Area Specific Management Directives
for
Ramona Grasslands Preserve
San Diego County

January 2007

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1.0 INTRODUCTION

1.1 Purpose of Management Plan

The Ramona Grasslands are located in the Santa Maria Valley, situated between the coastal mesas and the mountains of the Peninsular Ranges in west-central San Diego County (Figure 1). About two-thirds of what was once an extensive grassland ecosystem in the Valley has been lost to development. The Santa Maria Valley's remaining grasslands are largely intact, though fragmented by roads and subjected to edge effects by adjacent residential and infrastructure development. In recognition of its unique natural resource values, The Nature Conservancy (TNC) and California Department of Fish and Game (CDFG) included most of this remaining habitat, along with the surrounding foothills to the north and south, in the roughly 8,000-acre Ramona Grasslands Wildlife Area Conceptual Area Protection Plan (CAPP, CDFG 2002). The CAPP was the inception of the County of San Diego's Ramona Grasslands Preserve (Preserve).

These Area Specific Management Directives (ASMDs) provide guidance to maintain, enhance, and monitor the conservation values of biological resources within the Preserve (Figure 2). The ASMDs build from the scientific framework laid out in the Framework Management and Monitoring Plan for the Ramona Grasslands Open Space Preserve, San Diego County, California (CBI 2004). In 2003, the State Water Resources Control Board awarded a Proposition 13 grant to the County of San Diego for the protection and restoration of a portion of Santa Maria Creek and adjacent ephemeral aquatic habitats (e.g., vernal pools, vernal swales, and alkali playas) in the Ramona Grasslands. The project area of the Proposition 13 grant was the core grasslands area of the CAPP (Figure 2), including Santa Maria Creek, which supports many of the unique biological resource values represented in the greater Ramona Grasslands. The purpose of this plan is to:

- Guide the management of habitats, species, and programs described herein to protect and enhance wildlife values;
- Guide appropriate public uses of the property;
- Inventory fish, wildlife and native plant habitats, which occur on or use this property;
- Serve as a description of archaeological and/or historical resources which occur on this property;
- Determine proper adaptive management techniques; and
- Provide an overview of the property's operation, maintenance and personnel requirements to implement management goals, and serves as a budget planning aid.

1.2 Acquisition History

The Preserve is comprised of a number of properties that are conserved or publicly owned, properties with conservation agreements pending (e.g., Hobbs parcel), and properties targeted for conservation (Figure 2). Additional land is anticipated to be included in the Preserve via landowner dedications as mitigation for future development projects (e.g., portions of Cumming Ranch). The history of property acquisitions within the Ramona Grasslands is shown in Table 1.

In addition, the Wildlife Research Institute (WRI) owns a 10-acre property at the southern edge of the Preserve, which they use for environmental education and captive breeding of burrowing owls (*Athene cunicularia*).

Table 1. Acquisition history of conserved properties within the Preserve.

Property	APNs	Size (acres)	Acquisition Date	Remarks
Cagney Ranch	2820100600 2810101200 2810101400 2820100200 2771210200 2820103500 2820100100 2820100500 2820100400 2820100300 2771211300	420	June 2003	Purchased by TNC and transferred to County of San Diego August 2006
Hardy Ranch	2820103400 2820100800	70	November 2004	Owned by County of San Diego
TNC Oak Country Estates	2771115300 2770503100 2771211400	230	December 2004	Owned by TNC
Davis-Eagle Ranch	2790100400 2810101700 2800100400 2810101000 2770502500 2770502600 2800100100 2815210400 2790100500 2810101600 2810100900 3560404300 2815211000	1,230	December 2005	Owned by TNC
Gildred Family Ranch	—	1,350	N/A	Under purchase option by TNC, expires May 2007
Hobbs parcel	—	40	N/A	Conservation proposed by developer group as project mitigation

2.0 IMPLEMENTATION

2.1 Responsible Parties/Designation of Manager

The County of San Diego and TNC are the owners of the conserved lands within the Preserve. It is envisioned that all conserved lands in the Preserve will ultimately be transferred to County ownership. The County of San Diego Department of Parks and Recreation (DPR) is the habitat manager of the Preserve. TNC retains a management interest in the properties that they originally acquired via a conservation easement on these properties.

3.0 PROPERTY DESCRIPTION

3.1 Legal Description

The Preserve is located within the western portion of the Valle de Pamo (or Santa Maria Valley, T 13S, R 1E and R 1W), part of the historic Santa María Rancho. A total of 1,950 acres are currently conserved, and there is additional undeveloped open space owned by the County of San Diego Department of Public Works (DPW) around the Ramona Airport and the Ramona Municipal Water District. The Assessor's Parcel Numbers (APNs) of existing conserved properties are provided in Table 1.

3.2 Geographical Setting

The Preserve lies in the Santa Maria Valley, west of the town of Ramona (Figures 1 and 2). The Santa Maria Valley is a broad basin (elevation 1,350-1,450 feet), surrounded by gentle hills and rocky rises vegetated with coastal sage scrub, chaparral, and oak woodlands. The valley lies within the Southern California Mountains and Valleys ecological section of the South Coast Ecoregion (Bailey et al. 1994, Goudey and Smith 1994, McNab and Avers 1994; Miles and Goudey 1998).

3.2.1 Site Access

The eastern end of the Preserve (Cagney Ranch) can be accessed from Airport Road, off of Montecito Road. Access to the western end of the Preserve (including Cagney Ranch, TNC Oak Country Estates, and Davis-Eagle Ranch) can be accessed from Rangeland Road, off of Highland Valley Road. Hardy Ranch can be accessed from Vorhees Lane private properties, off of Highland Valley Road, which is not a public thoroughfare, or through Cagney Ranch. Entry into all parts of the Preserve, except Hardy Ranch, is currently via locked gates at the Airport Road and Rangeland Road entrances.

3.3 Property Boundaries and Adjacent Lands

The core grasslands area of the Preserve remains relatively unfragmented, except by a few paved roads (e.g., Rangeland Road) and private unpaved ranching roads. The Santa Maria Valley itself is largely surrounded by rural residential development and estate homes (Figure 2). South of the Preserve, houses line the south side of a portion of Santa Maria Creek along Voorhes Lane.

Some areas around the periphery of the Preserve are used for dry farming and citrus and avocado orchards. Undeveloped land is located northwest, west, and east of the existing conserved lands. Northwest of the conserved lands is the 1,350-acre Gildred Family Ranch (Gildred Building Company), which is currently under a purchase option with TNC. Adjacent to the conserved portion of Oak Country Estates (TNC Oak Country Estates) is the unprotected portion of Oak Country Estates, which has an approved residential development plan, and the Martz property, which is zoned as open space. South and east of Cagney Ranch is the Cumming Ranch, whose owner is currently proposing a residential development; however, two parcels will be conserved as project mitigation and donated to or acquired by the County for incorporation into the Preserve. Northeast of Davis-Eagle Ranch is the proposed Montecito Ranch residential development (Figure 2). Offsite improvements, including the proposed Montecito Road, would accompany this development project. The proposed Montecito Road alignment extends south from Montecito Ranch, through the eastern portion of Davis-Eagle Ranch, and across Cumming Ranch.

3.3.1 Onsite land uses

Ramona Airport

The Ramona Airport lies at the eastern end of the Ramona Grasslands, between Cagney Ranch and Davis-Eagle Ranch. The California Department of Forestry and Fire Protection has maintained the Ramona Air Attack Base at the airport since 1958. In 2002 the County extended the 4,000-feet runway an additional 1,000 feet to the west to accommodate larger fire-fighting aircraft. This extension, along with associated airport upgrades (e.g., sewer lines, taxiway, control tower), removed habitat occupied by the endangered Stephens' kangaroo rat (SKR, *Dipodomys stephensi*), adversely affected vernal pools, and filled U.S. Army Corps of Engineers and CDFG jurisdictional wetlands and waters. As mitigation for these impacts, 62.5 acres of airport property were conserved (west and north of the extended runway in the western half of the airport property), 20.2 acres supporting vernal pools were conserved in the northwest corner of Cagney Ranch, and 1.34 acres of wetlands are to be created in the southwestern corner of Cagney Ranch within the Preserve (Figure 2). Habitat management plans for SKR (FAA 2002) and vernal pools (FAA 2003) were prepared to govern long-term management and monitoring of these target resources on the mitigation sites. Management of resources on the airport property will be performed by DPW, while long-term management of the resources in the Preserve (i.e., vernal pool and wetland mitigation sites, Figure 2) will be performed by DPR.

Ramona Municipal Water District

The Ramona Municipal Water District (RMWD) utilizes a portion of the Ramona Grasslands for storage and infiltration of treated sewage effluent. Treated effluent is piped from a treatment facility at the eastern end of the Ramona Grasslands to two storage reservoirs at the western end of the valley. Treated effluent is disposed via infiltration within a series of spray fields on the northwestern portion of Davis-Eagle Ranch, which is currently owned by TNC. The irrigated spray fields are an important year-round source of green forage for cattle grazing on Cagney Ranch, Oak Country Estates, and Davis-Eagle Ranch. Discussions are currently underway to

determine if RMWD will acquire a portion of Davis-Eagle Ranch used for the spray fields or will enter into a long-term leases agreement with TNC for their use of the spray fields.

Cattle grazing

The majority of the core grasslands area has been used for cattle grazing for many years, with limited improvements such as perimeter fencing and wells installed over the years. Part of the Preserve (i.e., Cagney Ranch, TNC Oak Country Estates, and Davis-Eagle Ranch) is currently under lease to Tellam and Tellam Cattle for cattle ranching, while Hardy Ranch (and Cumming Ranch) is currently leased for grazing by Jack Dempsey. The Tellam and Tellam Cattle operation is the largest in the Preserve compared to Jack Dempsey, and consists of year-round cattle grazing, without formalized rotation or rest periods. Stocking rates are established on an annual basis, primarily based on weather and forage conditions (Tellam personal communication). No quantitative measures are made of forage production or residual dry matter. Bulls are added to the range around the first week of December to begin siring calves, with calving starting in mid-September of the following year. Calves are removed the following summer when the forage begins losing nutritional value. Supplemental feed is provided during summer (molasses supplement for increased protein and improved digestion of the dry forage), when the pregnant cows are on the range, which is otherwise low in nutrition once the vegetation dries out.

Table 2. Grazing intensity (AUM) on Cagney Ranch, Oak Country Estates and Davis-Eagle Ranch from 2004-2005.

Month	**2004[1]**	**2005[2]**	**2006[3]**
January	—	10/6	40/8/115
February	—	18/6	30/10/115
March	—	18/6	40/10/115
April	—	18/6	40/10/115
May	—	18/6	8/115[4]
June	—	18/6	30/8/115
July	—	18/6	8/105[5]
August	—	18/6	0/105 (135)[6]
September	20	18/6	—
October	20	18/6	—
November	20	18/6	—
December	20	18/6	—

— = No data
[1] AUM on Cagney Ranch
[2] AUM on Cagney Ranch/TNC Oak Country Estates
[3] AUM on Cagney Ranch/TNC Oak Country Estates/Davis-Eagle Ranch
[4] AUM on TNC Oak Country Estates/Cagney Ranch + Davis-Eagle Ranch, with 40 AUMs moved to the Vangler property this month.
[5] AUM on TNC Oak Country Estates/Cagney Ranch + Davis-Eagle Ranch
[6] AUM on TNC Oak Country Estates/Cagney Ranch + Davis-Eagle Ranch from 8/1 -8/28. Cagney Ranch + Davis-Eagle Ranch had 135 AUM from 8/28 – 8/31. No cows were on TNC Oak Country Estates during the month because of a mistakenly closed gate.

Grazing intensity, expressed as Animal Units per Month (AUMs) for the Cagney Ranch, TNC Oak Country Estates, and Davis-Eagle Ranch is summarized in Table 2. DPR staff have estimated approximately 20 cows are currently grazing the Cumming and Hardy Ranch as a unit (McFedries personal communication). The lease agreement with Jack Dempsey allows a maximum of 70 cows to graze on the Hardy Ranch.

3.4 Geology, Soils, Climate, Hydrology

3.4.1 Geology and soils

The Santa Maria Valley basin is predominantly filled with soils of the Fallbrook and Bonsall series (Figure 3, Table 3), which are well-drained to moderately well-drained sandy loams with a subsoil of clay loam or sandy clay loam over decomposed granodiorite, on gentle (2-9%) slopes (USDA 1973). On a more local scale, however, there is significant variation in soil characteristics depending on topographic location, depth of clay subsoils, and effects of erosion and deposition. Granodiorite outcrops dot the grasslands, predominantly on hilltops, with relatively deep, well-drained soils of decomposed granodiorites (in the Vista or Fallbrook series) sloping away from them. Lower-lying areas tend to support heavier clay soils, with shallow or even surface expression of clay hardpans. These soils sometimes develop characteristic vernal pool mima mound topography, which is best expressed on Placentia soils in the Preserve. Gabbro outcrops and associated Las Posas soils are scattered through the grasslands and may influence plant associations. Soils within the floodplain of Santa Maria Creek include deep, well-drained to excessively drained, sandy alluvium in the Visalia series (USDA 1973).

