ____

	Start	Stop
Time		1230
Temp		78
Wind		3-8
Cloud cover		0
Precipitition		0

Sighting #: 9 Number of individuals: 1 Species: (CAGN) CAWR

Sex: female (male) pair Age: (adult) juvenile fledgling

Vegetation type: CSS

	Dominant Shrub	% Relative Cover	Average Height
1:	Artem	60	1
2:	lemonade	20	.5
3:	Encelia	20	2

Shrub Cover 60% Slope 15° Aspect N Elevation ____

Sighting #: Number of individuals: Species: CAGN CAWR

Sex: female male pair Age: adult juvenile fledgling

Vegetation type: ____

	Dominant Shrub	% Relative Cover	Average Height
1:			
2:			
3:			

Shrub Cover ____ Slope ____ Aspect ____ Elevation ____

Sighting #: Number of individuals: Species: CAGN CAWR

Sex: female male pair Age: adult juvenile fledgling

Vegetation type: ____

	Dominant Shrub	% Relative Cover	Average Height
1:			
2:			
3:			

Shrub Cover ____ Slope ____ Aspect ____ Elevation ____

CALIFORNIA GNATCATCHER/CACTUS WREN SURVEY

PROJECT: Otay SPA 1 #: 047 CLIENT: Dudek

Investigator: Hayworth
Date: 7/20/94
Region/Location: Otay - SPA1 east to Pas. Ranchero
Aerial photo #:
Site visit #: 2

	Start	Stop
Time	0800	
Temp	69	
Wind	1-4	
Cloud cover	40%	
Precipitition	0	

Sighting #: 1 Number of individuals: Species: CAGN (CAWR)
Sex: female male (pair)+juv Age: adult (juvenile) fledgling
Vegetation type: MSS - burned Same as 01

	Dominant Shrub	% Relative Cover	Average Height
1:	jojoba		
2:	yucca		
3:	lemonade		

Shrub Cover 40% Slope 10° Aspect S Elevation

Sighting #: 2 Number of individuals: Species: CAGN (CAWR)
Sex: female male (pair)+ Age: adult juvenile fledgling
Vegetation type: MSS

	Dominant Shrub	% Relative Cover	Average Height
1:	D. prolifera	50	.75
2:	jojoba	40	1.25
3:	lemonade	10	1.5

Shrub Cover 60% Slope 25° Aspect S Elevation

Sighting #: 3 Number of individuals: Species: CAGN (CAWR)
Sex: female male (pair)+ Age: adult juvenile fledgling
Vegetation type: MSS

	Dominant Shrub	% Relative Cover	Average Height
1:	D. prol	30	.75
2:	jojoba	30	1
3:	yucca	30	1

Shrub Cover 40 Slope 30° Aspect S+E Elevation

CALIFORNIA GNATCATCHER/CACTUS WREN SURVEY

PROJECT: Otay SPA 1 #: ____ CLIENT: ____

Investigator AMH
Date 7/20

Region/Location ____
Aerial photo # ____
Site visit # ____

	Start	Stop
Time		
Temp		
Wind		
Cloud cover		
Precipitition		

Sighting #: W4 Number of individuals: Species: CAGN (CAWR)
Sex: female male (pair) Age: adult juvenile fledgling
Vegetation type: MSS

	Dominant Shrub	% Relative Cover	Average Height
1:	Lemonade (O. prolifera too)	20	2
2:	jojoba	20	1.25
3:	yucca	20	1.5
	Artemisia	30	1

Shrub Cover 50 Slope 25 Aspect S Elevation ____

Sighting #: C1 Number of individuals: 2 Species: (CAGN) CAWR
Sex: female male pair Age: adult (juvenile) fledgling independent
Vegetation type: MSS/CSS ecotone

	Dominant Shrub	% Relative Cover	Average Height
1:	Artem	40	.75
2:	jojoba	20	1
3:	lemonade	30	1.5

Shrub Cover 50 Slope 30° Aspect E + SE Elevation ____

Sighting #: W5 Number of individuals: 2 Species: CAGN (CAWR)
Sex: female male (pair) Age: adult juvenile fledgling
Vegetation type: MSS

	Dominant Shrub	% Relative Cover	Average Height
1:	Artem	30	1
2:	jojoba	40	1.25
3:	O. prolifera	30	1

Shrub Cover 60% Slope 20° Aspect S Elevation ____

Bincat Western ever seen - killed a cottontail - trying to

CALIFORNIA GNATCATCHER/CACTUS WREN SURVEY

PROJECT: Otay SPA 1 #: ____ CLIENT: Dudek

Investigator AMH
Date 7/20
Region/Location ____
Aerial photo # ____
Site visit # ____

	Start	Stop
Time	1200	
Temp	78	
Wind	2-5	
Cloud cover	0	
Precipitition	0	

Sighting #: C2 Number of individuals: 1 Species: (CAGN) CAWR
Sex: female male? pair Age: (adult) juvenile fledgling
Vegetation type: ~~CSS~~/MSS

	Dominant Shrub	% Relative Cover	Average Height
1:	Artem	40	1
2:	O. prolif	30	1
3:	jojoba	30	1.25

Shrub Cover 50% Slope 15° Aspect S+SW Elevation ____

Sighting #: W6 Number of individuals: 2 Species: CAGN (CAWR)
Sex: female male (pair) Age: (adult) juvenile fledgling
Vegetation type: MSS (not same as W5)

	Dominant Shrub	% Relative Cover	Average Height
1:	O. prolif.	20	1
2:	jojoba	40	1
3:	Tetramacle	30	1.5

Shrub Cover 70% Slope 15° Aspect S Elevation ____

Sighting #: Number of individuals: Species: CAGN CAWR
Sex: female male pair Age: adult juvenile fledgling
Vegetation type: ____

	Dominant Shrub	% Relative Cover	Average Height
1:			
2:			
3:			

Shrub Cover ____ Slope ____ Aspect ____ Elevation ____

DUDEK & ASSOCIATES, INC.
1994 STANDARD SCHEDULE OF CHARGES
COMPANY SERVICES

MANAGEMENT	
Principal Manager	$120.00/hr
Principal	$115.00/hr
ENGINEERING SERVICES	
Senior Engineer	$95.00/hr
Project Manager	$80.00/hr
Associate Engineer	$80.00/hr
Engineer III	$70.00/hr
Engineer II	$60.00/hr
<u>Drafting/CADD Services</u>	
GIS Specialist	$65.00/hr
CADD Operator/Designer Drafter III	$65.00/hr
CADD Operator/Designer Drafter II	$55.00/hr
Designer Drafter I	$45.00/hr
Assistant Designer Drafter	$30.00/hr
<u>Surveying</u>	
Professional Land Surveyor	$90.00/hr
Field Supervisor	$75.00/hr
Survey Analyst	$55.00/hr
1-Person Survey Crew	$65.00/hr
2-Person Survey Crew	$115.00/hr
3-Person Survey Crew	$155.00/hr
HYDROGEOLOGICAL SERVICES	
Senior Hydrogeologist Project Manager	$95.00/hr
Associate Hydrogeologist	$80.00/hr
Hydrogeologist III	$65.00/hr
Hydrogeologist II	$55.00/hr
Hydrogeologist I	$45.00/hr
ENVIRONMENTAL SERVICES	
Senior Environmental Project Manager	$95.00/hr
Environmental Scientist/Planner III	$65.00/hr
Environmental Scientist/Planner II	$55.00/hr
Environmental Scientist/Planner I	$50.00/hr
Environmental Analyst	$45.00/hr
Acoustician	$75.00/hr
Habitat Restoration Specialist/Landscape Architect	$75.00/hr
Habitat Restoration Specialist	$60.00/hr
Habitat Restoration Specialist	$45.00/hr
Biological Sciences Manager	$95.00/hr
Zoologist/Senior Project Manager	$75.00/hr
Biologist IV	$65.00/hr
Biologist III	$60.00/hr
Biologist II	$50.00/hr
Biologist I	$45.00/hr
Research Assistant	$30.00/hr

Revised 4/21/94

DUDEK & ASSOCIATES, INC.
1994 STANDARD SCHEDULE OF CHARGES
COMPANY SERVICES

MUNICIPAL SERVICES

Construction Manager	$88.00/hr
Construction Engineer	$75.00/hr
Construction Inspector III	$68.00/hr
Construction Inspector II	$58.00/hr
Construction Inspector I	$48.00/hr
District Manager	$115.00/hr
District Engineer	$90.00/hr
Assistant District Manager	$65.00/hr
District Secretary/Accountant	$52.00/hr
Wastewater Treatment Plant Operator Grade IV	$58.00/hr
Wastewater Treatment Plant Operator Grade III	$45.00/hr
Wastewater Treatment Plant Operator Grade II	$43.00/hr
Wastewater Treatment Plant Operator Grade I	$41.00/hr
Wastewater Mechanic	$27.00/hr
Laborer	$18.00/hr

OFFICE SERVICES

Computer Processing	$45.00/hr
Clerical/Administration	$35.00/hr

PERSONNEL CHARGES

Charges for personnel engaged in professional and/or technical work are made for the actual hours directly chargeable to the project. (Terms: Net 30 days)

FORENSIC ENGINEERING

Court appearances and depositions by expert witness engineers at 1.5 times above rates with four (4) hours minimum.

MATERIAL AND OUTSIDE SERVICES

Subcontractors, rental of special equipment, special reproductions and blueprinting, outside data processing and computer services, etc., will be considered "Extra Work" items and will be charged at 1.15 times the direct cost.

TRAVEL EXPENSES

Mileage is reimbursed at 28 cents per mile. Per diem where overnight stay is involved is charged at $60.00/day. Lodging is reimbursed at direct cost.

CHANGE OF BILLING POLICY AND/OR PROCEDURE

Any revisions will be provided to you in advance of their institution. Revisions will not affect any existing fixed-fee or not-to-exceed contract amounts, unless project temporarily suspended by Client for more than 90 days.

Otay Ranch

Phase 2
Resource Management Plan

Appendix F10
Results of An Archaeological Survey and Evaluation of Cultural Resources At The Otay Ranch Sectional Planning Area One and Annexation Project

APPENDIX F10

RESULTS OF AN ARCHAEOLOGICAL SURVEY AND EVALUATION OF CULTURAL RESOURCES AT THE OTAY RANCH SECTIONAL PLANNING AREA ONE AND ANNEXATION PROJECT

Prepared for:

THE BALDWIN COMPANY
11975 El Camino Real, Suite 200
San Diego, California 92130

Contact: Kim Kilkenny

Prepared by:

BRIAN SMITH & ASSOCIATES
14678 Ibex Court
San Diego, California 92129

Contact: Brian Smith
(619) 484-0915

1995

The report is available in the SPA One Environmental Impact Report, Volume III, Appendix F.

Otay Ranch

Phase 2 Resource Management Plan

Appendix F11

Biota Monitoring Program For the Phase 2 Otay Ranch Resource Management Plan San Diego County, California

APPENDIX F11

SECOND DRAFT

BIOTA MONITORING PROGRAM
FOR THE
PHASE 2 OTAY RANCH RESOURCE MANAGEMENT PLAN
SAN DIEGO COUNTY, CALIFORNIA

Prepared for:

THE BALDWIN COMPANY
11975 El Camino Real, Suite 200
San Diego, California 92130

Contact: Kim Kilkenny

Prepared by:

DUDEK & ASSOCIATES, INC.
605 Third Street
Encinitas, California 92024
(619) 942-5147

Contact: June Collins

1 September 1995

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1.0 SCOPE OF BIOTA MONITORING PROGRAM

1.1 INTRODUCTION

Policy 5.4 of the Otay Ranch Resource Management Plan (RMP) requires establishment of a comprehensive monitoring program for the biota of the Otay Ranch Preserve (Preserve). This annual monitoring program is designed to identify changes in the quality and quantity of onsite biological resources, including sensitive wildlife species, sensitive plant species, and sensitive habitat types.