Soils have a strong influence on the distribution of target resources and management emphasis (Table 3). Placentia soils have the greatest concentration of vernal pools. Bosanko clays dominate the low-lying eastern portion of the core grasslands and are present in patches on the western portion of the Preserve, and support existing native grasslands. Several sandy loams (e.g., Fallbrook, and Vista) in the northern and western portion of the grasslands provide optimal habitat conditions for the SKR. Soils along Santa Maria Creek are mostly sandy alluvial deposits—Tujunga sands along the stream channel and Visalia sandy loams in the adjacent floodplain. A series of alkali playas lies within areas mapped as Visalia sandy loams (USDA 1973), but these areas more likely have clay soil inclusions or eroded areas too small to have been mapped at the USDA mapping resolution.

3.4.2 Climate

Temperature extremes at Ramona range from about 17^{o}F to 112^{o}F, with minimum mean temperatures in December-January of 37-38^{o}F, and maximum mean temperatures during July-August of approximately 91^{o}F (as recorded at the Ramona Airport). In the summer months the climate is generally hot and subhumid, with moderate oceanic influence. For the purposes of this report, rainfall data are summarized on a water year basis (October 1 – September 30), which is a common annual interval used by hydrologists in the U.S. to ensure annual stream flow and precipitation patterns are not split between calendar years. Rainfall is largely restricted to the period November through March, with 65% of average annual rainfall (15.86 inches/year) falling from January to March. Inter-annual variation in rainfall can be high. For example, during

Table 3. Pertinent characteristics of soils in the core grasslands area.

Soil Series*	Characteristics	Distribution	Biological Relevance
Bonsall Sandy Loams	Moderately well-drained, shallow to moderately deep sandy loams with heavy clay subsoil on gentle, generally concave slopes.	Scattered, mostly in western portion of grasslands.	Low potential to support vernal pools. Generally suitable for SKR, depending on depth to clay subsoil.
Bonsall-Fallbrook Sandy Loams	A complex intermixing of Bonsall sandy loams (in swales) and Fallbrook sandy loam (on rises).	Widespread on undulating uplands, including much of the central portion of grasslands.	Bonsall portions in swales support vernal pool species; Fallbrook portions on rises are among most important SKR-supporting soils.
Bosanko Clay	Moderately deep clays on undulating hills; slightly alkaline.	Large area extending from east end of airport to and along Santa Maria Creek; scattered areas on either side of creek (e.g., west of Rangeland Road).	Heavy clays supporting vernal pools and swales. Supports some dense stands of artichoke thistle. Low potential for SKR
Fallbrook Sandy Loams	Well-drained, moderately deep to deep sandy loams weathered in place from granodiorite on gentle to steep upland slopes.	Widespread on hills throughout grasslands, especially on hills with granodiorite outcrops.	Among the best soils supporting SKR; associated with oak woodlands on hills around grasslands.
Las Posas Fine Sandy Loams	Well-drained, moderately deep stony fine sandy loams with a clay subsoil on upland slopes, derived from weathered gabbroic rocks.	Scattered small rises in grasslands, generally adjacent to lower-lying Bosanko Clays, and larger chaparral and oak-covered hills north of the grasslands.	Rated as low potential to support vernal pools. Marginal to unsuitable for SKR. Supports patches of native bunchgrasses (including purple needlegrass), and may be highly suitable for native grassland restoration.
Placentia Sandy Loams	Moderately well-drained sandy loams over a sandy clay subsoil, formed in granitic alluvium; moderately alkaline, with calcareous underlayer. On flat to gentle slopes, sometimes with mima mound topography.	Scattered small areas within grasslands; large expanses lost to development by the town of Ramona.	Supports the greatest density of vernal pools in Ramona area, often with classic mima mound topography. Also strongly associated with vernal swales and alkali playas supporting unique species.

Table 3. Pertinent characteristics of soils in the core grasslands area.

Soil Series*	Characteristics	Distribution	Biological Relevance
Tujunga Sands	Very deep, excessively well-drained sands derived from granitic alluvium, on alluvial fans and floodplains.	Comprises the length of the Santa Maria Creek channel.	Too sandy and subject to flooding to reliably support SKR. Primarily suited to restoring riparian vegetation.
Visalia Sandy Loams	Moderately well-drained, very deep sandy loams derived from granitic alluvium on alluvial fans and floodplains.	Predominant soil comprising the floodplain of Santa Maria Creek and Etcheverry Creek.	Perhaps too sandy and subject to flooding to reliably support SKR. Very few burrows, mostly associated with berms near Rangeland Road. Alkali playas cut through this area.
Vista Rocky Coarse Sandy Loam	Well-drained, deep, coarse sandy loams on slopes over weathered rock, with abundant boulders and rock outcrops.	Scattered large rocky hills throughout grasslands.	Highly suitable for SKR, especially in midslopes. Complex rocky outcrops provide den sites for coyotes, raptor roost sites, and homes for ground squirrels and other rodents. Cattle appear to congregate on these soils, especially along drainage swales between rocky hills and outcrops.

*Source: USDA 1973.

water years from 1974 to 2005, annual totals ranged from a minimum of 3.17 inches in 2001/2002 to a maximum of 34.08 inches in 1977/1978 (Western Regional Climate Center 2006). Rainfall totals for years 2002/2003, 2003/2004, and 2004/2005 were 17.38 inches, 7.64 inches, and 27.24 inches, respectively. Rainfall from October 1, 2005 through July 2006 is 7.94 inches (with reported March data incomplete).

3.4.3 Hydrology

The Ramona Grasslands comprise a significant portion of the Santa Maria Creek subbasin of the San Dieguito River watershed (Figure 4a). Santa Maria Creek and its tributaries drain about 57 mi^2 from the mountains east of Ramona, across the Grasslands, and through the steep and narrow walls of Bandy Canyon to its confluence with Santa Ysabel Creek. Below the confluence, the San Dieguito River flows through San Pasqual Valley into Lake Hodges, a City of San Diego drinking water reservoir which is listed as an impaired water body (Clean Water Act 303(d) listed) due to excessive nutrients and color from runoff of non-point source pollutants within the watershed.

Santa Maria Creek generally exhibits ephemeral flow in response to winter rainfall; although surface flow in the creek may persist very late in the year in heavy rainfall years, and surface water is perennial at the far western end of the valley. The U.S. Geological Survey (USGS) has operated a stream gage at the western end of the Santa Maria Valley (HUC 11028500), which measures all flow leaving the Ramona Grasslands. Annual mean daily streamflow of Santa Maria Creek from 1974-2005 was 3,968 cubic feet per second (cfs), and ranged from almost no flow for some years to 28,547 cfs in 1993.

The Ramona Grasslands drain to Santa Maria Creek via shallow, ephemerally flowing swale features and, presumably subsurface flow. During the extremely rainy 2004/2005 water year, surface water left the Santa Maria Creek channel near the western boundary of Hardy Ranch; peak flow in Santa Maria Creek was measured at 2,050 cubic feet per second during this event. Surface water flowed through an east-west trending swale across the grasslands, where it crossed Rangeland Road and then re-entered Santa Maria Creek via a tributary swale (Figure 4b). This east-west trending swale supports the alkali playa system and scattered vernal pools.

4.0 CULTURAL RESOURCES

The County's MSCP subarea plan requires inventory and management of cultural resources be included within the habitat preservation system. A records search for known archaeological sites was conducted as part of preparation of the Framework Management and Monitoring Plan (CBI 2004) for the project area. This records search and additional archival research was used to prepare this section. Additional studies and surveys are recommended as part of ongoing management.

During the prehistoric period (the era before the founding of the San Diego Mission in 1769), Native Americans occupied the Santa Maria Valley for many thousands of years. The people living in the area at the time of Spanish contact are known as the Kumeyaay people.

The Santa Maria Valley was home to the village of Pamo, a large, complex civilization, for many hundreds of years. Pamo was a collective of Kumeyaay Indians living and working areas within Santa Maria Valley. The village was seamlessly integrated into one of the last remnants of extensive grassland habitat in coastal Southern California. Surrounding and embedded within these grasslands are a variety of rare habitat types, including vernal pools, Diegan coastal sage scrub, oak woodland, and riparian forests, all which would have served to support village residents. The rich environment within the Ramona Grasslands provided abundant resources for the Pamo villagers. Of particular and unique importance was the native grassland. The plants and animals distinctive to this habitat contributed toward the large number of people who lived in the Pamo village complex.

The cultural resources within the Santa Maria Creek and Ramona Grasslands areas are particularly important to preserve because the sites exist at a landscape scale and the area contains a wide variety of residential, activity-based, and ceremonial archaeological locations. It is extremely rare in California to find an entire settlement complex of villages that can be preserved undisturbed in an intact natural landscape also supporting rare and endangered species.

The Pamo villages consisted of a complex settlement system perfectly adapted to the grasslands environment of the Santa Maria Valley. The Pamo settlement system contained a network of villages, special activity sites for the production of stone tools, seasonal sites for gathering and processing acorns and other seeds, and religious and sacred locations. Over a period of thousands of years, several large villages and outlying activity areas were established and occupied. Dozens of these undisturbed archaeological sites still exist within the Preserve.

Research on the archaeology of the Santa Maria Valley was conducted at San Diego State University's South Coastal Information Center (SCIC) and at the San Diego Historical Society by Dr. Susan M. Hector, principal investigator. Detailed results of the research are provided in Attachment A. The research consisted of a record search at SCIC to identify recorded archaeological sites and determine which areas had been systematically surveyed for cultural resources; and an archival, photograph, and map search at the San Diego Historical Society. The original plat maps for the Santa Maria Grant were examined to identify any possible historic structures or features; none were observed. Aerial photographs were also examined to identify prehistoric and historic features. Dr. Hector also obtained and evaluated archaeological and cultural resource studies in the Santa Maria Valley as part of the background research for the restoration project.

The Cagney Ranch, Voorhes Lane, Hobbs, and Hardy Ranch properties have not been systematically surveyed for cultural resources, so there were no previously recorded sites identified in those areas as a result of the record and archival searches. Informal site visits by Dr. Hector in April and July, 2002, resulted in the discovery of four sites on Cagney Ranch. Three of the sites are prehistoric camp sites, and the fourth is a historic bombing target (see description below). The three prehistoric sites have been recorded at the SCIC as SDI-17144, SDI-17143, and SDI-17142. Based on the results of this investigation, a systematic survey of the unsurveyed properties would most likely result in the discovery of additional cultural resources.

In addition to a diverse complex of prehistoric resources, the Ramona Grasslands area has important historical sites as well. The area near the Ramona Airport was used during World War II as a bombing target. The Ramona Bombing Target and Emergency Landing Field included 405 acres near the town of Ramona. Eventually, the Navy acquired enough property for a landing field, which was transferred to the County of San Diego in 1956; the County had leased the airfield since 1947. The Ramona Bombing Target was used to practice dive bombing an aircraft carrier, and is located on Cagney Ranch. It has been recorded at the SCIC as P-037-024571. The Target consisted of a series of concentric rock rings to simulate the size and shape of an aircraft carrier. Some remains from the practice bombs still remain in remote locations within the Preserve area. Conservation of this important World War II site is important as development continues to obscure the recent history of our nation.

Updated records searches are needed as properties are added to the Preserve, to determine whether inventories have been accomplished. If the properties have not been surveyed within the past five years, updated field inventories will be done. No habitat restoration, trail construction, staging area development, or other activities are planned to be conducted without a cultural resources inventory.

5.0 HABITAT AND SPECIES DESCRIPTION

The Preserve ecosystem is an interconnected and interdependent set of ecological communities, encompassing oak woodlands, chaparral, and coastal sage scrub in the surrounding hills, and the riparian corridor, meadows and marshes, vernal wetlands, and native and annual grasslands within the core grasslands area. The prehistoric and historic land uses have effected the current composition of vegetation communities in the Preserve (i.e., predominance of grasslands) and may not reflect the composition prior to human settlement of the area. Oberbauer (1978) suggests that grassland habitat is successional in coastal and foothills areas of San Diego County and in many areas may be replaced by shrubs in the absence of disturbance. It is likely that the Ramona Grasslands exhibited a greater mosaic of vegetation types prior to human settlement, and the probable altered fire and grazing regimes present pre-settlement, with a greater proportion of coastal sage scrub species and oaks historically on the rocky knolls and loamy soils.