The Guidelines for Policy 5.4 state:

- Monitoring shall include, but not be restricted to, focused surveys and population estimates for state- and federally-recognized plants and wildlife species, use of wildlife corridors, and assessments of habitat quality.
- Annual monitoring reports summarizing the results of monitoring efforts shall be submitted to the City, County, and resource agencies.
- Based on the monitoring reports, the City, County, and resource agencies shall evaluate RMP performance, and, if necessary, recommend program modifications.
- Monitoring programs shall include performance standards.
- Habitat restoration efforts shall be monitored.
- Monitoring of the Preserve's sensitive resources may be integrated with mitigation monitoring and reporting programs (MMRPs) carried out in accordance with the CEQA review of individual developments within Otay Ranch.
- The Preserve's monitoring program shall be submitted with the Phase 2 RMP with input from the Preserve Owner/Manager (POM).

Monitoring requirements for different habitats and different species vary. For this reason, this program must address specific monitoring requirements of the diverse biological resources present on the Ranch and be flexible enough to allow the POM discretion in application of the program. The intent of this Biota Monitoring Program is to provide the Preserve/Owner Manager guidelines and direction for implementing the monitoring program. It is not intended to be a strict set of criteria that must be met without variance to fulfill the requirements of the RMP, but rather a framework plan for the monitoring program. It is important to understand that as the biota of the Preserve changes, either by natural succession of vegetation communities or specific environmental perturbations such as fire, flood, drought, etc., changes in the monitoring program probably will be necessary. Also, some habitat monitoring methods may require modification to those generally described here because of local conditions. It is assumed that the POM will be qualified to determine whether and what modifications to the program are warranted. Any proposed modifications would be subject to review by the City, County, U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Game (CDFG), and other relevant resource agencies or groups.

1.2 BIOLOGICAL RESOURCES TO BE MONITORED

Many different sensitive habitats, plants, and wildlife species are subject to the monitoring program, as summarized in *Table 1*. The "Percent Preserved" column lists the preservation standards set forth in Chapter 3 of the RMP. The percent preservation standards are based on data available for species and habitats at the time of approval of the Otay Ranch General Development Plan (GDP). It should be recognized that the standards set forth herein are minimum standards subject to change after completion of more precise surveys, identification of new information, change of a species' status, and/or other factors.

TABLE 1
BIOLOGICAL RESOURCES TO BE MONITORED

Biological Resource	Percent Preserved
Habitats	
Diegan Coastal Sage Scrub	70[1]
Maritime Succulent Scrub	80[2]
Floodplain Scrub, Southern Willow Scrub & Aquatic/Freshwater Marsh	95
Valley Needlegrass Grassland/Perennial Grassland	25
Alkali Meadow	72
Vernal Pools (large or high value & all others per policy 2.9 of RMP)	95
Vernal Pools (specified on page 29 of EIR Findings of Fact)	100
Woodlands	100
Plant Species	
San Diego Thorn-mint (*Acanthomintha ilicifolia*)	95
San Diego County Stipa (Needle-grass) (*Achnatherum diegoensis*)	75
California Adolphia (*Adolphia californica*)	75
San Diego Bur-sage (*Ambrosia chenopodiifolia*)	75
Otay Manzanita (*Arctostaphylos otayensis*)	75
San Diego Sagewort (*Artemisia palmeri*)	75
Orcutt's Brodiaea (*Brodiaea orcuttii*)	75
Dense Reed Grass (*Calamogrostis densa*)	50
San Miguel Savory (*Calamintha chandleri*)	50
Dunn's Mariposa Lily (*Calochortus dunnii*)	100
Slender-pod Caulanthus (*Caulanthus stenocarpus*)	100
Southern Mountain Misery (*Chamaebatia australis*)	50
Fallbrook Spine-flower (*Chorizanthe procumbens* var. *albiflora*)	50
Campo (Delicate) Clarkia (*Clarkia delicata*)	75
Summer-holly (*Comarstaphylos diversifolia* spp. *diversifolia*)	75
Orcutt's Bird's-beak (*Cordylanthus orcuttianus*)	75
Tecate Cypress (*Cupressus forbesii*)	75
Western Dichondra (*Dichondra occidentalis*)	50
Variegated Dudleya (*Dudleya variegata*)	75
San Diego Button-celery (*Eryngium aristulatum* var. *parishii*) (on-site)	95

TABLE 1 BIOLOGICAL RESOURCES TO BE MONITORED	
Biological Resource	**Percent Preserved**
San Diego Button-celery (where occurring with vernal pool species)	100
San Diego Barrel Cactus (*Ferocactus viridescens*)	75
Mexican Flannelbush (*Fremontodendron mexicanum*)	100
Palmer's Grappling-hook (*Harpagonella palmeri* var. *palmeri*)	75
Otay Tarplant (*Hemizonia conjugens*)	70
San Diego Marsh-elder (*Iva hayesiana*)	75
Spiny Rush (*Juncus acutus* var. *sphaerocarpus*)	50
Gander's Pitcher-sage (*Lepechinia ganderi*)	75
Dwarf Pepper-grass (*Lepidium latipes*)	50
Willowy Monardella (*Monardella linoides spp. viminea*)	100
San Diego Goldenstar (*Muilla clevelandii*)	54
Little Mousetail (*Myosurus minimus* var. *apus*)	100
San Diego Navarretia (*Navarretia fossalis*)	100
California Adder's-tongue Fern (*Ophioglossum lusitanicum* spp. *californicum*)	50
Snake Cholla (*Opuntia parryi* var. *serpentina*)	75
Greene's Ground-cherry (*Physalis greenei*) (if present)	50
Otay Mesa Mint (*Pogogyne nudiuscula*)	95
Engelmann Oak (*Quercus engelmannii*)	50
Coulter's Matilija Poppy (*Romneya coulteri*)	50
Munz's Sage (*Salvia munzii*)	46
Ashy Spike-moss (*Selaginella cinerascens*)	50
Narrow-leaved Nightshade (*Solanum tenuilobatum*)	75
San Diego Sunflower (*Viguiera lanciniata*)	75
Wildlife Species	
Cooper's Hawk (*Accipiter cooperii*)	NA[3]
Tricolored Blackbird (*Agelaius tricolor*)	100
Southern California Rufous-crowned Sparrow (*Aimophila ruficeps canescens*)	75
Bell's Sage Sparrow (*Amphispiza belli belli*)	70-75
Golden Eagle (*Aquila chrysaetos*)	NA
Burrowing Owl (*Athene cunicularia*)	80-90
San Diego Vernal Pool Fairy Shrimp (*Branchinecta sandiegonensis*)	95
Cactus Wren (*Campylorhynchus brunneicapillus*) (viable populations)	100
Northern Harrier (*Circus cyaneus*)	NA
Southwestern Pond Turtle (*Clemmys marmorata pallida*)*	100
Orange-throated Whiptail (*Cnemidophorus hyperythrus beldingi*)	60-70
Southwestern Willow Flycatcher (*Empidonax traillii extimus*)	100
Quino Checkerspot (*Euphydryas editha quino*)*	100
Harbison's Dun Skipper (*Euphyes vestris harbisoni*)*	100

TABLE 1
BIOLOGICAL RESOURCES TO BE MONITORED

Biological Resource	Percent Preserved
Prairie Falcon (*Falco mexicanus*)	NA
Hermes Copper (*Lycaena hermes*)*	100
Thorne's Hairstreak (*Mitouri thornei*)*	100
San Diego Horned Lizard (*Phyrnosoma coronatum blainvillei*)	60-70
Coastal California Gnatcatcher (*Polioptila californica californica*) (on-site CSS habitat)	70
Coastal California Gnatcatcher (restore CSS habitat)	15
California Gnatcatcher (documented pairs & individuals)	52
California Red-legged Frog (*Rana aurora draytoni*)*	100
Riverside Fairy Shrimp (*Streptocephalus woottonii*)*	100
Two-Striped Garter Snake (*Thamnophis hammondii*)	90-100
Least Bell's Vireo (*Vireo bellii pusillus*)	100

[1] Plus 1,300 acres of restored coastal sage scrub
[2] Plus 57 acres minimum of restored maritime succulent scrub
[3] Percent Preserved standards were not established for most raptor species
* 100% of HCP/MSCP Standard

A variety of species designated as federal Category 2 Candidates are not included in *Table 1*. Policy 2.8 of the RMP requires the onsite preservation of plant and wildlife species recognized as Category 2 Candidates. Unless otherwise specified (e.g., orange-throated whiptail [*Cnemidophorus hyperythrus beldingi*] or San Diego horned lizard [*Phyrnosoma coronatum blainvillei*]), the standard for preservation for candidate species is a minimum of 75% of Ranch populations in a Preserve configuration that will ensure their conservation in perpetuity. This standard may be re-evaluated if future studies demonstrate a greater or lesser need for conservation of any resources. Achievement of this standard may be measured by evaluation of the sensitive plant and animal maps (MBA/RECON 1989, 1990), or as updated by any Phase 2 RMP field mapping efforts which include measured areas of the populations to establish the numbers of individuals within those populations. Monitoring for Category 2 Candidate species will be discussed in the relevant section for each species.

2.0 MONITORING METHODOLOGIES - HABITATS

2.1 INTRODUCTION

The Biota Monitoring Program requires tailored monitoring strategies for different resources. Generally, the monitoring program should accomplish the goal of tracking any changes in the quantity and quality of specified biological resources to determine whether the RMP is functioning as planned. Monitoring techniques need to be sensitive to the normal variation and cycles in biological resources in order to determine actual positive or negative trends in habitat quality and/or populations of plants and animals. For this reason, some resources may need annual censuses (e.g., highly ephemeral plants) while others may only require monitoring at several year intervals (e.g., habitat types or perennial plants). This section describes the monitoring methodologies appropriate for the different habitats listed in Table 1.

The following sections recommend monitoring schedules for different resources. These schedules are considered to be the minimum necessary for detecting biotic changes on the Preserve and represent a reasonable time effort for the POM (i.e., it probably is not feasible to monitor all resources listed in Table 1 on a yearly basis). However, more frequent surveys of many of the resources in Table 1 certainly would be desirable. The POM, in consultation with the City, County, and resource agencies, should seek research support, additional funding, etc. to augment the baseline monitoring surveys described here. For example, university- or agency-affiliated scientists may be interested in conducting more frequent surveys of listed or candidate species (e.g., least Bell's vireo or southwestern willow flycatcher) in conjunction with large-scale, region-wide monitoring programs. If additional research support is obtained, the POM must ensure that the effort is compatible with and contributes to the ongoing monitoring program and management of the Preserve.

2.2 GENERAL MONITORING TECHNIQUES

Monitoring is an essential management activity, whether it be for existing vegetation, habitats, or plant and wildlife species. Monitoring provides the data base from which to draw comparisons from between surveys and to determine negative or positive changes in the biota of an area, including vegetation communities and composition, overall health and vigor of the biota, species richness diversity, demographic structure of populations, etc. There are a variety of simple techniques and methods that facilitate monitoring activities, including:

- Regularly updated aerial photographs to help detect large-scale changes in the biota (e.g., detecting changes in vegetation communities, disturbances such as new trails and roads, etc.);
- Establishment of permanent photo-documentation stations in study plots to detect more fine-grained changes in vegetation communities and composition;
- Field forms that are the same from survey to survey and consistently utilized by personnel;
- Consistent field techniques for measuring biota (e.g., always percent cover or frequency of a dominant plant species in a transect, bird surveys conducted at the same time of year under consistent survey conditions [weather, time of day], live-trapping on transects or grids using the same bait mixture); and
- Measurement of important environmental variables (e.g., local precipitation).

The main point is that maintaining consistency from survey to survey, using the same measurement instruments under comparable conditions, and measuring variables at the same sites are essential monitoring practices for detecting significant changes and trends in the biota. Keeping in mind that personnel will change over the life of the monitoring program and that they probably will have different levels of experience and backgrounds emphasizes the importance of making the monitoring program as consistent and objective as possible.

On the other hand, it is likely that new monitoring techniques, more sophisticated field equipment, and changes in the biota of the Preserve will result in modifications of the monitoring program. When incorporating new technologies, the POM must ensure that modifications to the program do not preclude the use of previously collected data or lead to erroneous conclusions because of measurement changes. All new equipment, techniques, etc. should be validated to ensure consistency with prior methods. All new personnel should be thoroughly trained and tested in the field protocols to ensure that they collect data in a consistent manner.

All proposed modifications to the monitoring program should be documented in writing by the POM and submitted to the City, County, USFWS, CDFG, and any other relevant resource agencies or groups for review and/or approval prior to adoption and implementation.

2.3 DIEGAN COASTAL SAGE SCRUB/MARITIME SUCCULENT SCRUB

Policy 2.2 of the RMP states:

> Preserve coastal sage scrub habitat (including Diegan coastal sage scrub, disturbed coastal sage scrub, maritime succulent scrub, coastal sage scrub/non-native grassland, and coastal sage scrub/chaparral). Habitat values can be measured in terms of number of acres, biodiversity, habitat maturity, and presence of sensitive species.

The RMP standards for the preservation of coastal sage scrub (CSS) are as follows:

- Preservation and restoration activities shall be consistent with the guidelines of any applicable regional open space/resource protection program and shall result in equal or greater overall habitat values than occur under existing conditions.
- A minimum of 85% of the total acreage of CSS habitat onsite shall be preserved or restored.
- The 85% standard may be achieved through a combination of preservation (a minimum of 70% of existing CSS and 80% of MSS) with the remainder through restoration of disturbed and/or non-native habitats.

The RMP guidelines specify that the following blocks of high quality CSS habitat shall be included in the preserve.

- Salt Creek Canyon
- Wolf Canyon
- Poggi Canyon
- southwestern Jamul Mountains
- slopes south and north of the Otay River

To achieve the 85% preservation standard for CSS, 70% (approximately 7,787 acres) of the existing Diegan CSS on-site (approximately 11,125 acres) shall be preserved. An additional 15% (1,300 acres) of CSS will be restored on-site. For maritime succulent scrub (MSS), 80% (approximately 228 acres) of the existing habitat shall be preserved. An additional 20% (57 acres) of MSS will be restored. Coastal sage scrub restoration activities shall commence prior to, or concurrent with, approval of the first SPA/Specific Plan and shall have achieved success, based on performance standards described below and in the restoration plan, prior to, or concurrent with, any project approval for development resulting in significant impacts to CSS habitat occupied by coastal California gnatcatchers (*Polioptila californica californica*).

2.3.1 Methodology - Existing Vegetation

Monitoring of CSS habitat will occur in conjunction with ongoing biological studies of the California gnatcatcher and cactus wren (*Campylorynchus brunneicapillus*). Monitoring will be the responsibility of the POM, and will include data gathering, recommendations for remedial actions, and reporting.

Habitat studies will be conducted within permanently established study plots within the Preserve. Ten (10) study plots of approximately 100 acres each will be identified. Five of the plots will be located in areas believed to be of particular significance for gnatcatchers and cactus wrens. Suggested areas for these study plots include Salt Creek Canyon, the Otay River Valley, Poggi Canyon, western San Ysidro Mountains, and southwestern Jamul Mountains. Five (5) additional plots will be randomly situated throughout the Preserve where CSS is present.

Within each 100-acre study plot, four permanent line-intercept vegetation transects 100 meters long will be established. Permanent transects will be randomly situated within the study plot at the onset of the studies. The sampling method will be based on the California Native Plant Society Plant Communities project and vegetation data will be compiled according to the schedule below. Data to be obtained include percent cover of vegetation, numbers of individuals of each dominant shrub (frequency), percent cover of each dominant shrub (dominance), relative density, and canopy height. Permanent photo-documentation stations shall be established along each vegetation transect to record existing conditions from survey to survey.

Vegetation data from the study plots will be compiled and analyzed during the year it is collected. The analyses will include comparisons of current data from previous surveys. A regression analysis will be conducted, with an emphasis on identifying long-term trends rather than short-term variation.

Habitat studies will begin in 1996 and proceed according to the following schedule:

1996	2012
1997	2015
1998	2018
1999	2021
2000	2024
2003	2027
2006	2030
2009	

In addition to surveys of the ten study plots described above, a ranch-wide walkover survey for gnatcatchers and cactus wrens will be conducted every five years beginning in the year 2000.

Vegetation information collected for each gnatcatcher or cactus wren location will be qualitatively evaluated for overall health and quality. Because these locations will differ between surveys, it would not be possible to conduct trend analyses on vegetation at the sites.

For 1995, the contribution to the ongoing CSS habitat study will include identification and mapping of the ten 100-acre study plots for surveys beginning in 1996.

2.3.2 Methodology - Restoration Sites

Monitoring of CSS restoration sites will be the responsibility of the POM. Monitoring will include data gathering, recommendations for remedial actions, and reporting. The Coastal Sage Scrub and Maritime Succulent Scrub Habitat Replacement Master Plan (DUDEK 1995a) will augment monitoring information presented below.

Permanent vegetation sampling stations will be established within the restoration sites at appropriate locations following the protocol of the California Native Plant Society (CNPS) Plant Communities Project. The sampling method used by the CNPS Plant Communities Project is based on a 50-meter point-transect centered in a 50 meter x 5 meter plot that is randomly located in a subjectively chosen homogeneous patch of vegetation and physiography. The CSS restoration effort should be assessed in September following the first summer after planting to determine mortality of individuals, initial success of seeding, and functioning of irrigation. The number, size, and species of dead plants should be recorded, along with percent cover. Mortality judged to be the result of competition for resources with other native species appropriate to the restoration effort or as a result of inappropriate soil moisture conditions will not require replacement planting. The restored sites should be checked monthly from the onset of winter rains until June of the year following planting to monitor and control invasion by exotic weeds. Thereafter, the restored sites should be monitored twice per year for three to five years. Monitoring shall consist of a field check during the spring by a qualified biologist (TWS or ESA certification or recommendation by USFWS) to assess percent cover, size of individuals, and use of the revegetated area by wildlife species. Spring monitoring sessions should determine the need to continue the temporary irrigation through the following year. Fall monitoring should be conducted to determine mortality as described above. Permanent photo-documentation stations shall be established along each vegetation transect to record the progress of the restored vegetation over the three to five year period.

2.3.3 Performance Standards - Existing Vegetation

Regression analyses will be conducted to determine long-term trends in habitat quality. This statistical technique will allow the POM to detect changes in habitat quality by evaluating whether the slopes of regression lines based on measured variables (i.e., percent cover of vegetation, frequency of dominant shrubs, percent cover of dominant shrubs, relative density, and canopy height) are significantly increasing or decreasing in a linear fashion, or whether survey-to-survey variation is random, cyclical, or correlated with some environmental variable (e.g., rainfall, fire, etc.). If significant declines in CSS habitat quality are detected, the POM, in consultation with the City, County, and resource agencies, will determine whether and what remedial actions are necessary.

2.3.4 Performance Standards - Restoration Sites

The success of the CSS restoration effort will be measured by its ability to replace habitat values lost, and by its ability to support native plant and wildlife species typically associated with CSS. The Coastal Sage Scrub and Maritime Succulent Scrub Habitat Replacement Master Plan will augment monitoring

information presented below. The following outlines the preliminary success criteria for CSS revegetation plots. They are subject to revision based on empirical field data.

The shrub layer within each revegetated patch will consist of a least four site-typical native shrub species, and the herb layer will consist of at least four native grass or herb species. *Table 2* presents the performance standards for CSS cover on revegetation sites.

TABLE 2
RECOMMENDED GOALS FOR COVER - CSS

Vegetation Type	Coverage Goal	Coverage Range
Shrubs	50%	40-65%
Herbs	30%	20-30%
Bare Ground	20%	10-30%

The percent cover of the shrub layer in a target patch of vegetation will be determined by quantitative analysis following the protocol of the CNPS Plant Communities Project. The target patch may be a different sub-type of CSS than that being disturbed; the availability of the mitigation site will determine which sub-type is most appropriate for restoration. Factors that reflect habitat quality of the to-be-disturbed site will be measured, including total species, shrub, and herb density. Vegetation success standards for the restoration area will incorporate the presence of at least 60% of the shrub species determined to occur in the preferred habitat type within the target patch of vegetation.

Wildlife use will be measured using birds. In a patch greater than 25 acres, there will be use by at least 80% of the species found to be resident in the baseline study or at least five scrub-requiring bird species from the following list of resident species, whichever is greater.

Bewick's wren - *Thryomanes bewickii*
Cactus wren - *Campylorhynchus brunneicapillus*
Coastal California gnatcatcher - *Polioptila californica californica*
California quail - *Callipepla californica*
California thrasher - *Toxostoma redivivum*
California towhee - *Pipilo crissalis*
Southern California Rufous-crowned sparrow - *Aimophila ruficeps canescens*
Rufous-sided towhee - *Piplio erythrophthalmus*
Bell's sage sparrow - *Amphispiza belli belli*
Scrub jay - *Aphelocoma coerulescens*
Wrentit - *Chamaea fasciata*

In addition to the above performance standards from the RMP, the habitat within each treatment site should be tracked over time to quantify the percentage of native- and non-native species cover and species diversity. The results of the monitoring should be compared to the appropriate target transect site identified in the *Coastal Sage Scrub and Maritime Succulent Scrub Habitat Replacement Master Plan.*

2.4 FLOODPLAIN SCRUB, SOUTHERN WILLOW SCRUB & AQUATIC/FRESHWATER MARSH

Policy 2.10 of the RMP stipulates preservation and enhancement of wetlands. The standards for preservation of wetlands, including floodplain scrub, southern willow scrub, and aquatic/freshwater marsh, are as follows:

- No net loss of in-kind wetland quality or quantity in accordance with the standards of the U.S. Army Corps of Engineers (COE), implementing Section 404 of the Clean Water Act, the USFWS and CDFG implementing Section 1600 of the California Fish and Game Code.

- If feasible, opportunities and plans for mitigation banks shall be developed in conjunction with preparation of wetlands enhancement plans for Otay River Valley and the Vernal Pool Management Plan (DUDEK 1995b) in conjunction with the Phase 2 RMP and the first SPA. All revenue generated by wetland mitigation banks shall be used to fund Preserve activities.

To achieve the standards for preservation and enhancement of wetlands, the RMP guidelines are as follows:

- Include at least 90% of identified wetlands within the Preserve.

- Where feasible, preserve wetlands not included within the Preserve within non-preserve open space.