The resources currently present in the Grasslands are valuable conservation and management targets because of their limited regional distributions in San Diego County, particularly those that support endangered species such as SKR and San Diego fairy shrimp (*Branchinecta sandiegonensis*). Although the Ramona Grassland system could potentially be managed to shift community composition to a state hypothesized to be closer to historic conditions (e.g., greater abundance of shrub species), management actions must reflect the needs of current priority resources and altered conditions (e.g., prevalence of non-native grasses).

For the purpose of this Resource Management Plan, the Preserve is subdivided into communities using soil characteristics and hydrological features, which affect their species composition and influence their responses to various management interventions (Figure 5):

Grasslands—

Loamy grasslands dominate in the center of the core grasslands area. This community is comprised of annual, mostly non-native grasses and forbs that are generally associated with well-drained, loamy soils on hills and slopes, as well as sandy alluvial soils along the floodplain.

Clayey grasslands occur in heavier clay soils that line the lower-lying portions of the grasslands, especially in the easternmost area, but also west of Rangeland Road. Native grasses and forbs, such as purple needlegrass (*Nassella pulchra*), are more common on these soils than on better-drained soils, but must still compete with non-native grasses. Vernal pools and swales occur within clayey grasslands.

Vernal pools/swales—

Vernal pools and vernal swales occur as small and scattered wetlands within the grassland matrix, especially in pockets of clay soils. The densest area of vernal pools is in the eastern portion of the Preserve within the clayey grasslands, but vernal pools and swales also occur on pockets of clay soils within the loamy grasslands community. They depend on the surrounding grassland matrix in their watersheds for much of their hydrologic functions.

Alkali playas—

Alkali playas lie within the Santa Maria Creek floodplain, north of the creek. They sit within an east-west trending swale that may be the remnant of a prehistoric creek channel paralleling the creek. The playas represent a unique wetland habitat type for San Diego County and support several rare plant species.

Riparian corridor—

This includes the Santa Maria Creek channel and the associated wetland and riparian vegetation.

5.1 Vegetation Communities, Habitats and Plant Species

The characteristics of the major vegetation communities are described in the sections below. This information is derived from field studies discussed in detail in *Baseline Conditions Report for the Ramona Grasslands Preserve* (CBI 2007), which includes a series of technical appendices that report the results of field studies conducted in the Preserve. A complete list of plant species observed to date in the Preserve, including their regulatory status, is provided in Attachment B.

5.1.1 Grasslands

The Ramona Grasslands is a complex mosaic of habitat conditions that vary directly with soil characteristics, land uses, and grazing. Vegetation structure on clayey soils tends to be different from that on loamy soils, largely because of the physical differences in how soil structure affects

water availability to plants and soil penetration by roots and burrowing animals. However, existing grassland community composition patterns are confounded by spatial patterns of grazing in the Preserve. Existing fences, rock outcrops, water sources, and topography tend to concentrate cattle activity more in some areas than others, resulting in a mosaic of grazing intensities and habitat disturbance. Some areas far from water sources, and especially those on the clay soils at the eastern end of the Cagney Ranch property, are lightly grazed resulting in dense cover of invasive non-native annuals and accumulated thatch.

Loamy grasslands

Most of the more intensively grazed area of the Preserve (i.e., central potions of Cagney Ranch and Davis-Eagle Ranch) support large areas of loamy soil types (Figure 3) and are dominated by non-native annual grasses and forbs, including long-beaked filaree (*Erodium botrys*), wild oat (*Avena barbata*), rip-gut brome (*Bromus diandrus*), and Italian ryegrass (*Lolium multiflorum*). While not an accepted vegetation community class, we refer to these as *loamy grasslands*, a useful description of these habitats for management purposes. Although dependent on grazing intensity and annual rainfall, loamy grasslands generally have a higher proportion of forbs and more bare ground than clayey grasslands (CBI 2007) and provide suitable habitat for SKR.

The majority of the loamy grasslands area continues to be used for cattle grazing and cattle tend to congregate more heavily in some portions of the property than others. In particular, cattle grazing appears to be most intense near rocky swales, where more mesic conditions make for better forage, and in the northwestern grasslands, close to the effluent spray fields of the RMWD. The spray fields are supported by a subsurface pipe network and sprinkler irrigation system. The much richer forage associated with this irrigation and associated nutrient enrichment is highly attractive to cattle. According to the local grazing leaseholder (Tellam personal communication), economically viable cattle ranching in the grasslands is largely dependent on the increased productivity provided by these spray fields.

Clayey grasslands

The grasslands occurring on areas of the Preserve supporting clay soils, which we refer to as *clayey grasslands*, tend to have the same general species composition as do loamy grasslands. However, they support a greater abundance of native grasses and forbs (Figure 6), including purple needlegrass, creeping wild rye (*Leymus triticoides)*, small-leaved morning-glory (*Convolvulus simulans*), round-leaved filaree (*California macrophylla*), southern tarplant (*Centromadia parryi* var. *australis*), and graceful tarplant (*Holocarpha virgata* ssp. *elongata*). The only known location in the Preserve of the federally threatened and state endangered San Diego thornmint (*Acanthomintha ilicifolia*) is in Bosanko clay soils west of Hardy Ranch (Figure 6). Clayey grasslands have a higher proportion of grass species cover than do loamy grasslands. Cattle grazing also appears to be less intense in the low-lying clay soils in the Preserve. While not statistically significant, grasslands on clay soils tend to support higher RDM and thatch cover than do grasslands on loamy soils used by SKR (CBI 2007).

Prior to 2005, invasive non-native plant species, especially artichoke thistle (*Cynara cardunculus*), were abundant in the grasslands, particularly in clayey grasslands. In addition, three other

invasive non-native plant species including milk thistle (*Silybum marianum*), Italian thistle (*Carduus pycnocephgalus*), and intermediate wheatgrass (*Elytrigia intermedia*) were detected primarily in clayey grasslands. These species have been the focus of an invasive non-native plant control program implemented in 2005 and 2006. This invasive non-native plant control program is discussed further in Section 6 of this document and in more detail in RECON (2005) and Kelley & Associates (2007) (in CBI 2007). Locations of non-native plants in the Preserve are shown in Figures 7a and 7b. Areas of invasive non-native plants treated in 2005 and 2006 are shown in Figure 8.

5.1.2 Vernal pools and swales

Vernal pools are scattered throughout the Preserve, but are concentrated in the northeast corner, south of the Ramona Airport (Figure 5). The pools in the Airport complex display a distinct, although shallow, mima mound topography. The length of ponded conditions in the vernal pools monitored in 2005 varied substantially, but pools in the Airport complex tended to be the least persistent (RECON 2005 in CBI 2007). Many of the vernal pools in the Preserve outside of the Airport complex appear to be associated with swale features that have been physically modified by historic land use changes (e.g., dry farming, Ramona Airport runway construction, and impoundment of the Cumming swale) that have altered swale hydrology and morphology. A deeply incised swale draining the airport runway and discharging into Santa Maria Creek has been named the *Cagney swale* and a substantial swale feature exists on the northern portion of Cumming Ranch (referred to in this report as the *Cumming swale*) that has been impounded to create a stock pond. Sections of the Cagney and Cumming swales support ephemeral pools that function in some respects like vernal pools. The Ramona vernal pools are part of the Inland Valley Management Area of the Southern California recovery plan (USFWS 1998).

The vernal pools south of the Ramona Airport and the Cagney swale are associated with Placentia soils, while many of the other pools in the Grasslands are associated with Bonsall, Fallbrook, or Bosanko soils (Figures 3 and 5). Vernal pools in the Preserve are variable in their species composition (CBI 2007) but cover in the center portions of the pools is typically dominated by Italian ryegrass, Mediterranean barley (*Hordeum marinum*), pale spike-sedge (*Eleocharis macrostachya*), iris-leaved rush (*Juncus xiphioides*), dwarf woolly-heads (*Psilocarphus brevussimus*), owl's clover (*Castilleja densiflora*), and grass poly (*Lythrum hyssopifolium*). Outside of the deepest parts of the pools, non-native annual grass and forbs, including long-beak filaree, soft chess (*Bromus hordeuceus*), slender wild oat, and hairy rat-tail fescue (*Vulpia myuros*) are increasingly important contributors to vegetative cover. Several rare and sensitive native species were detected in the vernal pools during 2005 and 2006 field surveys, including southern tarplant, small-flower microseris (*Microseris douglasii* ssp. *platycarpha*), coast popcornflower (*Plagiobothrys undulatus*), and dwarf peppergrass (*Lepidium latipes*). Little mousetail *(Myosurus minimus* ssp. *apus*) and the federally threatened spreading navarretia (*Navarretia fossalis*) have been detected in the vernal pools in the Ramona area but were not detected in the Preserve during field surveys in 2005 and 2006.

Vernal pool watershed function in other vernal pool systems has been maintained by decreasing thatch buildup through cattle grazing (Marty 2005, Pyke and Marty 2005). Following the increase in vegetative biomass from the 2005 rains, high levels of thatch were seen in the Airport

vernal pools in 2006, presumably because cattle did not graze this portion of the Preserve as heavily as other parts (e.g., loamy grassland areas, CBI 2007). Anecdotal evidence suggests that increased biomass and residual thatch in areas where cattle grazing has been discontinued (e.g., Ramona Airport, CBI 2004) result in higher water absorption rates and, thus, less surface water runoff filling the vernal pools (Ecological Ventures California 2003). However, it has been suggested that water quality in the Cumming Ranch vernal pools may be compromised by cattle ranching (EDAW 2003), although the effect on vernal pool species is unclear.

5.1.3 Alkali playas

Alkali playas, or alkali meadows, occur within the Preserve along the north side of Santa Maria Creek within a shallow, east-west trending topographic depression or swale (Figure 5). This and other swales in the Preserve are mapped as alkali seeps in the San Diego regional vegetation database (Figure 5). However, the only location in the Preserve where alkali playas occur within these seeps is in the area north of Santa Maria Creek. The playas are adjacent to vernal pools, and the distinction in their mapping appears to be that vernal pools support dwarf wooly heads and alkali playas do not (FAA 2003).

The alkali playas in the Preserve do pond in the winter months, though it appears that they pond less frequently than the vernal pools in the Airport complex. However, in 2005 surface water overtopped the Santa Maria Creek channel and flowed through the east-west trending swale, completely inundating and hydraulically connecting the alkali playas and adjacent vernal pools (Figure 4b). The single alkali playa monitored for its hydroperiod in 2005 was among the largest in the Preserve, and held between 5 to 10 inches of water for about two months (RECON 2005, CBI 2007). Conductivity (a measure of the amount of dissolved solids, such as salts, in water) was measured in several alkali playas in March 2005 and ranged from 1,890 microsiemens (µS) to over 1,990 µS, whereas the conductivity of vernal pools in the Airport complex was less than 150 µS (CBI 2007). This implies there is an underlying soil difference that contributes dissolved salts to the overlying water in playas. Very little is known about the origin of the alkali playas or the processes that maintain them. CBI (2006) speculated that periodic overbank flow from Santa Maria Creek may have played a role in the maintenance of alkali playa habitat in the Grasslands by periodically scouring the east-west trending swale that supports the playas.

Common species in the alkali playas include pale spike-sedge, Italian ryegrass, grass poly, bermuda grass (*Cynodon dactylon*), Buccone's sand-spurry (*Spergularia bocconi*), saltgrass (*Distichlis spicata*), and alkali barley (*Hordeum intercedens*). Three rare plants, Parish's brittlescale (*Atriplex parishii*), Coulter's saltbush (*A. coulteri*), and dwarf peppergrass (*Lepidium latipes* var. *latipes*) are associated with the alkali playas in the Preserve, and southern tarplant occurs around the margins of the playas (Figure 6). The *Atriplex* species in the Ramona grasslands (*A. parishii* and *A. coulteri*) have been found elsewhere in the Southwest but are rare in San Diego County. Parish's brittlescale was believed to be extinct until 1990 but has since been relocated in Riverside County. The Preserve represents the only location of this species in San Diego County. The invasive, non-native Buccone's sand-spurry and bermuda grass are quite dense in areas within and adjacent to *A. parishii* and *A. coulteri* patches, possibly outcompeting these rare plants.

5.1.4 Riparian corridor

The Santa Maria Creek channel within the Preserve varies in width from 30 to 200 feet and in depth from 3 to 12 feet, although the active channel is generally confined to a small portion of the wider reaches of the creek (CBI 2007). The majority of Santa Maria Creek within the Preserve has an ephemeral flow regime, flowing only in response to rainfall events in the watershed, but the westernmost reach supports permanent surface water.

Vegetation community composition also varies in response to land use and hydrology along the length of Santa Maria Creek within the Preserve. For example, cows historically congregated near cover provided by riparian trees in the Preserve, especially for calving (Tellam personal communication), but were excluded by fences from the riparian corridor along the Vorhees Lane properties (Note: the entire riparian corridor of the preserve was completed fenced to exclude cattle in 2006). As is discussed by CBI (2007) and described below, this historic difference in grazing pressure has resulted in a different vegetation community composition and structure. For the purposes of describing the biological resources of the Santa Maria Creek corridor, it has been divided into six reaches (Figure 5). Reach D (Vorhees Lane properties) has been fenced from cattle since at least the 1980s (some properties as early as 1968, CBI 2006), Reaches B and C were fenced in the spring of 2004 by the WRI, Reaches A and E were fenced by DPR in 2006. Vegetation species composition is summarized by below.

Reach A – This reach is downstream of Rangeland Road at the western end of the grasslands. This is the only reach supporting permanent surface water in the Preserve. The vegetation community in this reach is mulefat (*Baccharis salicifolia*) scrub and is dominated by relatively dense cover of shrubby mulefat. The herbaceous layer is dominated by freshwater marsh species including, Olney's bulrush (*Schoenoplectus americanus*), yerba mansa (*Anemopsis californica*), Mexican rush (*Juncus mexicanum*), and western ragweed (*Ambrosia psilostachya*) and mulefat seedlings. An occasional black willow (*Salix gooddingii*) can be found in this reach. At the northern (downstream) end of the reach, Santa Maria Creek begins to enter Bandy Canyon and coast live oak (*Quercus agrifolia* var. *agrifolia*) and western sycamores (*Platanus racemosa*) begin to occur along the stream banks.

Reach B – This reach has been fenced since 2004, but was accessible to cattle prior to that time. It is relatively marshy supporting bromes (*Bromus* spp.), Olney's bulrush, salt grass, western ragweed, yerba mansa, white sweet clover (*Melilotus alba*), and cocklebur (*Xanthium strumarium*). It has virtually no shrub or canopy cover.

Reach C – This reach has been fenced since 2004, but accessible to cattle prior to that time. A cattle stock tank is located adjacent to the channel at the eastern end of the reach. The channel is largely unvegetated sandy substrate with patches of herbaceous species including cocklebur, yerba mansa, mugwort (*Artemisia douglasiana*), water speedwell (*Veronica anagallis-aquatica*), great marsh evening primrose (*Oenothera elata* ssp. *hirsutissima*), grass poly, bromes, and mulefat seedlings. Mulefat occurs in the shrub layer, and scattered individual black willow, arroyo willow (*Salix*

lasiolepsis), and Fremont cottonwood (*Populus fremonti*) form the sparse canopy layer.

Reach D – Most of this reach is privately owned and is not part of the Preserve. This reach has the highest quality riparian vegetative cover in the vicinity of the Preserve, since the private properties along this reach have been fenced from cattle since at least the 1980s. The channel is sandy with patches of yerba mansa, Mexican rush, mugwort, water speedwell, cocklebur, great marsh evening primrose, creeping wild rye, grass poly, and mulefat seedlings. Mulefat occurs in the shrub layer, and black willow, arroyo willow, and Fremont cottonwood comprise the relatively dense canopy layer.

Reach E – This reach was historically accessible to cattle until fencing was installed in 2006. The channel dominated by bare sandy substrate and non-native annual grasses and forbs. Little shrub cover and virtually no canopy cover, except for occasional individual black willow and Fremont cottonwood.

Reach F – This reach is currently accessible to cattle. The channel is dominated by bare sandy substrate and non-native annual grasses and forbs. The eastern end of the reach has abundant shrubby mulefat, while the western end has little shrub cover. Virtually no canopy cover is present in the reach, except for the occasional individual narrow-leaf willow (*Salix exigua*), red willow (*Salix laevigata*), and black willow.

Invasive non-native plant species, including salt cedar (*Tamarix ramosissima*), giant reed (*Arundo donax*), milk thistle, and perennial pepperweed (*Lepidium latifolium*) have been detected in the Santa Maria Creek corridor (7a, b). These species have been the focus of an invasive non-native plant control program implemented in 2005 and 2006 (Figure 8). Perennial pepperweed was treated on Cumming Ranch in 2005, but access was not granted to this property in 2006 and no follow-up surveys or treatments occurred. This population will be closely monitored to ensure it does not spread into downstream areas. This invasive non-native plant control program is discussed further in Section 6 of this document and in more detail in RECON (2005) and Kelley & Associates (2007) (in CBI 2007).

5.1.5 Other communities

Two other communities are also present within the Preserve, oak woodland and coastal sage scrub (Figure 5). Oak woodland, characterized by an open woodland of coast live oaks (*Quercus agrifolia* var. *agrifolia*), occurs along Santa Maria Creek on the TNC Oak Country Estates and the RMWD properties. Patches of milk thistle occur within stands of oaks and have been the subject of an invasive non-native plant removal program in the Preserve (RECON 2005 and Kelley & Associates 2007, in CBI 2007). Coastal sage scrub, dominated by California sagebrush (*Artemisia californica*), coast California buckwheat (*Eriogonum fasciculatum* var. *fasciculatum*), white sage *(Salvia apiana*), and laurel sumac (*Malosma laurina*), occurs at the northern edge of the Preserve on the Davis-Eagle Ranch property. The coastal sage scrub on Davis-Eagle Ranch supports the federally threatened coastal California gnatcatcher (*Polioptila californica californica*) and is contiguous with larger areas of coastal sage scrub in the San Pasqual Valley.

With the exception of non-native plants in the oak woodland, no management issues have been identified for these two communities, and they are not addressed further in this report.

5.2 Animal Species

Animal species occurring in the various habitats of the Preserve are discussed in the sections below. A complete list of wildlife species observed and their regulatory status is provided as Attachment C.

5.2.1 Grasslands

Loamy grassland habitats in the Preserve support a regionally important population of the federally endangered and state threatened SKR. Suitable habitat for this species is located in the central part of the Preserve on well drained soils with relatively high cover of annual forbs and bare ground (Figure 9). The distribution of SKR within this area of suitable habitat is patchy and density is variable from year to year depending on rainfall and resulting vegetation growth, grazing intensity, and underlying soil characteristics (Spencer and Montgomery 2007 in CBI 2007). Following drier winters, SKR expand into areas of lower quality habitat within the loamy grasslands as the structure of these areas remains more open relative to wetter years. Following wetter winters when lower habitat quality areas are overwhelmed by dense growth of annual grasses, the SKR population contracts to the highest quality areas, i.e., those areas where the amount of bare ground and annual forb cover consistently remain the highest. The SKR population in the Preserve during the 2005-2006 survey period is considered to be fairly low in abundance due to the high biomass of annual grasses following the wet winter of 2005 (Spencer and Montgomery 2007 in CBI 2007).

The loamy grassland habitats in the Preserve also support a diverse raptor community, including wintering raptors such as ferruginous hawk (*Buteo regalis*) that require similar open grassland habitat conditions that benefit from moderate grazing regimes (CBI 2007). As many as 22 ferruginous hawks winter every year in the Preserve, the largest wintering concentration of these rare hawks in San Diego County (WRI 2006 in CBI 2007). A variety of other raptors utilize the Ramona Grasslands for wintering and nesting (WRI 2006 in CBI 2007), including Cooper's hawk (*Accipiter cooperii*), red-tailed hawk (*Buteo jamaicensis*), red-shouldered hawk (*Buteo lineatus*), American kestrel (*Falco sparverius*), white-tailed kite (*Elanus leucurus*), barn owl (*Tyto alba*), great-horned owl (*Bubo virginianus*), and turkey vulture (*Cathartes aura*) (Figure 10). A pair of golden eagles (*Aquila chrysaetos*) nests in Bandy Canyon and they are known to forage in the Preserve. Burrowing owls have been observed throughout the Preserve; however, have only been observed nesting in artificial nest boxes on the WRI property (Figure 10, WRI 2006 in CBI 2007).

A number of terrestrial animal species have been detected in the Preserve including coachwhip (*Masticophis flagellum*), two-striped garter snake (*Thamnophis hammondi*), gopher snake (*Pituophis catenifer annectens*), Botta's pocket gopher (*Thomomys bottae*), Dulzura kangaroo rat (*Dipodomys simulans*), Audubon's cottontail (*Sylvilagus audubonii*), California ground squirrel (*Spermophilus beecheyi*), gray fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*), mule deer (*Odocoileus hemionus*), bobcat (*Felis rufus*), and mountain lion (*Felis concolor*). There

have been reports of American badger (*Taxidea taxus*) in the Preserve, but this species was not documented during baseline surveys conducted in 2005 and 2006. While comprehensive bird surveys were only conducted in riparian habitats associated with Santa Maria Creek, other avian species detected in the grasslands include Cassin's kingbird (*Tyrannus vociferans*), western kingbird (*Tyrannus verticalis*), grasshopper sparrow (*Ammodramus savannarum*), lark sparrow (*Chondestes grammacus*), loggerhead shrike (*Lanius ludovicianus*), mourning dove (*Zenaida macroura*), killdeer (*Charadrius vociferous*), and European starling (*Sturnus vulgaris*).

5.2.2 Vernal pools and swales

The federally endangered San Diego fairy shrimp is well distributed in the vernal pools and swales in the Preserve (FAA 2003, RECON 2005 in CBI 2007), and has also has been detected in portions of Santa Maria Creek (EDAW 2003). No other fairy shrimp species were detected in the Preserve. The distribution of fairy shrimp among vernal pools may be related to vernal pool hydrology, and some vernal pools apparently do not hold water long enough for fairy shrimp to reach maturity in some years (EDAW 2002, EDAW 2003, Ecological Ventures California 2003). However, given natural variation in the morphology of vernal pools, variation in habitat suitability of fairy shrimp is to be expected.

Vernal pools in the Preserve support breeding populations of western spadefoot toad (*Spea hammondii*), western toad (*Bufo boreas*), and Pacific tree frog (*Pseudacris regilla*) (RECON 2005 in CBI 2007). Spadefoot and western toads were observed in approximately half of the pools surveyed in the Preserve in 2005 (RECON 2005 in CBI 2007). Waterfowl such as Canada geese (*Branta canadensis*) and mallard (*Anas platyrhynchos*) utilize vernal pools and swales when ponded in the winter.

5.2.3 Alkali playas

San Diego fairy shrimp were detected in the single alkali playa surveyed in 2005 (RAAP 100), but only on the first survey date (1/21/05, RECON 2005 in CBI 2007). This was shortly after overbank flow from Santa Maria Creek moved through this and other alkali playas and vernal pools in the swale north of Santa Maria Creek. It is possible that fairy shrimp were transported into RAAP 100 from adjacent pools. It is unclear if San Diego fairy shrimp can survive in alkali playas where conductivity can exceed 1,800 µS. Western toads bred and successfully metamorphosed in RAAP 100 in 2005 (RECON 2005 in CBI 2007)

5.2.4 Riparian corridor

A breeding population of the federally endangered arroyo toad (*Bufo californicus*) has been documented in the western reach (Reach A) of Santa Maria Creek (Figure 11, RECON 2005 and Hollingsworth et al. 2006 in CBI 2007). Arroyo toad habitat in the Preserve appears to be restricted to this reach of Santa Maria Creek, and is a product of surface water hydrology. The creek channel in the upstream portion of the Preserve is predominately sandy alluvium and is characterized by ephemeral stream flow. In the reaches upstream of Rangeland Road (i.e., Reaches B-F) Santa Maria Creek flows only in response to rainfall events. Even in the very wet winter of 2005, surface flow in these reaches had stopped by June. However, at the extreme

western end of the Preserve, surface water appears to be perennial. CBI (2006) speculated that the granitic geology forming the western "wall" of the Santa Maria Valley, through which the creek has cut Bandy Canyon, may maintain groundwater at a shallower depth below the channel bottom than in the eastern end of the Valley by "impounding" shallow groundwater as it flows through the Valley to Bandy Canyon. This would also explain the presence of marsh vegetation in this reach of the creek, which requires consistently high groundwater. Regardless of the mechanism, which clearly requires more investigation, it appears that the western end of the Preserve consistently provides suitable habitat for arroyo toads, whereas the eastern end of the Preserve typically does not provide suitable habitat for this species.

Reach A also supports western toad, two-striped garter snake, California kingsnake (*Lampropeltis getula*), and Pacific treefrog. A number of non-native species, including crayfish (*Procambarus clarkii*), mosquitofish (*Gambusia affinis*), largemouth bass (*Micropterus salmoides*), green sunfish (*Lepomis cyanellus*), and bullfrog (*Rana catesbeiana*) are present in Reach A as well. It appears that arroyo toad abundance in areas of suitable habitat on Santa Maria Creek (i.e., Reach A) is less than what has been reported in similar stream systems, and this is likely due the high abundance of bullfrogs and other non-native aquatic species (Hollingsworth et al. 2006 in CBI 2007).