- Conduct a wetland delineation for each SPA development using the methodology appropriate for the permit or approval being sought.

- Compensate for wetlands outside of the Preserve by wetland creation, restoration, and enhancement within the Preserve, primarily in the Otay River Valley.

- When and where feasible, wetland creation, restoration, and enhancement within the Preserve shall be completed prior to actual habitat disturbance for which these activities are considered mitigation.

The implementation guidelines of the RMP (*Section 4.3.1 and Figure 21*) specify locations for potential wetland/riparian habitat creation, restoration, and enhancement. These activities will be concentrated in the Otay River Valley in areas that currently support disturbed or degraded wetlands, including tamarisk/mule fat scrub, mule fat scrub, tamarisk scrub, and baccharis scrub.

Final wetland/riparian habitat restoration plans have not been developed. The planned restoration acreage for wetlands is 171 acres, which assumes an overall 3:1 replacement of wetlands to be disturbed. Ultimate ratios may vary depending upon resource agency requirements determined on a case-by-case basis for wetland impacts associated with individual developments. Specific restoration activities may take place within the Preserve or within the proposed development area, but in no case will acreage shown for restoration in the Preserve be decreased by restoration activities outside the Preserve.

The success of wetland/riparian habitat restoration activities shall be evaluated by the appropriate jurisdiction in conjunction with ongoing review and approval process for individual developments

within Otay Ranch. If it is determined that restoration activities are not succeeding, other options shall be considered to provide mitigation for impacts associated with development of Otay Ranch. Such options may include project redesign to avoid anticipated impacts or offsite mitigation.

2.4.1 Methodology - Existing Vegetation

Monitoring of existing wetland/riparian habitat will occur in conjunction with ongoing biological surveys for the least Bell's vireo (*Vireo bellii pusillus*), southwestern willow flycatcher (*Empidonax traillii extimus*), tricolored blackbird (*Agelaius tricolor*), southwestern pond turtle (*Clemmys marmorata pallida*) and other wetland/riparian habitat wildlife and plant species. Monitoring will be the responsibility of the POM, and will include data gathering, recommendations for remedial actions, and reporting.

Habitat studies will be conducted within permanently established study plots within the Preserve. Ten (10) study plots will be identified. These study plots primarily should be situated in the Otay River Valley where the majority of wetland/riparian habitats are located. However, the POM should have the flexibility to identify other significant wetland/riparian habitats for long-term monitoring if deemed appropriate.

Within each study plot, four permanent line-intercept vegetation transects 100 meters long will be established. Permanent transects will be randomly situated within the study plot at the onset of the studies. For each point-transect, vegetation data will be compiled at least once every three years. Environmental perturbations such as flood, fire, or drought may require more frequent field monitoring. The POM also should coordinate monitoring activities with the Range Manager regarding limited use of riparian habitat as pasture for foraging and calving (also refer to the Range Management Plan for Otay Ranch [DUDEK 1995c]). Vegetation data to be obtained include percent cover of vegetation, numbers of individuals of each dominant shrub or tree species (frequency), percent cover of each dominant shrub or tree species (dominance), relative density, and canopy height.

Vegetation data from the study plots will be compiled and analyzed during the year that it is collected. The analyses will include comparisons of current data from previous surveys. A regression analysis will be conducted, with an emphasis on identifying long-term trends rather than short-term variation. Permanent photo-documentation stations shall be established along each vegetation transect to record existing conditions from survey to survey.

Transect data should be collected during the primary breeding season for riparian habitat nesting birds (i.e., least Bell's vireo and southwestern willow flycatcher; refer to survey protocol in Section 3.2.2) in order to maximize the efficiency of data collection for habitats and plant and wildlife species.

Habitat studies will begin in 1998 and proceed according to the following schedule:

1998	2016
2001	2019
2004	2022
2007	2025
2010	2028
2013	

2.4.2 Methodology - Restoration Sites

A conceptual wetland/riparian habitat restoration plan is provided in the appendix to the RMP document. The monitoring aspect for the restoration sites is summarized here.

Permanent vegetation sampling stations will be established within the restoration sites at appropriate locations following the protocol of the CNPS Plant Communities Project. The sampling method used by the CNPS Plant Communities Project is based on a 50-meter point-transect centered in a 50 meter x 5 meter plot that is randomly located in a subjectively chosen homogeneous patch of vegetation and physiography. The wetland/riparian habitat restoration effort should be assessed in September following the first summer after planting to determine mortality of individuals, initial success of seeding, and functioning of irrigation. The number, size, and species of dead plants should be recorded, along with percent cover. Success standards for coverage are presented in *Table 3*. If the assessment reveals greater than 10% mortality of container stock or 20% mortality of willow cuttings, replacement plantings will be required. Mortality judged to be the result of competition for resources with other native species appropriate to the restoration effort or a result of inappropriate soil moisture conditions will not require replacement planting. The restored sites should be checked monthly from the onset of winter rains until June of the year following planting to monitor and control invasion by exotic weeds. Thereafter, the restored sites should be monitored twice per year for three to five years. Monitoring shall consist of a field check during the spring by a qualified biologist (TWS or ESA certification or recommendation by USFWS) to assess percent cover, size of individuals, and use of the revegetated area by wildlife species. Spring monitoring sessions should determine the need to continue the temporary irrigation through the following year. Fall monitoring should be conducted to determine mortality as described above. Permanent photo-documentation stations should be established along each vegetation transect to record the progress of the restoration effort over the three to five year period.

After three to five years, the restored sites will be monitored every three years on the schedule described above for existing wetland/riparian habitat.

2.4.3 Performance Standards - Existing Vegetation

Regression analyses will be conducted to determine long-term trends in habitat quality. This statistical technique will allow the POM to detect changes in habitat quality by evaluating whether the slopes of regression lines based on measured variables (i.e., percent cover of vegetation, frequency of dominant shrubs and trees, percent cover of dominant shrubs and trees, relative density, and canopy height) are significantly increasing or decreasing in a linear fashion, or whether survey-to-survey variation is random, cyclical, or correlated with some environmental variable (e.g., rainfall, fire, etc.). If significant declines in wetland/riparian habitat quality are detected, the POM, in consultation with the City, County, and resource agencies, will determine whether and what remedial actions are necessary.

2.4.4 Performance Standards - Restoration Sites

General performance standards for the restoration sites are presented in *Table 3*. Depending on local conditions and empirical field information, these percentages (and those specified for other habitats below) area subject to modification.

TABLE 3 RECOMMENDED GOALS FOR COVER - WETLAND/RIPARIAN VEGETATION		
Vegetation Type	Coverage Goal	Coverage Range
Trees	50%	40-60%
Shrubs	25%	20-30%
Herbs	8%	5-15%
Emergent Aquatic	15%	10-20%
Bare Ground/Open Water	2%	0-5%

2.5 VALLEY NEEDLEGRASS GRASSLAND/PERENNIAL GRASSLAND

Policy 2.3 of the RMP requires preservation of native grasslands (valley needlegrass grassland). This preservation is to be achieved by implementation of the following standards:

- A minimum of 80% of the total acreage of native grassland habitat onsite shall be preserved.
- The 80% standard may be achieved through a combination of preservation (a minimum of 25% of existing habitat) with the remainder through restoration of disturbed and/or native habitats.
- Restoration must result in habitat for threatened and endangered species that is of equal or greater value than that of the habitat disturbed.

2.5.1 Methodology - Existing Vegetation

Monitoring of existing preserved native grasslands will occur in conjunction with ongoing biological surveys for sensitive species, such as the grasshopper sparrow (*Ammodramus savannarum*) and California horned lark (*Eremophila alpestris actia*). Monitoring will be the responsibility of the POM, and will include data gathering, recommendations for remedial actions, and reporting.

Habitat studies will be conducted within permanently established study plots within the Preserve. Within each study plot, four permanent line-intercept vegetation transects 100 meters long will be established. Permanent transects will be randomly situated within the study plot at the onset of the studies. For each point-transect, vegetation data will be compiled at least once every three years. Environmental perturbations such as flood, fire, or drought may require more frequent field monitoring. Vegetation data to be obtained include percent cover of vegetation, numbers of individuals of each dominant species (frequency), percent cover of each dominant species (dominance), and relative density. Permanent photo-documentation stations shall be established along each vegetation transect to record existing conditions from survey to survey.

Vegetation data from the study plots will be compiled and analyzed during the year that it is collected. The analyses will include comparisons of current data from previous years. A regression analysis will be conducted, with an emphasis on identifying long-term trends rather than short-term variation.

Transects should be conducted during the spring in order to maximize the efficiency of data collection for habitats, identification of grass species, flowering plants, and wildlife species.

Habitat studies will begin in 1998 and proceed according to the following schedule:

1998	2016
2001	2019
2004	2022
2007	2025
2010	2028
2013	

2.5.2 Methodology - Restoration Sites

A conceptual native grassland restoration plan is provided in the appendix to the RMP document. The monitoring aspect for the restoration sites is summarized here.

Permanent vegetation sampling stations will be established within the restoration sites at appropriate locations following the protocol of the CNPS Plant Communities Project. The sampling method used by the CNPS Plant Communities Project is based on a 50-meter point-transect centered in a 50 meter x 5 meter plot that is randomly located in a subjectively chosen homogeneous patch of vegetation and physiography. The native grassland restoration effort should be assessed in September following the first summer after planting to determine mortality of individuals, initial success of seeding, and functioning of irrigation. The number, size, and species of dead plants should be recorded, along with percent cover. Success standards for coverage are presented in Table 4. If the assessment reveals greater than 20% mortality of grass plugs, replacement plantings will be required. Mortality judged to be the result of competition for resources with other native species appropriate to the restoration effort or a result of inappropriate soil moisture conditions will not require replacement planting. The restored sites should be checked monthly from the onset of winter rains until June of the year following planting to monitor and control invasion by exotic weeds. Thereafter, the restored sites should be monitored twice per year for three to five years. Monitoring shall consist of a field check during the spring by a qualified biologist (TWS or ESA certification or recommendation by USFWS) to assess percent cover, size of individuals, and use of the revegetated area by wildlife species. Spring monitoring sessions should determine the need to continue the temporary irrigation through the following year. Fall monitoring should be conducted to determine mortality as described above. Permanent photo-documentation stations should be established along each vegetation transect to record progress of the restored vegetation over the three to five year period.

After three to five years, the restored sites will be monitored every three years on the schedule described above for existing native grasslands.

2.5.3 Performance Standards - Existing Vegetation

Regression analyses will be conducted to determine long-term trends in habitat quality. This statistical technique will allow the POM to detect changes in habitat quality by evaluating whether the slopes of regression lines based on measured variables (i.e., percent cover of vegetation, frequency of dominant species, percent cover of dominant species, and relative density) are significantly increasing or decreasing in a linear fashion, or whether survey-to-survey variation is random, cyclical, or correlated with some environmental variable (e.g., rainfall, fire, etc.). If significant declines in native

grassland habitat quality are detected, the POM, in consultation with the City, County, and resource agencies, will determine whether and what remedial actions are necessary.