Avifauna surveys were not conducted with equal effort throughout the Preserve. In particular, the most well developed riparian woodland in Reach D was under-surveyed relative to other reaches because of a lack of access to private properties in this reach. Bird species most commonly detected breeding within the Santa Maria Creek corridor are primarily habitat generalists (Lovio 2007 in CBI 2007), and included red-tailed hawk, American kestrel, mourning dove, Anna's hummingbird (*Calypte anna*), black phoebe (*Sayornis nigricans*), ash-throated flycatcher (*Myiarchus cinerascens*), Cassin's and western kingbirds, western scrub-jay (*Aphelocoma californica*), American crow (*Corvus brachyrhynchos*), bushtit (*Psaltriparus minimus*), spotted towhee (*Pipilo maculatu*), California towhee (*Pipilo crissalis*), brown-headed cowbird (*Molothrus ater*), blue grosbeak (*Guiraca caerulea*), and house finch (*Carpodacus mexicanus*). Only one species detected in 2005, the yellow warbler (*Dendroica petechia*), may be regarded as a riparian obligate species. However, this species can show affinity for non-native forests, and was associated with the eucalyptus woodland adjacent to the creek in Reach E (Lovio 2007 in CBI 2007). In addition, several species, including sora (*Porzana carolina*), Virginia rail (*Rallus limicola*), and red-winged blackbird (*Agelaius phoeniciu*) were associated with the mulefat scrub and marsh habitats in Reach A of the creek corridor (Lovio 2007 in CBI 2007).

5.3 Overall Biological Value

The conservation significance of the Ramona Grasslands has been recognized by many governmental and nongovernmental organizations, including the County of San Diego, State Water Resources Control Board, San Diego Regional Water Quality Control Board, CDFG, U.S. Fish and Wildlife Service (USFWS), TNC, San Dieguito River Valley Conservancy, and WRI, which has its headquarters in the Ramona Grasslands. The Preserve supports at least 19 known sensitive species (Appendices B and C), and will play a prominent role in the proposed North County Multiple Species Conservation Program (MSCP) preserve system, which aims to

prioritize conservation for rare and endangered species and the habitats that support them. Lands prioritized for protection in the western subregion MSCP are designated as the Multiple Habitat Planning Area (MHPA), and those within the North County MSCP are designated as the Pre-Approved Mitigation Area (PAMA). Areas that are already conserved or have agreements for conservation are considered *hardline* preserve areas within the MHPA and PAMA (Figure 12).

The Ramona Grasslands function as a core habitat area within a regional network of existing and anticipated conservation lands, including lands in the San Dieguito River Valley to the north and San Vicente Highlands Open Space Preserve to the south. The coastal sage scrub, chaparral, and oak woodlands of the surrounding landscape, together with the grasslands, riparian habitat, and vernal wetlands of the core area, constitute an exceptional concentration of regionally and globally significant resources. This significance is reflected by the near complete overlap of the Preserve by Critical Habitat designated by the USFWS for three threatened and endangered species—San Diego fairy shrimp, coastal California gnatcatcher (*Polioptila californica californica*), and spreading navarretia (Figure 13).

6.0 MANAGEMENT ELEMENTS AND GOALS

A managed grazing program, supplemented with other management actions as necessary to achieve management goals, is considered the most cost effective approach to maintaining existing high value biological resources and enhancing and restoring lower quality resources in the Preserve. The current grazing regime of the private cattle operations in the Preserve is beneficial to several high priority species utilizing the loamy grasslands, e.g., SKR and raptors. Modifications to the current grazing regime, via managed grazing within specifically delineated grazing management units, was recommended by CBI (2004) to enhance resource values in the riparian corridor and clayey grasslands. The use of managed grazing to benefit riparian habitats and vernal pools as discussed by CBI (2004), Marty (2005), and Pyke and Marty (2005) provide recent experimental evidence demonstrating the benefits of grazing to vernal pool systems. In addition, an invasive non-native plant removal program implemented in the Preserve by DPR starting in 2005 is showing positive effects (RECON 2005 and Kelly & Associates 2007 in CBI 2007).

Adaptive management is the concept of treating natural resources management as an experiment, where responses of the system to management actions are observed and recorded, so that the manager can learn from the experience and alter future management actions as appropriate (Holling 1978, Walters 1986, Meffe et al. 2002). Adaptive management explicitly recognizes the gaps in our knowledge and understanding of ecosystems, the inherent uncertainties in land management, and the need for management to be flexible and informed by monitoring. Therefore, while management prescriptions are established in this plan, ecosystem responses to management must be evaluated through monitoring and adjusted accordingly. This approach increases our overall understanding of the natural variation of factors contributing to ecosystem health or integrity, which in-turn improves our ability to manage these ecosystems.

Components of experimental design typically include controls and replication, randomization, and interspersion of treatments (Hurlbert 1984). However, in the Preserve it will be difficult to design formal experiments for many target resources. For example, due to their distribution, it is

not practical to construct enclosures around all vernal pools, vernal pool complexes, or clay soil units to replicate even a single grazing treatment/control experiment, let alone evaluate a variety of grazing intensity and timing treatments. However, comparing the responses of target resources to alternative management actions that can be distributed across different management units, even if conducted outside the framework of a controlled experiment, can increase land managers' understanding of ecosystem variability and response. In addition, because of the scale of management units are much larger than distributions of some resource types (e.g., alkali playas and some vernal pools are contained within a loamy grassland management unit), it may be necessary for the habitat manager to regulate grazing at a smaller scale within the management unit (e.g., use of temporary or electric fencing) or employ alternative approaches to achieve management objectives.

Therefore, the objective of this plan is to establish biological goals for a workable and cost-effective management program for maintaining and restoring the Ramona Grasslands ecosystem, and to provide management prescriptions based on existing conditions and our current understanding of this ecosystem. It is important to recognize that an experienced habitat manager must refine grazing prescriptions, consistent with these goals, as management actions are implemented, variations in weather are accounted for, responses to management observed, and understanding of the ecosystem is improved. Natural variations in environmental conditions are constantly in flux, and the desired biological responses to management actions may require many years to achieve. Thus, the long-term monitoring program is a fundamental component of the adaptive management of the Preserve, and will document the ranges of natural variation within the different grasslands communities and the ecosystem as a whole, as well as the differential responses to human-controlled management prescriptions.

The management actions outlined below integrate our current understanding of the biological requirements for target resources and the logistical considerations for establishing workable grazing management units. Management actions such as invasive non-native plant control will be implemented outside of the grazing management framework. All management goals may be revised and updated to comply with the requirements of the North County MSCP once it is approved.

Table 4 serves as a conceptual model for how various conservation targets, key ecological factors, and indicators can inform management actions for the Ramona Grasslands Preserve. Management approaches vary among the ecological communities because of hypothesized differences in how specific management actions differentially affect conservation targets via key ecological factors. For example, cattle grazing (herbivory) benefits a number of target resources by opening up habitat, controlling invasive non-native species, reducing detrimental thatch buildup, and increasing water availability in vernal wetlands, although resources may respond differentially to the timing and intensity of livestock grazing. However, grazing may adversely affect other target resources (e.g., riparian vegetation and water quality) due to herbivory, trampling, and nutrient input from urine and feces. Such differences in the anticipated response of target resources to ecological factors and management tools are used to define management approaches for each ecological community. Defining management approaches requires considering our scientific understanding of the ecology of each community, the responses of

each community to major stressors, and the existing and desired conditions for each conservation target.

6.1 Biological Elements: Goals and Tasks

Within the Preserve, there are three major biological elements around which the managed grazing program has been developed – loamy grasslands, clayey grasslands, and the Santa Maria Creek corridor (riparian corridor). The delineation of grazing management units presented in the Framework Management and Monitoring Plan was based on the distribution and differential response to grazing of the various conservation targets and existing fencing in the Preserve (CBI 2004). Additional fencing to create these units was installed by the County in the summer of 2006 (Figure 14). Some management actions (e.g., invasive non-native plant removal) will be implemented independent of management unit boundaries.

The locations of fences, gates, and the resulting management units in the Preserve are shown in Figure 14. Management Units 1A, 1B, and 1C are units of the Santa Maria Creek corridor. Management Units 2A and 2B are loamy grassland units in the heart of the Preserve, and Management Units 3A, 3B, 3C, 3D, and 3E are clayey grassland units at the edges of the existing Preserve. As described below, major biological elements and individual management targets are distributed among these grazing management units and grazing intensity (a combination of number of cattle and length of time in a unit) will be managed within various grazing management units for specific resource targets. All management and monitoring described below is subject to funding availability.

6.1.1 Loamy grasslands

Loamy grasslands (Management Units 2A and 2B, Figure 14) support high quality habitat for SKR and raptors such as ferruginous hawks. With the exception of the alkali swale and alluvial soils adjacent to Santa Maria Creek in the southern portion of Management Unit 2A, these management units are generally characterized by a relatively open vegetation cover, with a high proportion of bare ground and low amounts of thatch. The southern portion of Management Unit 2a has denser and taller vegetation, including patches of southern tarweed. The primary management emphasis for loamy grassland habitats in the Preserve is long-term maintenance of conditions suitable for SKR and raptors, and maintaining viable populations of rare alkali playa plant species.

It is becoming increasingly clear that the structure of grasslands in the Preserve (e.g., density, height and biomass of grasses and forbs and amount of bare ground) can vary substantially from year-to-year depending on weather patterns, and that species such as SKR exhibit population fluctuations in response to these conditions. SKR appear adapted to this inter-annual variation in habitat quality, so that management actions should focus on maintaining appropriate conditions over the long-term, rather than attempting to maintain a consistent grassland structure each year. As long as grazing is maintained in the Preserve, the distribution and abundance of SKR and other loamy grassland species is expected to naturally expand and contract in response to annual rainfall and changing habitat conditions (Spencer and Montgomery 2007 in CBI 2007).

Table 4. Conceptual model for managing conservation targets in the Preserve.

Conservation Target	Key Ecological Factors	Factors	Indicators	Desired Condition	Management Implications
Stephens' kangaroo rat (SKR)	vegetation structure and composition	grazing (herbivory), fire	forb/grass ratio	abundance of annual forbs to produce preferred foods and facilitate movements	Moderate to heavy grazing is beneficial on loamy soils.
			% bare ground	abundant bare ground patches for foraging, dust bathing, etc.	
			residual thatch	very sparse thatch remaining during summer-fall to facilitate foraging, movement, and forb regeneration	
	soil condition/burrow availability	soil type	soil texture and depth	deep loams	Management unlikely to improve SKR conditions on heavier clay soils; management ineffective on wetland soils. Avoid heavy trampling on moist soils.
		compaction (e.g., trampling)	soil bulk density	low bulk density; well-drained soils	
		pocket gopher abundance	gopher burrows	abundant pocket gophers to aerate soils and provide "starter" burrows for kangaroo rats	
Ferruginous hawk	prey base (esp. pocket gophers)	soil type, vegetation diversity	similar to SKR	abundant pocket gophers and other rodent prey	Same as SKR: Graze loamy soils to maintain open, forb-dominated foraging areas with abundant gophers.
	vegetation structure and composition	same as SKR	similar to SKR	open, sparse vegetation to facilitate successful foraging behavior	
Burrowing owl	vegetation structure	grazing	same as SKR	same as SKR	Same as SKR
	burrow availability	ground squirrel abundance	ground squirrel burrow counts	abundant burrows to facilitate nesting	Prohibit poisoning of squirrels or other rodents in areas occupied by burrowning owls; add artificial burrows as necessary.

Table 4 (cont). Conceptual model for managing conservation Targets in the Ramona Grasslands Preserve.

Conservation Target	Key Ecological Factors	Factors	Indicators	Desired Condition	Management Implications
Native grassland community	competition with annual plants	grazing (competitive advantage to annuals when heavily grazed)	native to non-native abundance/biomass ratio	light herbivory to favor perennial growth and reproduction and remove non-native thatch	Perennial grassland management areas will have light grazing.
		soil type (competitive advantage to annuals on loamy soils)	soil texture	clay soils to favor perennials in competition with annuals	Native grassland restoration unlikely to succeed except on clay soils due to competitive advantages of non-native annuals on better-drained soils.
Arroyo toad	habitat quality	grazing intensity, hydrologic characteristics	groundwater elevation	high local groundwater table	Restore riparian vegetation on channel banks to slow flow and increase bank storage and groundwater recharge.
			persistence of surface water	surface water in Santa Maria Creek through June	
			channel characteristics	open channel bottom with sand and gravel bars	Maintain open channel bottom via natural scour patterns or with periodic grazing.
		vegetation structure	canopy structure	occasional openings (no trees or shrubs) on sand bars in creek	Consider occasional use of cattle to open canopy in specific sites to improve breeding habitat.
Least Bell's vireo and other neotropical migratory bird species	riparian vegetation structure and composition	livestock grazing	vertical structure, density and species composition of riparian vegetation	dense shrubby understory with closed overstory, dominated by willows, cottonwoods, and mulefat	Restrict cattle from stream corridor to allow passive restoration of riparian/wetland vegetation; intervene with active restoration as indicated by monitoring; use cattle as management tool to alter structure of vegetation as indicated by monitoring.

Table 4 (cont). Conceptual model for managing conservation Targets in the Ramona Grasslands Preserve.

Conservation Target	Key Ecological Factors	Factors	Indicators	Desired Condition	Management Implications
Surface water quality	non-point source pollutant inputs to creek	livestock bank trampling; input of urine/feces	concentrations of nitrogen (N), phosphorus (P), suspended solids	Basin Plan standards; little/no livestock urine or feces in creek; no disturbance of channel banks; little/no runoff of excess N and P from uplands into wetlands	Restrict cattle from riparian zone and upland buffer; maintain water and shade sources well away from floodplain to spread urine/feces away from waterways; allow riparian vegetation to recover from grazing; intervene with invasive non-native plant species removal and/or active restoration as indicated by monitoring. No new development in Preserve except for public trails.
		urban runoff	loads of N, P, automotive hydrocarbons, pesticides, herbicides, metals	reduced pollutant loads from Ramona to areas downstream of Cagney property	
Surface water quality	Riparian/wetland vegetation structure (stabilizes soils and filters out pollutants)	grazing (herbivory)	density and cover of vegetation along and within stream channel	natural density and diversity of riparian vegetation to stabilize stream banks and filter out pollutants; greatly reduced inputs of N, P, and TDS into waters of the state.	Restrict cattle from stream corridor to allow passive restoration of riparian/wetland vegetation; intervene with active restoration as indicated by monitoring.
San Diego fairy shrimp	depth and duration of inundation (hydroperiod)	watershed size and vegetation density in pool and watershed	exotic plant density; residual thatch	inundation through March/April in average rain years; hydroperiod for no less than 2 weeks at a time	Grazing during wet season may maintain hydroperiod by reducing vegetation density and thatch.
	metapopulation dynamics and local extinctions	proximity of pools; wildlife or cattle use of pools (disperse cysts); absence of toxics (incl. pesticides) and sediments in watershed	fairy shrimp presence and abundance (adults, cysts) by pool; recurring maturation on annual basis	pools managed as complexes with conserved watersheds; natural dissemination of cysts among pools (by birds, other wildlife); appropriate water quality	Some cattle use may disseminate cysts between pools. Restrictions of pesticide use and sediment discharge in vernal pool watershed.

Table 4 (cont). Conceptual model for managing conservation Targets in the Ramona Grasslands Preserve.

Conservation Target	Key Ecological Factors	Factors	Indicators	Desired Condition	Management Implications
Vernal pool/swale plant communities	competition from exotic species	grazing (herbivory); fire	native/exotic ratio; populations of native vernal pool indicator species; thatch density	high native/exotic ratio; stable/increasing populations of native vernal pool plants; low residual thatch during summer/fall	Use managed livestock grazing (or fire) during the fall and early winter to control weedy exotics and reduce thatch; remove grazing during period of native forb growth (April-October); control invasive exotics as necessary by other means based on monitoring.
	depth and duration of innundation (hydroperiod)	watershed size and integrity (contiguity); vegetation density in pool and watershed	exotic density; residual thatch	inundation through March/April in average rain years; hydroperiod for no less than two weeks at a time	
	integrity of pool bottom	trampling in wet season	hoof prints, fractures in pool hardpan, stirring of vernal pool soils and decreasing water holding capacity	intact clay hardpan pool bottom	
	nutrient loads	urine/feces in pools and watersheds	P, N, feces	low levels of P, N, feces in pools.	

Table 4 (cont). Conceptual model for managing conservation Targets in the Ramona Grasslands Preserve.

Conservation Target	Key Ecological Factors	Factors	Indicators	Desired Condition	Management Implications
Alkali playa plant communities	competition from exotic species	grazing (herbivory); fire	native/exotic ratio; populations of endemic plant species associated with saline/alkaline conditions; thatch density	high native/exotic ratio; stable/increasing populations of endemic plants associated with saline/alkaline playa habitats; low residual thatch during summer/fall	Use managed livestock grazing (or fire) to control weedy exotics and reduce thatch; control invasive exotics as necessary by other means based on monitoring.
	location in floodplain, seasonal inundation and presence of saline and alkaline soils	floodplain size and integrity (contiguity); infrequent indundation and intervals of drying between flooding; vegetation density in playa and watershed	exotic density; residual thatch	infrequent inundation with intervals of drying; appropriate salinity or alkalinity levels (pH above 8.5)	
	integrity of depression bottom	trampling in wet season	hoof prints, stirring of playa soils and decreasing hydrological gradient	intact clay playa bottom/appropriate pH in soil	
	nutrient loads	urine/feces in playas and floodplain	P, N, feces	low levels of P, N, feces in pools.	

Changes in grazing management in the loamy grasslands, or other management interventions such as prescribed fire, to maintain SKR habitat would likely only be required if a sequence of very wet years radically changed the structure of loamy grasslands. There are scattered occurrences of invasive non-native plant species in the loamy grasslands that have been the focus of a removal program, which should continue as needed. In addition, non-native plants in alkali playas may be a threat to rare plant species in this system, and require removal to ensure long-term persistence of these species.

Biological Goal A.1– Eliminate aggressive invasive non-native plant species from loamy grasslands.

Invasive non-native plant species of concern in the loamy grasslands within the Preserve include artichoke thistle and horehound. These species have been treated since 2005 as part of an ongoing removal program (RECON 2005 and Kelly & Associates 2007 in CBI 2007). Distribution of invasive non-native plant species treated in these years is shown in Figures 7a, b.

Task A.1.1: Annually treat all occurrences of invasive non-native plant species of concern in Management Units 2A and 2B. Herbicides used in 2005 and 2006 were Transline, Garlon 4a, Pathfinder (a pre-mix of Garlon 4a in a seed oil base), Glypro Pro (a Glyphosate herbicide, a generic Roundup), and Fusilade II. Treatments should continue with these herbicides as described by RECON (2005) and Kelly & Associates (2007) (in CBI 2007), or as recommended by a licensed weed removal specialist.

Transline and Garlon 4a are broadleaf specific herbicides. Transline, approved for rangeland use with cattle present, is most effective when used at the basal stage of artichoke thistle. It begins to lose effectiveness when the artichoke thistle bolts (flower buds emerge from the basal stage and grows upwards). At that point, Garlon 4a and Glyphosate Pro (generic Roundup), become more effective. Glypro Pro is a non-specific herbicide controlling both dicots and monocots. Once the plants are bolting in the field, a cocktail of Transline and either Garlon 4a or GlyPro II should be used. Keeping Transline in the cocktail of herbicides is important because the herbicide has a pre-emergent effect, killing emerging seedlings that would germinate the following year. Fusilade II is a grass specific herbicide.[1]

Biological Goal A.2 – Maintain the condition of loamy grassland habitats suitable for species such as SKR and raptors to ensure long-term persistence of these species.

Grazing Management Units 2A, 2B support high quality habitat for loamy grassland target species (SKR and wintering raptors, such as ferruginous hawks). Management Units 2A, 2B also support scattered vernal pools and swales, the alkali playa system (in Management Unit 2A), patches of clay soils, and rare plants such as southern tarplant, Coulter's saltbush, and Parish's brittlescale. Current grazing intensity in these units are beneficial to SKR, which thrives on sparse, forb-dominated vegetation communities with little thatch and abundant bare ground, and for foraging raptors.

[1] All references to Transline assume the rate of herbicide used is 0.25 oz of Transline per gallon of water with both a surfactant and dye added. Garlon 4a is used at 1% (1.33 oz per gallon of water) and mixed with Transline. Glypro Pro is used at 1% and mixed with Transline. Fusilade II is used at the rate of 1 oz per gallon of water.

Cattle grazing should be maintained in the Preserve to maintain suitable habitat for these species. Residual Dry Matter (RDM) quantifies the level of above-ground biomass at the end of the growing season, and is used by range managers to track the status of available forage for livestock. Heavier grazing reduces RDM, which is correlated with conditions beneficial to SKR (e.g., decreased cover of thatch, increased amount of bare ground). However, heavy grazing may also reduce the diversity and abundance of some prey species (e.g., rodents, lagomorphs, songbirds, insects, etc.) that help support a diverse community of raptors and other predatory species. Continuous heavy grazing also reduces native plant diversity, which is currently very low in the areas supporting a higher population of SKR (CBI 2007).

Task A.2.1: Manage grazing within Grazing Management Units 2A, 2B to maintain a suitable grassland habitat structure for SKR and foraging raptors. The existing grazing regime in this management unit is suitable for maintaining habitat quality for these target species, i.e., 20-50% bare ground and the ratio of forb cover to grass cover greater than two (Spencer 2003), particularly in the portions of these units that are of highest quality for SKR (Figure 9). An RDM of 1,500 pounds (lbs)/acre to less than 1,000 lbs/acre should be targeted in core habitat areas for SKR. Although SKR is found in areas of the Preserve with RDM over 2,000 lbs/acre, RDM of 3,000 lbs/acre appears to be an upper threshold for suitable habitat (Spencer and Montgomery 2007 in CBI 2007). Higher RDM levels are acceptable in portions of the management units not within core SKR habitat (e.g., the southern edge of Management Unit 2A and coastal sage scrub in north portion of Management Unit 2B, Figure 9).

Management Unit 3A supports both loamy grasslands with SKR (Figure 9) and clayey grassland with some purple needlegrass patches (Figure 6) and scattered vernal pools (Figure 5). Although the SKR population in Management Unit 3A is small and isolated from core SKR habitat in the Presere, it is recommended that the management regime for this unit be initially established for loamy grassland and SKR, as described above. The loamy grassland management regime is less restrictive and will give the grazing managers more flexibility in moving cattle around units in the Preserve. However, once the grazing management program is established, the County should reevaluate the management focus of Management Unit 3A.

Management Units 2A and 2B also support vernal pools, vernal swales and/or alkali playas, and several rare plant species. While the RDM targets discussed above are appropriate for these ephemeral aquatic habitats, as important is the seasonal timing of grazing, which cannot be effectively controlled for the subareas within these proposed management units that support ephemeral aquatic habitats. These ephemeral aquatic habitats may require finer scale management actions, which could include temporary fencing or strategically placing water and salt, and therefore should be closely monitored to ensure protection of target resources. The existing management units in the Preserve will allow rotation of livestock and some experimentation with grazing pressure between and among management units to benefit management targets such as vernal pools, if deemed desirable, but the emphasis of management in Management Units 2A and 2B is maintaining habitat for SKR and foraging raptors.

Prescribed fire can benefit certain communities by promoting habitat suitability for some native animal species or increasing the competitive advantage of some native plant species (Menke

1992, O'Farrell 1997, Pollak and Kan 1998, Wills 2000, Keeley 2001, Harrison et al. 2002, Spencer 2002, O'Farrell 2003). The timing of burning will depend on the specific management objectives. Controlled burning may be an appropriate element of habitat management within the Preserve, either in conjunction with other actions (e.g., managed grazing) or as an independent action. However, implementing controlled burning in the Preserve may be problematic because of visibility concerns at the Ramona Airport, regional air quality issues, and would require close coordination with the California Department of Forestry and Fire Protection (CDF).

Mowing, disking, raking, and superficial scraping have limited use for landscape-level vegetation management. Mowing alone creates thatch, which is a primary threat to native species conservation in California grasslands. Mowing followed by raking may alleviate the thatch problem, but it may promote lawn-like conditions, encouraging dense, low growth that may be impenetrable to target species (e.g., SKR) or inhibit native species germination. However, studies in western Riverside County suggest that mowing, followed by raking, may benefit SKR habitat as much as grazing, fire, or other management methods (Spencer personal communication). Raking may help reduce the unnatural level of nitrogen in surface soils as the thatch is removed from the site, thus decreasing the competitive advantage to weedy, nitrophilous non-native plant species over time. However, costs and thatch disposal requirements make this method less practical than grazing or fire for large areas.

Biological Goal A.3 – Ensure long-term persistence of native alkali playa plant species by controlling the abundance of invasive non-native plants in alkali playas.

The alkali playas and rare plants in and around the playas, such as southern tarplant, Coulter's saltbush, and Parish's brittlescale, are located within Grazing Management Unit 2A. Cattle-grazing in the alkali playas does not appear to be detrimental to these plant species as it appears that cattle do not consume them. However, cattle trails do run through the playas and cows may crush individual sensitive plants. A larger threat to the *Atriplex* species is invasion of the alkali playas by non-native Bermuda grass and Buccone's sand-spurry, which cattle do not appear to control.

Task A.3.1: Control invasive non-native plants as necessary to allow growth and reproduction of *Atriplex* in alkali playas. Bermuda grass and Buccone's sand-spurry are found in close association with sensitive native plants. Thus, herbicide treatments may not be appropriate in alkali playas. Anecdotal observations indicate that hand-removal of sand-spurry around several individual Parish's brittlescale plants resulted in increased vigor of these individuals (Sproul personal communication). Hand removal/thinning of invasive non-native plants in the immediate vicinity of the rare natives should be targeted to release them from competition by invasive non-native plant species.