2.5.4 Performance Standards - Restoration Sites

Performance standards for native grassland restoration sites are presented in *Table 4.*

TABLE 4
RECOMMENDED GOALS FOR COVER - NATIVE GRASSLAND

Vegetation Type	Coverage Goal	Coverage Range
Native grasses	35%	30-40%
Herbs	45%	40-50%
Bare Ground	20%	15-25%*

* Not to exceed 25%

2.6 ALKALI MEADOW

The Preserve would include 72% of existing alkali meadow. The EIR Findings of Fact state:

> "Impacts shall be substantially lessened through placement and design features (i.e., road location and infrastructure design) and application of a ratio as defined by the appropriate public agency, however, no less than 1:1 based on habitat type and quality and whether pre-establishment of in-kind habitat has occurred. Development shall not occur until compensation has been approved by California Department of Fish and Game through the Streambed Alteration Agreement and/or Corps of Engineers 404 permit process, as required in accordance with their no net loss statement.
>
> Potential indirect impacts shall be mitigated by providing a minimum 100-foot width buffer for all alkali meadow habitat. No development or landscaping shall be allowed within buffer areas. Impacts to alkali meadow from hydrological alterations (including potential displacement of native habitat with exotic and wetland species) shall be mitigated as described herein. The water runoff from surrounding development shall be diverted and controlled to retain the same amount and seasonality of water input existing before development. A study shall be required at the SPA level of analysis to determine existing hydrological conditions of streams containing alkali meadow and what hydrological changes will occur to these streams after development. The results of these studies shall be used to engineer storm drain development to achieve pre-impact hydrological conditions."

2.6.1 Methodology

The existing hydrological and vegetative conditions of existing alkali meadow must be established as a baseline for storm drain design and subsequent monitoring of the resource. The baseline studies should be initiated at least five (5) years prior to anticipated development of areas adjacent to alkali meadows in order to establish the hydrological regimes of the areas. The baseline studies would include hydrology and existing vegetation conditions.

Baseline hydrological studies would include an evaluation of the surface and groundwater resources, rainfall, and streamflows. Measurement parameters may include, but not be limited to, moisture, salt, and pollutant levels resulting from agricultural and urban runoff. A detailed monitoring plan should be developed at the time the study is initiated based on existing conditions at the monitoring site(s). Several years data are desirable because of the high variability of rainfall and general hydrological conditions from year to year in Southern California. Ideally, the POM would monitor precipitation and hydrological conditions on a monthly basis to provide a fine-grained record of variation. Alternatively, data from the CIMIS station at the Otay Olympic Training Facility could be used to establish baseline conditions. Rainfall records from the area should be incorporated in the analysis to permit correlation with onsite hydrological variation.

Baseline studies of vegetation will be conducted within permanently established study plots within alkali meadow. Within each study plot, four permanent line-intercept vegetation transects 100 meters long will be established. Permanent transects will be randomly situated within the study plot at the onset of the studies. For each point-transect, vegetation data will be compiled at least once every three years following the initial five-year baseline study. Environmental perturbations such as flood, fire, or drought may require more frequent field monitoring. Vegetation data to be obtained include percent cover of vegetation, numbers of individuals of each dominant species (frequency), percent cover of each dominant species (dominance), and relative density. Permanent photo-documentation stations should be established along each vegetation transect to record the existing condition of the sites.

The schedule for monitoring alkali meadow habitat will be dependent on the timing of development that would affect this habitat. Yearly monitoring should begin five years prior to disturbance. A specific monitoring program similar to that described for wetland/riparian habitats should be implemented following development and any restoration efforts.

2.6.2 Performance Standards

Regression analyses will be conducted to determine long-term trends in habitat quality. This statistical technique will allow the POM to detect changes in habitat quality by evaluating whether the slopes of regression lines based on measured variables (i.e., percent cover of vegetation, frequency of dominant species, percent cover of dominant species, and relative density) are significantly increasing or decreasing in a linear fashion, or whether survey-to-survey variation is random, cyclical, or correlated with some environmental variable (e.g., rainfall, fire, etc.). If significant declines in alkali meadow habitat quality are detected, the POM, in consultation with the City, County, and resource agencies, will determine whether and what remedial actions are necessary.

2.7 WOODLANDS

Policy 2.4 of the RMP stipulates preservation of the following types of woodland habitats: southern interior cypress forest, coast live oak woodland, oak riparian forest, riparian woodland, and sycamore alluvial woodland. The standard of preservation is 100%, and where it is infeasible to include these woodlands in the Preserve, they shall be included in non-preserve open space.

2.7.1 Methodology

Monitoring of existing woodland habitats will occur in conjunction with ongoing biological surveys for general wildlife. Woodlands provide the primary nesting and roosting habitat for raptors. Consequently, ongoing monitoring studies of the raptor population are compatible with monitoring of

woodland habitats. Monitoring will be the responsibility of the POM, and will include data gathering, recommendations for remedial actions, and reporting.

Woodland habitat studies will be conducted within permanently established study plots within the Preserve. A minimum of ten (10) study plots will be identified, with at least one study plot in each of the types of riparian habitats. These study plots may be established in conjunction with known raptor nesting sites to facilitate the monitoring program. Within each study plot, four permanent line-intercept vegetation transects approximately 100 meters long will be established. Because woodlands often are linear in shape, the dimensions of the transects may vary. The POM is responsible for establishing transects that meet the needs of the monitoring program. Permanent transects will be randomly situated within the study plot at the onset of the studies. For each point-transect, vegetation data will be compiled at least once every three years. Environmental perturbations such as flood, fire, or drought may require more frequent field monitoring. Vegetation data to be obtained include percent cover of vegetation, numbers of individuals of each dominant tree species (frequency), percent cover of each dominant tree species (dominance), relative density, and canopy height and width. Permanent photo-documentation stations should be established along each vegetation transect to record the status of the sites.

Vegetation data from the study plots will be compiled and analyzed during the year that it is collected. The analyses will include comparisons of current data from previous surveys. A regression analysis will be conducted, with an emphasis on identifying long-term trends rather than short-term variation.

Monitoring of woodlands habitats will begin in 1996 and proceed according to the following schedule:

1996	2014
1999	2017
2002	2020
2005	2023
2008	2026
2011	2029

2.7.2 Performance Standards

Regression analyses will be conducted to determine long-term trends in habitat quality. This statistical technique will allow the POM to detect changes in habitat quality by evaluating whether the slopes of regression lines based on measured variables (i.e., percent cover of vegetation, frequency of dominant trees, percent cover of dominant trees, relative density, and canopy height) are significantly increasing or decreasing in a linear fashion, or whether survey-to-survey variation is random, cyclical, or correlated with some environmental variable (e.g., rainfall, fire, etc.). If significant declines in woodland habitat quality are detected, the POM, in consultation with the City, County, and resource agencies, will determine whether and what remedial actions are necessary.

2.8 VERNAL POOLS

Policy 2.9 of the RMP stipulates preservation of a minimum of 95% of the vernal pool habitat on the Ranch supporting vernal pool indicator species. The RMP standards for vernal pool preservation are:

- In conjunction with the first SPA in the Phase 2 RMP, develop a Vernal Pool Management Plan (DUDEK 1995b).

- Establish a vernal pool preserve of no less than 330 acres on Otay Mesa south of the Otay River to include all vernal pools identified by the CDFG (Bauder 1986) as J23, J24, J25, J30 and identified sensitive portions of J29.

- Preserve a minimum of 95% of the Otay Ranch distribution of the state- and federally-listed San Diego button-celery (*Eryngium aristulatum* var. *parishii*) and 100% of the state-listed Otay Mesa mint (*Pogogyne nudiuscula*), in locations identified in the vernal pool report (DUDEK 1992).

- Assure 100% preservation of little mousetail (*Myosurus minimus* var. *apus*) and San Diego navarretia (*Navarretia fossalis*) on Otay Ranch through preservation of present known localities for these species on the Ranch, plus a combination of enhancement, restoration, and management efforts.

- Develop a vernal pool restoration plan to achieve the following:
  - restore the biota of individual, badly degraded vernal pools;
  - increase diversity and frequency of native biota in all disturbed vernal pools;
  - preserve and enhance vernal pools on K-6 where little mousetail occurs;
  - reduce the effect of alien plants;
  - enhance the populations of sensitive species;
  - stabilize soils on mounds and in watershed areas;
  - provide research and educational opportunities.

The following summarizes the monitoring procedures for vernal pools. A complete discussion of monitoring methods is provided in the Vernal Pool Management Plan (DUDEK 1995b).

2.8.1 Methodology

Two types of monitoring of vernal pools should be used: permanent photo-documentation and quadrat sampling of plant populations.

Photo-Documentation

For permanent photo-documentation, vernal pools should be photographed at least once or twice per year. For information on hydrology, photographs should be taken within 24 hours of a major storm (2-5 centimeters of precipitation). Ideally, these photographs would be taken after the second or third storm of the rainy season because pools absorb large amounts of water before ponding occurs.

For recording the presence of sensitive plants, photographs should be taken at the peak of the flowering season. Data on hydrology (i.e., pool surface area and surface drainage patterns), vegetative cover, and sensitive plant and wildlife species (i.e., fairy shrimp) could be collected simultaneously if the photographic effort were timed to coincide with the seasonal stages of vernal pool development (as described by Zedler 1987). These data also could indicate the degree of disturbance of pools and the associated habitat.

A representative sample of vernal pools should be selected for monitoring, and should include natural or relatively undisturbed pools of varying size and depths, species composition, as well as disturbed and restored pools. Sample pools should be selected from different Vernal Pool Series. A minimum of five permanent photo-documentation stations should be established within each Vernal Pool Series including the types of pools listed above.

Aerial photographs at 200-scale (1 inch = 200 feet) should be taken every five years to reveal vegetation and disturbance patterns at a larger scale; particularly unauthorized trails and roads, trenching, grading, and scraping.

Quadrat Sampling and Demographic Data

Demographic data are important to determine the distribution, abundance, and population stability of vernal pool species in natural pools as well as in restored or disturbed pools. The POM should develop a detailed monitoring program in consultation with the City, County, and resource agencies to determine the number of sites to be monitored, how the sites should be chosen (e.g., randomly, stratified random procedure, or along a gradient), how many quadrats should be sampled, and what the size and shape of quadrats should be.

Because visible populations of many vernal pool species fluctuate widely from year to year, the number of adults of sensitive species should be monitored each spring in a sample of pools selected for diversity as described above. Water depth and quality, length of inundation, and soil properties also should be measured. Pools with known problems such as oil or fuel pollution should be sampled more frequently.

3.0 MONITORING METHODOLOGIES - SENSITIVE SPECIES

3.1 PLANT SPECIES

The monitoring program for sensitive plant species is based upon habitat associations and phenology. For example, some plants are herbaceous annuals that only occur in vernal pools (e.g., Otay Mesa mint) while some are perennials that occur is more than one habitat type (e.g., San Diego barrel cactus occurs in MSS and CSS). Herbaceous annuals, in particular, may be quite ephemeral in relation to timing and amount of precipitation, soil conditions, and competing native and non-native species. Other species germinate only as a result of disturbances such as fire. For this reason, the monitoring program for sensitive plants has to be structured in relation to the species and their habitats.

3.1.1 Vernal Pool Species

All of the sensitive vernal pool species are annuals and include the following:

San Diego button-celery
California Orcutt grass (*Orcuttia californica*)
Orcutt's brodiaea (*Brodiaea orcuttii*)
San Diego navarretia
California adder's-tongue fern (*Ophioglossum lusitanicum* ssp. *californicum*) (adjacent to vernal pools)
little mousetail
Otay Mesa mint

Monitoring and management of the vernal pool complexes, and associated sensitive plant and animal species, as discussed in Section 2.8.1, are treated in detail in the Vernal Pool Preservation and Management Plan.

3.1.2 Diegan Coastal Sage Scrub/Maritime Succulent Scrub and Chaparral Sensitive Species

The following plants are perennial sensitive species that primarily occur in Diegan CSS and/or MSS, and chaparral:

San Diego County stipa (*Achnatherum diegoensis*) (needle-grass) (often occurs in a mosaic with sage scrub throughout the Ranch)
California adolphia (*Adolphia californica*) (Otay River Valley)
Otay manzanita (*Arctostaphylos otayensis*) (Jamul Mountains)
San Diego bur-sage (*Ambrosia chenopodiifolia*) (Otay River/Johnson Canyon)
San Diego sagewort (*Artemisia palmeri*) (Jamul Mountains)
dense reed grass (*Calamogrostis densa*) (Jamul Mountains)
San Miguel savory (*Calamintha chandleri*) (Jamul Mountains)
southern mountain misery (*Chamaebatia australis*) (Jamul and San Ysidro mountains)
summer-holly (*Comarstaphylos diversifolia* spp. *diversifolia*) (San Ysidro Mountains)
Mexican flannelbush (*Fremontodendron mexicanum*) (San Ysidro Mountains)
San Diego barrel cactus (*Ferocactus viridescens*) (much of Ranch)
Gander's pitcher-sage (*Lepechinia ganderi*) (Jamul and San Ysidro mountains)
snake cholla (*Opuntia parryi* var. *serpentina*) (Salt Creek, Poggi and Wolf Canyons)
Munz's sage (*Salvia munzii*) (Jamul Mountains)

San Diego sunflower (*Viguiera lanciniata*) (throughout Ranch in CSS)
Greene's ground-cherry (*Physalis greenei*) (Salt Creek)
Coulter's matilija poppy (*Romneya coulteri*) (Jamul and San Ysidro mountains)
ashy spike-moss (*Selaginella cinerascens*) (throughout Ranch)
narrow-leaved nightshade (*Solanum tenuilobatum*) (Jamul Mountains)

Because these perennial species are detectable at any time, the monitoring protocol can be relatively flexible. Also, the distributional data base for these species should be very accurate. Major populations have been depicted on maps in the RMP (refer to RMP, Figure 6, sheets 1-3).

Study plots will be established for the major populations of each of these species contained in the Preserve. Four permanent line-intercept vegetation transects 100 meters long will be established in each plot where appropriate. Permanent transects will be randomly situated within the study plot at the onset of the studies. Shorter transects may be desirable or necessary where sensitive plant populations are small or have a restricted distribution. The POM should have the flexibility to select the most appropriate census method. For each point-transect, vegetation data will be compiled every three years. Vegetation data to be obtained include percent cover of vegetation, numbers of individuals of each sensitive species (frequency), percent cover of each sensitive species, relative density, and canopy height (if appropriate).

Vegetation data from the study plots will be compiled and analyzed during the year that it is collected. The analyses will include comparisons of current data from previous years. A regression analysis will be conducted, with an emphasis on identifying long-term trends rather than short-term variation.

The following plants are annual or herbaceous perennial sensitive species that primarily occur in Diegan CSS and/or MSS, and chaparral:

San Diego thorn-mint (*Acanthomintha ilicifolia*) (southwestern Jamul Mountains)
western dichondra (*Dichondra occidentalis*) (Jamul Mountains)
variegated dudleya (*Dudleya variegata*) (Otay River and Jamul Mountains)
Dunn's Mariposa lily (*Calochortus dunnii*) (Jamul and San Ysidro mountains)
Slender-pod caulanthus (*Caulanthus stenocarpus*) (Jamul Mountains)
Fallbrook spine-flower (*Chorizanthe procumbens* var. *albiflora*) (Poggi Canyon)
Orcutt's bird's-beak (*Cordylanthus orcuttianus*) (San Ysidro Mountains)
Palmer's grappling-hook (*Harpagonella palmeri* var. *palmeri*) (Proctor Valley and Salt Creek)
Otay tarplant (*Hemizonia conjugens*) (Jamul Mountains and Otay River)
dwarf pepper-grass (*Lepidium latipes*) (Proctor Valley)
San Diego goldenstar (*Muilla clevelandii*) (Otay Mesa and Jamul Mountains)

Because these species are annuals or herbaceous perennial species, monitoring protocols must be tailored to the species' life cycle so that studies are conducted during the typical growing and/or flowering period for each species.

Study plots will be established for the major populations of each of these species. Four permanent line-intercept vegetation transects 100 meters long will be established in each study plot where appropriate. Permanent transects will be randomly situated within the study plot at the onset of the studies. Shorter transects may be desirable or necessary where sensitive plant populations are small or have a restricted distribution. The POM should have the flexibility to select the most appropriate census method. For each point-transect, vegetation data for the major populations will be compiled at least every three

years. Vegetation data to be obtained include percent cover of vegetation, numbers of individuals of each sensitive species (frequency), percent cover of each sensitive species, relative density, and canopy height. If a species is not detectable in a known location in a particular year, or a measurable decline (based on regression analysis) is apparent, a survey for that species the following year, and potentially in subsequent years (subject to the POM's discretion), will be conducted. Highly ephemeral plants may need to be monitored yearly and certainly under conditions that would promote their germination.

Vegetation data from the study plots will be compiled and analyzed during the year that it is collected. The analyses will include comparisons of current data from previous surveys. A regression analysis will be conducted, with an emphasis on identifying long-term trends rather than short-term variation.

3.1.3 Other Sensitive Plant Species

The following species occur in a variety of habitat and/or specific locations. The general monitoring protocol for these species will be the same as described above for annual and perennial species.

Campo Clarkia (*Clarkia delicata*) (canyon northeast of Callahan Mountain) - annual species
Tecate cypress (*Cupressus forbesii*) (upper elevations of San Ysidro Mountains) - perennial species
San Diego marsh-elder (*Iva hayesiana*) (drainages throughout Ranch) - perennial species
spiny rush (*Juncus acutus* var. *sphaerocarpus*) (drainages throughout Ranch) - perennial species
willowy monardella (*Monardella linoides* spp. *viminea*) (San Ysidro Mountains) - perennial species
Engelmann oak (*Quercus engelmannii*) (San Ysidro Mountains) - perennial species

3.2 WILDLIFE SPECIES

In addition to RMP preservation policies for listed wildlife species described below, Policy 2.8 of the RMP requires preservation of onsite populations of wildlife species recognized as Category 2 Candidates for listing by the USFWS. It should be noted that this status is a "holding" designation while these species are being evaluated for listing as threatened or endangered. Species may ultimately be listed or they may be downgraded or removed from candidate status. A monitoring task will be to regularly review the listing status of species.

The RMP standard for preservation of Category 2 Candidate wildlife species is 75% in a configuration that will ensure their conservation in perpetuity. This standard may be re-evaluated if future studies demonstrate a greater or lesser need for conservation of any resources.

The RMP guidelines for achievement of this standard may be measured by evaluation of the existing sensitive species maps (Figure 5, Sheets 1-3 of the RMP) as updated by any Phase 2 RMP field mapping efforts which include measured areas of the populations to establish the number of individuals within those populations. Status reports shall be submitted with SPA to ensure long-term documentation of population status.

3.2.1 Coastal Sage Scrub/Maritime Succulent Scrub Species

Policy 2.5 of the RMP requires the maintenance of large, viable populations of the California gnatcatcher and cactus wren within the Preserve. The RMP standards for preservation of these species are:

- Include within the Preserve sufficient habitat to maintain at least 52% of existing documented pairs/individual of the California gnatcatcher.

- Include within the Preserve sufficient habitat to achieve no loss of viable cactus wren populations.

The RMP guidelines for meeting these standards are:

- Achievement of this standard may be measured by evaluation of the existing sensitive animal maps (Figure 5, Sheets 1-3 of the RMP), as updated by field mapping completed for the California gnatcatcher/cactus wren study as part of the first SPA in the Phase 2 RMP.

- Achievement of this standard may include maintenance of populations in non-Preserve open space.

California Gnatcatcher/Cactus Wren/Other Bird Species

Monitoring of California gnatcatcher, cactus wren, and other sensitive birds species associated with CSS/MSS will occur in conjunction with ongoing monitoring of existing and restored CSS and MSS. In addition, sensitive raptor species that forage in scrub habitats will be monitored. Other sensitive bird species that will be monitored include:

Southern California rufous-crowned sparrow
Bell's sage sparrow (*Amphispiza belli belli*)
golden eagle (*Aquila chrysaetos*)
burrowing owl (*Athene cunicularia*)
northern harrier (*Circus cyaneus*)
loggerhead shrike (*Lanius ludovicianus*)
white-tailed kite (*Elanus caeruleus*)

While the RMP does not require focused surveys for additional federal Candidate species and species without any state or federal status, anecdotal sightings of these species during focused surveys for the gnatcatcher and cactus wren should be noted. Monitoring will be the responsibility of the POM, and will include data gathering, recommendations for remedial actions, and reporting.

Habitat and population studies will be conducted within permanently established study plots within the Preserve, as discussed in Section 2.3.1. Ten study plots of approximately 100 acres each will be identified. Five of the plots will be located in areas believed to be of particular significance for gnatcatchers and cactus wrens. Suggested areas for these study plots include Salt Creek Canyon, the Otay River Valley, Poggi Canyon, western San Ysidro Mountains, and southwestern Jamul Mountains. Five additional plots will be randomly situated throughout the Preserve where CSS is present.

The population studies for California gnatcatcher, cactus wren, and other named species will be conducted following the presence/absence survey guidelines of the USFWS once a year for the first five years, and then once every three years through buildout of the Ranch. The USFWS guidelines require three surveys of each 100-acre polygon, at least one week apart during the breeding season (15 February through 15 July). However, it is recommended that the surveys be conducted between January and April to avoid problems in overcounting when juveniles are present.

During surveys, gnatcatcher, cactus wren, and other bird species locations will be recorded on 200-scale topographic maps, and information about the sighting will be recorded. Data sheets for each sighting will include the following information:

- General and specific location of sighting
- Weather conditions
- Number, status, sex, and age of individuals (if discernable)
- Site description: slope, aspect, elevation (if applicable)
- Vegetation description: type, three dominant shrub species, height, percent cover, percent gap, percent bare ground, percent herbaceous species (if applicable)
- General comments, including nest location (if found), behavior, presence of cowbirds, etc.

Population studies of the California gnatcatcher and cactus wren will include three surveys and four vegetation transects on each of the ten study plots. Studies will begin in 1996 and proceed according to the following schedule:

1996	2012
1997	2015
1998	2018
1999	2021
2000	2024
2003	2027
2006	2030
2009	

For 1995, the contribution to ongoing California gnatcatcher/cactus wren surveys will include identification and mapping of the ten 100-acre study plots for the surveys beginning in 1996, along with documentation of the previously unpublished data from the Otay River parcel compiled for the NCCP Scientific Review Panel. The data and mapping points will be evaluated to eliminate points that represent "double-counting" of the gnatcatcher or wren. The results will provide a conservative estimate of the population sizes of the species on the Ranch, and illustrate areas of occupation. A summary report will be prepared which presents the composite, multi-year (1989-1993) population results, including spatial distribution throughout the Ranch. The numbers derived from the review will serve as the baseline for the gnatcatcher and cactus wren population sizes within each parcel, and may form the basis for monitoring ongoing future "incidental take" of gnatcatchers and wrens. Future monitoring of Ranch-wide or SPA-level populations also may be compared to this baseline data base.