6.1.2 Clayey grasslands

Clayey grasslands support the majority of vernal pools in the Preserve, including the major complex south of the Ramona Airport that supports sensitive species such as San Diego fairy shrimp and western spadefoot toad. Purple needlegrass and several rare native plant species, including San Diego thornmint, round-leaved filaree, small-flowered morning glory, and

graceful tarplant also occur in clayey grasslands in the Preserve. The primary management emphasis for this biological element is to reduce the cover of non-native annual grasses and forbs and thatch, which should enhance native plant species cover and hydrologic function of vernal pools.

Biological Goal B.1 – Eliminate aggressive invasive non-native plant species from clayey grasslands.

Invasive non-native plant species of concern in the clayey grasslands of the Preserve include artichoke thistle and intermediate wheat grass (Figures 7a-c). These species have been treated since 2005 as part of an ongoing removal program (RECON 2005, Kelly & Associates 2006, CBI 2006a).

Task B.1.1: Annually treat all occurrences of invasive non-native plant species of concern in Management Units 3A, 3B, 3C, 3D, and 3E. Herbicides used in 2005 and 2006 were Transline, Garlon 4a, Pathfinder (a pre-mix of Garlon 4a in a seed oil base), Glypro Pro (a Glyphosate herbicide, a generic Roundup), and Fusilade II. Treatments should continue with these herbicides as described by RECON (2005) and Kelly & Associates (2006) (in CBI 2007), or as recommended by a licensed weed removal specialist.

Biological Goal B.2 – Decrease the cover of invasive non-native annual grasses and forbs and the amount of thatch in the vernal pools to improve vernal pool functions.

Ecological Ventures California (2003) speculated that drought and an increase in vegetative biomass (which in the Ramona Grasslands is primarily from non-native annual grasses) resulting from the reduction or the elimination of cattle grazing has reduced the length of ponding of pools in parts of the Grasslands. As documented in the Central Valley of California, managed cattle grazing benefits the overall function of vernal pools found in this area (Marty 2005, Pyke and Marty 2005). Species diversity and native plant cover increased in pools grazed by cattle, while invasive non-native species cover decreased. Cattle grazing also resulted in longer duration of inundation (i.e., longer hydroperiod) relative to ungrazed vernal pools.

Grazing Management Units 3B, 3C, and 3D support the majority of the clayey grassland habitats and vernal pools in the Preserve, as well as patches of purple needlegrass and native clayey grassland forbs (Figure 5 and 6). Management Unit 3C supports a high density of vernal pools in the complex south of the Ramona Airport. Management Unit 3A supports an isolated population of SKR and is recommended for management as a loamy grassland management unit as described under Task A.2.1. Management Unit 3E, located on the south side of Santa Maria Creek (Figure 14), is largely comprised primarily of alluvial soils and supports a grove of eucalyptus trees. A vernal pool has been documented within the eucalyptus grove on a small area of Placentia clay soil that extends into this unit from Cumming Ranch. The eucalyptus trees currently provide nesting habitat for raptors and, in 2005, a breeding pair of yellow warblers. The eucalyptus trees should be left as nesting habitat until riparian habitat in Santa Maria Creek is restored. After riparian trees mature and provide suitable nesting habitat, eucalyptus in Management Units 3D and 3E should be considered for removal.

Task B.2.1: The grazing regime for the vernal pools in the Preserve must be established adaptively but annual grazing within management units supporting vernal pools (i.e., Management Units 3A, 3B, and 3C) should be allowed to prevent non-native annual grasses from becoming too dense and thatch from building up. Unless active grazing management is implemented in these management units, cattle should be allowed access to all management units for the majority of the year (i.e., the gates to these management units should be left open). Active grazing management consists of controlling the timing and intensity of grazing managed by regulating the number of cattle within specific management units during certain periods of the year. Active grazing management in Management Units 3B, 3C, and 3D should be implemented in an adaptive fashion to achieve the biological goal of reducing the cover of invasive non-native plants and thatch. A desired level of RDM for this unit is between 1,500 lbs/acre to 700 lbs/acre, as well as a reduction in the abundance and cover of invasive non-native annual species, a reduction in the amount of thatch, and an increase in the abundance and cover of native species.

An initial regime for Management Unit 3C would isolate cattle with this management unit during fall, after native plant species have set seed, and early winter months, when annual grasses are starting their new growth. Fall grazing will help reduce levels of RDM and thatch build-up in the management unit, while early winter grazing will help to depress invasive non-native plant growth. It is anticipated that grazing in Management Unit 3C will occur during the period November to March, but the precise timing will depend on rainfall and temperature within a given year and the number of cattle necessary to achieve the desired RDM level. The intensity of grazing across the Ramona Grasslands for the past three years has varied from approximately 10-20 acres/AUM. Management Unit 3C is approximately 50 acres, thus an initial number of 5 AUM should be targeted for this management unit and modified in an adaptive fashion depending on management response and weather patterns.

Grazing Management Units 3B and 3D and support several vernal pools and populations of purple needlegrass, round-leaved filaree, small-flowered morning glory, San Diego thornmint, and virgate tarplant (Figure 6). The goal for these management units is to increase the cover of native grass and forb species and decrease the cover of non-native grass and thatch. This would be accomplished with light to moderate fall/early winter grazing that would reduce cover of invasive non-native species and thatch. Management Unit 3B and 3D are approximately 90 acres and 22 acres in size, respectively. Thus an initial number of 5-10 AUM should be targeted for Management Unit 3B and modified in an adaptive fashion depending on management response and weather patterns. Management Unit 3D may be too small to effectively manage on its own; however, managed grazing with a low number of animals can be attempted.

It is recommended that during initial years of active grazing management cattle be confined to Management Units 3B, 3C, and 3D after native plant seed set has occurred and prior to filling of vernal pools (e.g., fall). The period of grazing can be lengthened as needed to achieve management targets. Cattle cannot be isolated within these management units without a water supply. A source of water is potentially available from a landscaping irrigation system at the eastern edge of Management Unit 3C, on the Cruise Air property at the Ramona Airport (Figure 13). Cattle in Management Units 3B have access to the water in Santa Maria Creek within Management Unit 1A and TNC is considering adding an supplemental water source in Management Unit 3B (Figure 14).

Controlled burns may also be an effective tool in native grassland restoration. Controlled burns (Cox and Austin 1990, Bauder 1996, Pollak and Kan 1996) can be useful in removing excessive thatch and to control non-native species. Pollak and Kan (1996) studied use of spring prescribed fire to control invasive exotic weeds in a mima mound vernal pool system at Jepson Prairie Preserve in Solano County, California. They found that late spring burns (near the end of the growing season, but before seed set in weed species) greatly reduced the cover of thatch and non-native annual grasses, such as medusahead, while increasing the dominance and cover of native grasses and forbs. However, implementing controlled burning in the Preserve may be problematic because of visibility concerns at the Ramona Airport and regional air quality issues.

6.1.3 Riparian corridor

Santa Maria Creek supports two distinct sets of conservation targets – arroyo toads and marsh habitats downstream of Rangeland Road (Reach A), and riparian scrub and woodland habitat for breeding neotropical migratory birds and raptors upstream of Rangeland Road (Reaches B-F). Reach A supports a perennial surface water, whereas Reaches B-F support ephemeral stream flow. Reaches B-F typically do not retain surface water into the spring, except in extraordinarily wet years (e.g., 2005). The abundance of arroyo toads in Reach A appears to be reduced by the presence non-native animal species, primarily bullfrogs, but including crayfish, green sunfish, largemouth bass, and mosquitofish. Willow and mulefat-dominated riparian scrub and woodland habitats in Reaches B-F are severely degraded by overgrazing, except in Reach D where riparian habitat quality is high due to over 20 years of cattle exclusion from the creek corridor. Several aggressive invasive non-native plant species, such as giant reed and tamarisk occur throughout the creek corridor.

Biological Goal C.1 – Eliminate aggressive invasive non-native plant species from the Santa Maria Creek corridor.

Invasive non-native plants of concern in the Santa Maria Creek corridor include giant reed, tamarisk, milk thistle, and potentially perennial pepperweed, found in Reach F of the creek (Cumming Ranch) in 2005. These species have been treated since 2005 as part of an ongoing removal program (RECON 2005 and Kelly & Associates 2007, in CBI 2007), except Reach F which was only treated in 2005. The distribution of the invasive non-native plant species treated in these years is shown in Figures 7a, b.

Task C.1.1: Annually treat all occurrences of invasive non-native plant species of concern. Herbicides used in 2005 and 2006 were Transline and Aquamaster (a Glyphosate herbicide). Treatments will continue with these herbicides as described in RECON (2005) and Kelly & Associates (2007) (in CBI 2007), or as recommended by a licensed weed removal specialist. Transline is a broadleaf specific herbicide and was used to treat milk thistle in 2006 (milk thistle was hand removed in 2005).

Biological Goal C.2 – Maintain and enhance arroyo toad habitat quality.

Arroyo toad habitat is confined to Reach A of Santa Maria Creek (i.e., downstream of Rangeland Road, RECON 2005 and Hollingsworth et al. 2006 in CBI 2007). This reach of Santa Maria Creek has perennial surface water and open sandy streambed interspersed with pockets of freshwater marsh and mulefat scrub, but very little cover of willow species (CBI 2007). This reach also supports marsh associated species such as red-winged blackbird and sora (Lovio 2007 in CBI 2007). There is a high abundance of non-native aquatic species, such as bullfrog, that appear to reduce the abundance of arroyo toads in this reach. Bullfrog populations are estimated in the thousands (Hollingsworth et al. 2006 in CBI 2007); however, the magnitude of the effect of bullfrogs on the arroyo toad population in Santa Maria Creek is unknown.

Task C.2.1: Maintain suitable habitat quality for arroyo toads. Arroyo toad habitat in Reach A is characterized by little cover of dense woody riparian vegetation. Cattle grazing in this reach, prior to installation of riparian fencing maybe helping to maintain its vegetation composition and structure. Allow cattle grazing in this reach, as needed to maintain suitable habitat conditions for arroyo toads.

Task C.2.2: Reduce or eliminate non-native aquatic species populations in Reach A of Santa Maria Creek. Bullfrogs are extremely abundant in Reach A, with an unconfirmed but likely source population in the RMWD's effluent holding ponds north and east of Reach A. Other species (e.g., non-native fish) may be washing down from upstream areas during periods of flowing surface water. Eradication of bullfrogs in Santa Maria Creek will be difficult unless source populations are controlled. Thus, complete eradication of this species may not be a feasible objective, and efforts should be focused on reducing the abundance of non-native species in Reach A. DPR may work with the RMWD and non-native species control specialists to develop a control program for the Santa Maria Valley. Bullfrog control techniques include seining egg masses and larvae, chemical treatments (e.g., chlorination), and giging or shooting. In lieu of removing source populations of non-native predators, appropriate control techniques (e.g., seining, giging, or shooting) should be implemented annually prior to arroyo toad breeding within Reach A.

Biological Goal C.3 – Enhance habitat quality for riparian-obligate species, particularly breeding birds.

Unmanaged cattle grazing within Reaches B, C, E, and F of the Santa Maria Creek corridor has diminished the compositional and structural diversity of the riparian community. The riparian corridor is characterized by low shrub and canopy cover, which provides reduced habitat quality for breeding riparian-obligate bird species. Reaches B-F have been fenced and cattle should be excluded from these reaches for the foreseeable future until the desired riparian vegetation structure develops. Reach A supports mulefat scrub, freshwater marsh, and open sandy substrates that support marsh associated species (e.g., red-winged blackbird and sora), in addition to arroyo toads. Low intensity cattle grazing may help to keep the vegetation composition and structure of Reach A suitable for these species. The Santa Maria Creek corridor in the Preserve has been largely fenced, with the exception of the far western portion of Reach A (Figure 14).

Task C.3.1: Manage grazing within the Santa Maria Creek corridor. The entire stream and riparian corridor should be fenced to initially exclude grazing from this unit and allow recovery of riparian and wetland habitats (Management Units 1A, 1B, and 1C). The Santa Maria Creek corridor on Cumming Ranch (Reach F) will be fenced once the County holds fee title or easement tot his portion of the property and has secured the necessary funding. The management objective for Management Units 1B and 1C is a vertically stratified riparian canopy and shrubby understory layer with over 100% absolute vegetative cover, which will provide conditions suitable for breeding obligate riparian bird species and some raptors. This structural target may take 20 years or longer to achieve, depending on weather patterns and surface flows that can affect recruitment and growth of riparian plant species. After this time period, limited grazing during the dormant season of riparian vegetation may be allowed to control vegetation density and structure, or to control invasive non-native herbaceous species.