In addition to the surveys of the 10 study plots described above, a ranch-wide walkover survey for gnatcatchers, cactus wrens and other named species will be conducted every five years beginning in 2000. Vegetation information collected for each gnatcatcher or cactus wren location will be qualitatively evaluated for overall health and quality. Because vegetation characteristics at these locations will differ between surveys, it would not be possible to conduct trend analyses.

Finally, surveys for the California gnatcatcher, cactus wren, and other sensitive bird species will be conducted on a SPA-by-SPA basis at the time development is proposed within those SPAs. The RMP does not mandate focused surveys for federal Candidate species on a SPA-by-SPA basis, but anecdotal sightings should be recorded. Focused surveys would be conducted only in SPAs with a potential for occupation by listed species.

Amphibians and Reptiles

Monitoring of sensitive amphibian and reptile species occurring in Diegan CSS/MSS species will occur in conjunction with ongoing monitoring of existing and restored CSS and MSS. While the RMP does not require focused surveys for federal Candidate species and species without any state or federal status, anecdotal sightings of these species during habitat studies should be noted. Monitoring will be the responsibility of the POM, and will include data gathering, recommendations for remedial actions, and reporting.

The RMP specifically identifies preservation standards for the orange-throated whiptail and San Diego horned lizard. Other Category 2 Candidate reptile species known to or likely to occur on the Ranch include:

northern red-diamond rattlesnake (*Crotalus ruber ruber*)
coastal western whiptail (*Cnemidophorus tigris multiscutatus*)
coastal rosy boa (*Licharana trivirigata rosafusca*)
Coronado skink (*Eumeces skiltonianus interparietalis*)
western patch-nosed snake (*Salvadora hexalepis virgultea*)

Monitoring for reptile species is very labor-intensive because of the secretive and cryptic, and sometimes nocturnal, behavior of most reptiles. Techniques range from walking transects (least intensive) to setting pitfall traps and drift fences (most intensive).

Surveys for the orange-throated whiptail and San Diego horned lizard should be conducted on study plots established for the Diegan CSS/MSS as described above. Transects shall be conducted under seasonal and weather conditions suitable for detecting reptiles: mid-April through July at temperatures between 80-85 degrees Fahrenheit (24-35 degrees Centigrade measured 2.5 centimeters aboveground). A general habitat description for each sighting, including percent cover of vegetation, numbers of individuals of each dominant shrub (frequency), percent cover of each dominant shrub (dominance), relative density, canopy height, as well as microhabitat components (biotic and abiotic), will be recorded on data sheets. Locations of scat of the San Diego horned lizard also will be recorded as evidence of horned lizard presence. Sightings of other reptiles named above will be recorded anecdotally.

Surveys for orange-throated whiptails and San Diego horned lizards will be conducted on the same schedule as for the CSS/MSS habitat studies described above.

Mammals

Monitoring of sensitive mammal species occurring in Diegan CSS/MSS species will occur in conjunction with ongoing monitoring of existing and restored CSS and MSS. While the RMP does not require focused surveys for federal Candidate species and species without any state or federal status, anecdotal sightings of these species during habitat studies should be noted. Monitoring will be the responsibility of the POM, and will include data gathering, recommendations for remedial actions, and reporting.

The RMP does not specifically identify any sensitive mammals species for monitoring. However, several Category 2 Candidate mammal species known to or likely to occur on the Ranch include:

northwestern San Diego pocket mouse (*Chaetodipus fallax fallax*)
Dulzura California pocket mouse (*Chaetodipus californicus femoralis*)
California mastiff bat (*Eumops perotis californicus*)
San Diego black-tailed jackrabbit (*Lepus californicus bennettii*)
San Diego desert woodrat (*Neotoma lepida intermedia*)

All but the San Diego black-tailed jackrabbit are nocturnal species that would require live-trapping studies or nocturnal surveys (bats) to establish presence or absence. The monitoring program does not include focused surveys for these species. If any of these mammals are listed as threatened or endangered, focused surveys may be warranted or necessary.

Sightings of the San Diego black-tailed jackrabbit will be recorded along established transects in conjunction with CSS/MSS habitat studies as described above and anecdotally. In addition, San Diego desert woodrat middens around rock outcrops or dense shrubs often are detectable in the course of walkover surveys. Any middens detected should be evaluated for occupation by searching for fresh scat (fecal pellets).

Invertebrates

Monitoring of sensitive invertebrate species occurring in Diegan CSS/MSS species will occur in conjunction with ongoing monitoring of existing and restored CSS and MSS. While the RMP does not require focused surveys for federal Candidate species and species without any state or federal status, anecdotal sightings of these species during habitat studies should be noted. Monitoring will be the responsibility of the POM, and will include data gathering, recommendations for remedial actions, and reporting.

Two sensitive butterfly species potentially occur in CSS on the Ranch: the Quino checkerspot (*Euphydryas editha quino*) and Hermes copper (*Lycaena hermes*). The checkerspot, while once widely distributed on the Ranch, is now thought to be exceedingly restricted or absent from the Ranch. Hermes copper is likely to be present wherever large stands of redberry (*Rhamnus crocea*) grow among California buckwheat (*Eriogonum fasciculatum*).

The flight period is late March to late April for the Quino checkerspot and late May to late June for Hermes copper. Sightings of either species will be recorded along established transects in conjunction with CSS/MSS habitat studies, as described above.

3.2.2 Wetland/Riparian Habitat Species

Policy 2.6 of the RMP requires preservation of state- and federally-listed rare, threatened, and endangered species. Several listed species occur in wetland/riparian habitats, of which the following are known to, or potentially, occur on the Ranch:

least Bell's vireo
southwestern willow flycatcher
California yellow-billed cuckoo (*Coccyzus americanus californicus*)
arroyo southwestern toad (*Bufo microscaphus californicus*)
California red-legged frog (*Rana aurora draytoni*)

In addition, the tricolored blackbird is identified for monitoring in the RMP.

Several federal Candidate species also occur in wetland/riparian habitats, of which the following are known to, or potentially, occur on the Ranch:

white-faced ibis (*Plegadis chihi*)
southwestern pond turtle
two-striped garter snake (*Thamnophis hammondii*)

Birds

Monitoring of sensitive wetland/riparian habitat bird species, including the least Bell's vireo, southwestern willow flycatcher, and tricolored blackbird, will occur in conjunction with ongoing monitoring of existing wetland/riparian habitats (floodplain scrub, southern willow scrub, and aquatic/freshwater marsh) as described above. Yearly surveys for the vireo and flycatcher may be desirable and possibly could be conducted by university or agency biologists monitoring the southern California breeding populations of these species.

Surveys will be conducted for the least Bell's vireo and southwestern willow flycatcher using the USFWS survey protocol for breeding riparian birds. The survey protocol is eight site visits conducted at approximately weekly intervals. Tape recorded calls of the vireo and flycatcher will be played to facilitate detection of the two species. Any vireos and/or flycatchers detected will be observed for a sufficient period to determine whether they are breeding onsite or are migrants.

Because of the relatively late timing for breeding by southwestern willow flycatchers, it is recommended that surveys commence no earlier than May and be completed no earlier than late June.

While the RMP does not require focused surveys for federal Candidate species and species without any state or federal status, anecdotal sightings of these species during focused surveys for the aforementioned species should be noted. Monitoring will be the responsibility of the POM, and will include data gathering, recommendations for remedial actions, and reporting.

Freshwater marsh habitat will be surveyed for the presence of the tricolored blackbird every three years. While there is no established survey protocol for the tricolored blackbird, this species is easily detected when present because they usually are very common to abundant (colonies of 50 to 1,000 pairs; Unitt 1984). Three surveys at least one week apart during the breeding season (mid-March through late May) should be adequate. Breeding population sizes will be estimated.

Amphibians and Reptiles

Monitoring of sensitive wetland/riparian habitat for reptile and amphibian species, including the southwestern pond turtle, two-striped garter snake, California red-legged frog, and arroyo southwestern toad will occur in conjunction with ongoing monitoring of existing wetland/riparian habitats (floodplain scrub, southern willow scrub, and aquatic/freshwater marsh) as described above.

Survey methods will vary for different species. Diurnal visual encounter surveys can be conducted for southwestern pond turtle and two-striped garter snake around ponds and pools along streams and, in particular, the Otay River. Also, the two-striped garter snake is known from a pond in the San Ysidro Mountains. For frogs and toads, nocturnal visual encounter surveys (i.e., spotlighting) or audio strip transects can be used. The audio strip transects monitor the calling of males along a transect. All calling males are counted along a transect, thus providing information about the relative abundance

of calling males, relative abundance of all adults, species composition, breeding habitat or microhabitat use, and breeding phenology of species. Visual encounter and audio strip transect survey techniques are recommended because they are less invasive compared to pitfall traps and drift fences.

There is no adopted or required survey protocol at this writing for sensitive amphibians. A protocol recommended by the USFWS (Cat Brown, pers. comm.) is to visit potentially suitable sites for three consecutive moonless nights between dusk and midnight to listen for chorusing. Surveys should be conducted between March and May.

Although there are no known populations on the Ranch of the arroyo southwestern toad, which was federally listed as endangered in December 1994, potential habitat exists along the Otay River. A focused survey for the arroyo southwestern toad was conducted in the spring of 1995 and none were detected. However, to ensure that the arroyo toad is absent from the Preserve, surveys should be conducted for three additional consecutive years (1996-1998). If no arroyo toad populations are detected after four consecutive years, further surveys should be conducted only in optimum years (e.g., years with high rainfall and flooding).

Surveys for the southwestern pond turtle and two-striped garter snake should be conducted in suitable habitat every three years to determine presence/absence and to monitor population trends.

The California red-legged frog is considered extirpated from San Diego County and is unlikely to occur on the Ranch, although potentially suitable wetland habitat is present. Focused surveys for the California red-legged frog are not recommended at this time.

Invertebrates

Monitoring sensitive wetland/riparian habitat for Harbison's dun skipper will occur in conjunction with ongoing monitoring of existing wetland/riparian habitats (floodplain scrub, southern willow scrub, and aquatic/freshwater marsh) as described above. Harbison's dun skipper is found in riparian scrub habitats that contain San Diego sedge (*Carex spissa*), the larval host plant of the insect. These surveys should be conducted at weekly intervals during the June flight period.

3.2.3 Grassland Species

The grasslands on the Ranch currently do not support any state- or federally-listed threatened or endangered wildlife species. However, several federal Candidate species occur in both native and non-native grasslands. Also, grasslands provide valuable foraging habitat for raptors. The RMP requires preservation of 75% of habitat for federal Category 2 Candidates.

Birds

Sensitive bird species that utilize grasslands for nesting and/or foraging include:

tricolored blackbird (foraging)
golden eagle (foraging)
burrowing owl (nesting/foraging)
northern harrier (foraging)
white-tailed kite (foraging)
prairie falcon (foraging)

grasshopper sparrow (nesting/foraging)
California horned lark (nesting/foraging)
loggerhead shrike (foraging)

Monitoring of the grassland bird species will be conducted in permanently established study plots within the Preserve. Ten study plots of approximately 100 acres each will be identified. Five of the plots will be located in areas believed to be of particular significance for grassland-dependent birds, including the grasshopper sparrow and horned lark, and at least five will be located in existing or restored native grassland.

Within each 100-acre study plot, four permanent line-intercept vegetation transects 100 meters long will be established. Permanent transects will be randomly situated within the study plot at the onset of the studies. For each point-transect, vegetation data will be compiled each year. Vegetation data to be obtained include percent cover of vegetation, numbers of individuals of each dominant species (frequency), percent cover of each dominant species (dominance), and relative density.

During surveys, bird species locations and additional information about the sighting will be recorded. Data sheets for each sighting will include the following information:

- General and specific location of sighting
- Weather conditions
- Number, status, sex, and age of individuals (if discernable)
- Site description: slope, aspect, elevation (if applicable)
- Vegetation description: type, three dominant species, height, percent cover, percent gap, percent bare ground, percent herbaceous species (if applicable)
- General comments, including nest location (if found), behavior, presence of cowbirds, etc.

Bird sightings and vegetation data from the study plots will be compiled and analyzed during the year that it is collected. The analyses will include comparisons of current data from previous years. A regression analysis will be conducted, with an emphasis on identifying long-term trends rather than short-term variation.

Mammals

Two sensitive mammal species primarily occur in grassland habitats; the southern grasshopper mouse (*Onychomys torridus ramona*) and American badger (*Taxidea taxus*). Both species, if present in the Preserve, are likely to uncommon. One badger sighting is known from the Otay River parcel and no recent grasshopper mouse records exist. It is likely that the POM will locate badger dens during general reconnaissance of the Ranch. Any known dens should be checked at least yearly to monitor the badger population. Live-trapping would be necessary to detect the grasshopper mouse. Because live-trapping is not part of the monitoring program, the status of the grasshopper mouse likely will remain unknown. If it is state- or federally-listed, a systematic trapping survey of grasslands on the Ranch should be conducted to determine its status.

3.2.4 Vernal Pool Species

The purpose of the fairy shrimp monitoring is to document the continued presence and to establish a relative density and determine trends in the population. Surveys for the San Diego fairy shrimp

(*Branchinecta sandiegoensis*) should be conducted once every two weeks during the time period when water is ponded to a minimum depth of 5 millimeters. A minimum of 5 minutes should be spent at each pool to conduct a visual survey. A relative density measure should be obtained by taking 10 random dips with a dip net, approximately 3 inches in diameter, and counting the number of fairy shrimp in each dip.

Surveys for the Riverside fairy shrimp (*Streptocephalus woottoni*) should be conducted weekly from March 1 to June 1. The stock pond where it occurs should be searched visually for at least 5 minutes during each visit. Once the fairy shrimp is observed, the visits can be stopped. A relative density measure should be obtained using the same methodology as for the San Diego fairy shrimp however, a larger net should be used, approximately 10 inches in diameter.

Fairy shrimp populations should be monitored to ensure that they thrive over time. The frequency, timing, and type of monitoring should be determined in consultation with the USFWS. Presence or absence, and relative abundance can be determined relatively easily. Their long life cycle also makes it easy to determine whether or not they occupy a pool because it is likely that pools would be monitored during the period they are present.

3.2.5 Woodland Species

Woodland habitats on the Ranch, including southern interior cypress forest, coast live oak woodland, oak riparian forest, riparian woodland, and sycamore alluvial woodland, provide nesting, foraging, and hiding areas for a variety of sensitive wildlife species. Woodlands are particularly important as nesting areas for raptors. Policy 2.4 of the RMP requires 100% preservation of woodlands and 75% preservation of any Category 2 Candidates that utilize woodlands.

Birds

The primary value of woodlands for birds is as nesting habitat. Raptors expected to nest in woodland habitats on the Ranch include Cooper's hawk, white-tailed kite, red-shouldered hawk (*Buteo lineatus*), red-tailed hawk (*Buteo jamaicensis*), and American kestrel (*Falco sparverius*). Other raptor species likely to use woodland habitats include sharp-shinned hawk (*Accipiter striatus*) and several owl species, including barn owl (*Tyto alba*), western screech owl (*Otus kennicottii*), great horned owl (*Bubo virginianus*), and long-eared owl (*Asio otus*). Woodland habitats will be monitored as described above. Raptor nests will be monitored for activity at least once every three years.

Invertebrates

Two sensitive invertebrates occur in woodland habitats. Thorne's hairstreak occurs in southern interior cypress forest and Harbison's dun skipper occurs in riparian oak woodlands where San Diego sedge occurs.

Because butterfly populations can vary substantially from year-to-year, spring surveys for Thorne's hairstreak and Harbison's dun skipper should be conducted yearly in suitable habitat for four consecutive years beginning in 1996 to establish baseline population conditions and every three years thereafter. Weekly surveys should be conducted during the early February to early March flight period for Thorne's hairstreak and the June flight period for Harbison's dun skipper.

4.0 WILDLIFE CORRIDORS

4.1 INTRODUCTION

A wildlife corridor study of the Otay Ranch was conducted by Ogden Environmental and Energy Services Co., Inc. in 1992 (Ogden 1992). The corridor study concentrated on five focal species: bobcat (*Lynx rufus*), mule deer (*Odocoileus hemionus*), mountain lion (*Felis concolor*), California gnatcatcher, and cactus wren. Ogden also distinguished between regional and local wildlife corridors:

> "Regional corridors link two or more large areas of open space and are necessary to maintain demographic and genetic exchange between wildlife populations residing within these geographically disjunct areas. Local corridors allow resident animals access to necessary resources (e.g., water, food, cover, or den sites) within a large habitat patch and they may function as secondary connections to the regional corridor system." (pg 1-1)

Based on the Ogden study, several regional and major local wildlife corridors were identified on all three parcels of the Otay Ranch. Several of these corridors also occur on, or cross, other public and private ownerships.

Regional wildlife corridors in the Otay River Parcel include:

- Poggi Canyon
- Otay River Valley
- Wolf Canyon
- O'Neal Canyon
- Salt Creek Canyon

Regional wildlife corridors in the Proctor Valley Parcel include:

- Sweetwater Reservoir to San Ysidro Mountains
- Jamul Mountains to Dulzura Creek I
- Jamul Mountains to Dulzura Creek II

Regional wildlife corridors in the San Ysidro Parcel include:

- Otay River to Dulzura Creek
- Lower Otay Reservoir to O'Neal Canyon
- Cedar Canyon
- Little Cedar Canyon

A goal of the Preserve is to maintain the function of the regional and local wildlife corridors.

4.1.1 Methodology

Regional and local wildlife corridors should be monitored using the same field methodology as used in the Ogden study. The methodology utilizes accepted field techniques for detecting sign of wildlife species, including tracks, scat, and, rarely, visual contact. Track surveys may be conducted using several methods: (1) finely raked sand or dirt; (2) graphite powdered cards; (3) layers of lime chalk; (4)

soot-coated aluminum scent stations; and (5) combinations of these methods. Infrared triggered cameras also can be used to photograph passing animals.

The Ogden report provides specific details on the species using the different regional and local wildlife corridors and should be used as the baseline reference document for monitoring the use of the corridors in the future. However, the Ogden study focused their field observations in locations expected to function as corridors (e.g., canyons) and thus did not survey the entire Otay Ranch for evidence of wildlife use and movement. Corridors in the Ogden report thus only depict areas where focal animal sign was found. The results do not imply that animals do not use other habitat areas as movement corridors. Additional baseline studies may need to be conducted prior to development of SPAs in order to evaluate the impacts of development or the movement of species through potentially constrained areas.

Monitoring sites should be established in areas where there may be future constraints on wildlife movement because of a reduction of habitat (e.g., a narrowing of habitat links), potential physical barriers (e.g., roadways), and potential edge effects from development (noise and lighting). It is reasonable to assume that if animals use relatively constrained wildlife corridors in the Preserve, that they also will use less constrained areas (e.g, the Otay River Valley portion of the Preserve).

Based on the results of the Ogden study, recommended areas for monitoring wildlife corridors include:

- The confluence of Wolf and Poggi canyons
- Otay Valley Road where Wolf Canyon meets the Otay River Valley
- The SR 125 crossing of the Otay River Valley
- The confluence of O'Neal Canyon and Otay River
- Buschalaugh Cove-San Ysidro Mountains
- Jamul Mountains-Dulzura Creek I at Otay Lakes Road
- Proctor Valley Road near the City of Chula Vista boundary
- Little Cedar Canyon at Otay lakes Road
- Cedar Canyon at Otay Lakes Road

Selection of monitoring sites should be at the discretion of the POM, in consultation with the City, County, and resource agencies.

Sites should be monitored at least quarterly during survey years in order to establish seasonal use of wildlife corridors. Each site should be monitored every three years. During each survey period, a site should be visited every three or four days for three weeks to increase the probability of detecting the majority of species moving through the site. During the each visit, all animal sign of terrestrial vertebrates should be recorded. A ten minute visual/aural survey for birds also should be conducted during each visit.

Within each study area, four permanent line-intercept vegetation transects 100 meters long will be established. Permanent transects will be randomly situated within the study plot at the onset of the studies. For each point-transect, vegetation data will be compiled according to the schedule below. Data to be obtained include percent cover of vegetation, numbers of individuals of each dominant shrub (frequency), percent cover of each dominant shrub (dominance), relative density, and canopy height. Permanent photo-documentation stations should be established at each of the study sites and photos should be taken once during each survey year in the same season from survey to survey.

Wildlife use and vegetation data from the study plots will be compiled and analyzed during the year it is collected. The analyses will include comparisons of current data from previous surveys. A regression analysis will be conducted, with an emphasis on identifying long-term trends rather than short-term variation.

5.0 MONITORING REPORTS

An annual monitoring report shall be submitted by the POM to the City, County, and resource agencies. The annual report generally should include the following information:

- A description of the monitoring activities completed for the year
- Identification of any problems or issues encountered during the year
- Status of the existing biota, as updated with information collected during the year (including tables showing results of line transects for plants and wildlife by habitat)
- Status of restoration efforts, as updated with information collected during the year
- Status of research activities in the Preserve (including annual status reports or published technical articles resulting from research as attached appendices)
- A general scope of monitoring activities for the upcoming year
- A report of expenditures for the monitoring program during the year
- A budget for monitoring activities for the upcoming year
- A refinement of future monitoring activities for the upcoming five years, if determined to be necessary

5.1 ANNUAL STATUS REPORT OF BIOTA

The annual report should focus on the status of the existing biota in the Preserve. At minimum, the report should include the following:

- Purpose and background information on biota monitoring activities
- The scope of work during the year
- A description of the study sites
- Methods of study, including:
  - vegetation community and species population measurements
  - photo-documentation
  - additional environmental measurements (e.g., precipitation)
  - statistical analyses
- Results of studies, including
  - vegetation community and species population measurements
  - photo-documentation
  - additional environmental measurements (e.g., precipitation)
  - statistical analyses
- Conclusions and recommendations

5.2 ANNUAL STATUS REPORT OF RESTORATION ACTIVITIES

The annual status report for restoration activities should, at minimum, include the following:

- Purpose and background information on restoration activities
- The scope of work during the year
- A description of the study sites
- A description of physical activities for year, including:
  - site preparation (soils, weed eradication, etc.)
  - planting
  - irrigation (if relevant)
  - monitoring
  - maintenance
- Methods of study, including:
  - vegetation community and species population measurements
  - photo-documentation
  - additional environmental measurements (e.g., precipitation, soil conditions)
  - statistical analyses
- Results of studies, including
  - vegetation community and species population measurements
  - photo-documentation
  - additional environmental measurements (e.g., precipitation)
  - statistical analyses
- Conclusions and recommendations

6.0 ACKNOWLEDGEMENTS

7.0 LITERATURE CITED

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Otay Ranch

Phase 2
Resource Management Plan

Appendix F12
Preserve Owner/Manager JEPA

APPENDIX F12

PRESERVE OWNER/MANAGER JEPA

To be completed.