Within Management Unit 1A, cattle should initially be excluded except for accessing the water hole at the Arizona crossing on TNC Oak Country Estates and the western end of the Management Unit where fencing is yet to be installed (Figure 14). This management unit can likely tolerate a higher intensity of grazing, and periodic grazing may in fact be required to maintain a suitable open habitat structure for arroyo toads (as is discussed in Task C.2.1). Arroyo toads are rarely found in areas with closed canopies of riparian vegetation (USFWS 1999); they require an open channel in areas of high water tables. Cattle should be allowed to graze within Management Unit 1A, as needed to maintain a suitable habitat structure for arroyo toads.

6.2 Cultural Resources Elements: Goals and Tasks

DPR is charged with preserving, managing, and interpreting the archaeological and historic resources of the Ramona Grasslands for the benefit of San Diego County residents. DPR will strive to meet the highest standards for preservation, access, interpretation and research established for sites of exceptional significance within the resources available. As part of the planning process, the following objectives were established to guide the goals and implementation of the Area Specific Management Directives for the Preserve.

Preservation—

DPR will preserve and maintain the cultural resources balancing the need for public access with the need to preserve cultural and natural resources.

Access—

DPR will employ a wide range of methods and technologies to make the Ramona Grasslands cultural resources more accessible to the public and make it more important to the various communities that the site serves.

Education—

DPR will inform the public about the cultural resources as a site of national significance and the accomplishments of the Pamo settlement system of the Kumeyaay Indians, Spanish, Californios, and American ranchers who lived in and worked these resources.

DPR will also communicate the importance of preserving the cultural resources and will work to foster respect for the Native American cultures that built some of these resources and for the spiritual nature of the site for many Native Americans. In addition, the historical importance of the Cagney parcel utilized as a practice bombing range during World War II will be communicated to the public.

Research—

DPR will foster research at the Preserve in order to discover and disseminate knowledge about the cultures that have lived in this location.

6.2.1 Surveys

Cultural Goal D.1 – Identify, record, and assess significance of all cultural resources within the Preserve.

Task D.1.1: A qualified specialist should survey the Voorhes Lane easement, Hardy Ranch, Cagney Ranch, and Davis -Eagle properties. DPR shall coordinate with the land managers of the Hobbs parcel to conduct cultural surveys of the property. As future acquisitions are made, cultural resource surveys will be conducted.

6.2.2 Preservation

The TNC Oak Country Estates property has been surveyed for cultural resources and site location information is available. A technical report has also been completed for this property and the archaeological site locations are held by the County as confidential information. The following management strategies are recommended for cultural resources on the TNC portion of Oak Country Estates and for potential cultural resources found on the Voorhes Lane easement, Hardy Ranch, Davis-Eagle Ranch and Cagney Ranch properties.

Cultural Goal D.2 – Preserve and protect identified significant cultural resources and ensure that they are available for appropriate uses by present and future generations.

Task D.2.1: Interpretive information regarding the cultural resources located within the Preserve should be provided to the public, without disclosing specific information about site locations. The interpretive component may consist of signage away from the sites, informative brochures, and lectures or talks. Specific programs disclosing site locations or providing direct public access to sensitive cultural resources shall be prohibited.

Task D.2.2: Conduct a biannual monitoring program for cultural resources identified within the Preserve as properties are added. Use the San Diego County Archaeological Society (SDCAS) monitoring protocols (provided in Attachment D) to record baseline conditions and note changes. Any adverse changes to the condition of the site shall be immediately remedied in consultation with a qualified archaeologist.

Cultural Goal D.3 – Identify, eliminate, and/or reduce/mitigate impacts to the cultural resources from natural or human-caused events.

Task D.3.1: Signs shall be stationed at all trailheads that notify users that sensitive cultural resources cannot be damaged. Signs shall be posted throughout the Preserve indicating that removal of any archaeological material is prohibited.

Task D.3.2 For each known culture resource, consider the potential proximity of public access (trails and staging areas), measures needed to stabilize the resource from erosion or other adverse impacts, and the need for restricting public access. This strategy shall be based on field inspections to collect baseline information about the condition of the site.

Task D.3.3 Trails and staging areas will not be planned or constructed within 100 feet of archaeological sites. Archaeological monitors shall be present during trail and staging area construction.

Task D.3.4: Certain archaeological sites, such as those present on the TNC Oak Country Estates, contain above ground features. These sites are highly sensitive and easily vandalized. Public access to these areas shall be prohibited, and a 100' buffer shall be provided between the sites and any public use.

Task D.3.5: Restrict public use of those properties where no information is available until a complete cultural resource survey can be conducted.

Task D.3.6: All cultural resources identified shall be recorded at the SCIC. The site location information will be used for planning future improvements and will allow appropriate management of cultural resources.

Task D.3.7: For each site identified during the inventory, develop a management strategy that will consider the potential proximity of public access, measures needed to stabilize the resource from erosion or other adverse impacts, and the need for restricting public access. The use of bulldozers and other equipment that disturbs the surface of the ground shall not be permitted for fire suppression activities in the vicinity of identified archaeological sites. A prescribed cattle grazing program shall be utilized within the Preserve to control vegetation while benefiting sensitive species. Uncontrolled cattle grazing shall not be allowed as damage to identified archaeological and/or historical sites could occur.

6.3 Public Use Elements: Goals and Tasks

Public access to the Preserve is appropriate in selected areas to provide opportunities for compatible recreational and educational activities, including hiking, bird-watching, biking, and equestrian use. However, access will be restricted to designated trails and staging areas to preclude adverse impacts to sensitive resources via trampling and loss of vegetation, increased erosion from trail scars, disruption of breeding activities, and interference with the managed grazing program in the Preserve. Off-road vehicle use and hunting are not compatible with

maintaining Preserve functions or with the residential nature of the surrounding area and is not permitted by DPR on Open Space Preserves.

WRI organizes the Hawk Watch Program, which provides the public opportunities to view and learn about the raptors utilizing the Preserve. Raptors are used as a learning tool to educate the public about the value of the Ramona Grasslands. The program is offered on weekends during January and February when numerous raptor species are wintering in the Grasslands. WRI also provides environmental education opportunities for local school children by using the Preserve and their facilities adjacent to the Preserve as an outdoor classroom. DPR Rangers will also interpret for the public.

Public Use Goal E.1 – Provide for appropriate public use of the Preserve, compatible with natural and cultural resources protection and management goals.

The County of San Diego Trails Program has prepared a Community Trails Master Plan that describes corridors for an integrated public trails system, including areas within the Preserve. This trails system will be integrated into the Public Facilities Element of the County's General Plan 2020, and site-specific information will be used to established specific alignments. In addition, the County has proposed developing the Santa Maria Creek Greenway, a continuous greenway and trail system along Santa Maria Creek. These proposals include development of a trail that would cross the Preserve, within the Santa Maria Creek Greenway corridor to link with a proposed trail through Bandy Canyon and into the San Pasqual Valley.

Task E.1.1: Develop a trail corridor through the Preserve consistent with the Community Trails Master Plan and Santa Maria Creek Greenway, but is compatible with natural and cultural resources protection and management goals. The proposed trail corridor through the Grasslands, including a suggested staging area, is shown in Figure 15, which has been planned to avoid sensitive resources and reduce potential conflicts with land management activities. The County will consult with the land managers of the Hobbs parcel to construct a trail along the southern border of the parcel. Surveys should be conducted for sensitive resources within the proposed trail corridor prior to construction to avoid resources such as vernal pools and archaeological sites.

The trail should be 10-12 feet wide to accommodate pedestrians, equestrians, and bikers. The trail corridor will be fenced to prevent interactions between cattle and people. Fences will be constructed of four-strand fencing to keep cattle from the trail corridor. The top three strands will be barbed wire, and the bottom strand will be smooth wire. There will be two gates per mile of fencing, with a stiffener barrier every 1,300 feet. Optional split-rail or other more visually appealing fencing can be added to trail side of the four-strand fence to improve the aesthetics of the trail corridor. Staging areas should be sited in areas Due to the sensitive nature of the natural resources in the Preserve, trail users will not be allowed unrestricted access to portions of the Preserve outside of the trail corridor unless accompanied by DPR Ranger-led hike.

6.4 Fire Management Element: Goals and Tasks

San Diego County has perhaps the most severe fire weather in the nation, with huge shrubland wildfires sometimes driven by hot, dry Santa Ana winds during autumn (Keeley and Fotheringham 2001). Fire plays a strong role in shaping local vegetation communities. Repeated short-interval fires in chaparral and sage scrub habitats tend to type-convert them to annual grasslands having few trees or shrubs (Minnich and Dezzani 1998, Keeley 2001). Hills surrounding the Ramona Grasslands have burned repeatedly (every decade in the past 50 years), and increasing fire ignitions correlated with human population growth (Keeley and Fotheringham 2001) may conceivably increase the extent of the grasslands over time via type-conversion of shrub habitats. However, there are no recent records of fires on large portions of the Preserve, perhaps in part due to heavy grazing pressure that reduces fuel loads. Recent small, prescribed fires were conducted on the Ramona Airport property (2001 and 2004) to improve habitat for the SKR. Prescribed fire may be a useful management tool in the Preserve as discussed in Tasks A.2.1 and B.2.1.

Fire Management Goal F.1 – Provide for necessary fire suppression activities that are sensitive to natural and cultural resources protection.

Periodic fires in the Preserve pose no real threat to biological resources in the Preserve and may in fact be beneficial. As discussed for loamy and clayey grasslands above, prescribed fire is a potential management tool in the Ramona Grasslands, and can be used to reduce fuel loads and threats of wildland fires. If they occur however, wildland fires must be managed to protect human lives and property in adjacent private properties, while minimizing potential impacts to biological and cultural resources from fire suppression activities.

Task F.1.1: Provide access to the Preserve for fire suppression activities by CDF/DPR. Access to the interior portions of the Preserve is via the dirt access road system. These roads should be maintained annually to keep them fuel free.

Task F.1.2: Work with the CDF to develop a Vegetation Management Plan (VMP) that will allow environmental documentation for prescribed fires to be conducted when needed. The following will need to be addressed when developing a VMP with CDF or whether DPR writes its own prescription to put fire on the ground:

1. General fire management plan for each vegetation type/climate zone.
2. Biological and management specific objective plans as it relates to fire use and suppression in the ASMDs.
3. A prescription/plan should be limited to items not in existing plans and reports.
4. A prescription/plan should include specific management units and general prescriptions.
5. A prescription/plan or plan should be a working document for personnel charged with implementing it.
6. A prescription/plan must consider the adjacent public and private lands with a goal of treating watershed scale areas as a unit.

7. A prescription/plan should have infrastructure specifics including road widths, types, fire hydrant and other water source locations, locked gates with access names, age of vegetation in adjacent watersheds, weather station locations, etc.
8. DPR will need copies of an approved plan that can be utilized in response to a wildland fire as the owner/manager to provide fire agency's incident commanders to consult on resource values as affected by fire suppression tactics. Fire personnel familiar with the specific plan may not be always available to respond to that particular area in the event of a large scale event as such has been seen in the Pines Fire of 2002 and the Cedar, Paradise and Otay fires of 2003.
9. Considerations in a prescription/plan should include future build out analysis for private lands adjacent to the Preserve.
10. The following areas of discussion should be included in a prescription/plan:
    - Jurisdictional boundaries
    - Infrastructure
    - Emergency services
    - Local fire ecology
    - Frequency periods
    - Fire weather
    - Fire fuel distribution
    - Condition class
    - Natural fire/fuel breaks
    - Fire history
    - Ignitions
    - Expected fire behavior
    - Fire spread potential assessment
    - Fire effects assessment
    - Structures/density
    - Wildlife, habitat, plants, ecosystem health, primitive areas
    - Water and watersheds
    - Risks
        - Fuels
        - Severe fire behavior analysis
        - Communities and concentrations of dwellings
        - Mitigation goals
        - Vegetation management/fuel modification projects

6.5 Biological Monitoring Elements: Goals and Tasks

Monitoring the responses of the natural resources in the Preserve to management actions will inform decisions on modifying management prescriptions, recognizing that the desired biological responses to management actions may require many years to achieve. The initial monitoring program will be used to refine an understanding of the range of variation of biological conditions for each biological element, track the response of resources to managed grazing regimes and invasive non-native species removal efforts, and to assess the need for additional species or habitat focused management.

The objectives of monitoring are to

- Collect and continuously update information that will inform adaptive management and grazing prescriptions (e.g., reduction in invasive non-native grass biomass);
- Collect information on the presence of invasive non-native plant species to direct ongoing invasive non-native plant species removal efforts in the Preserve;
- Document the persistence of SKR and arroyo toad in the Preserve;
- Measure changes in physical condition, hydrology, and water quality of Santa Maria Creek;
- Track the distribution and abundance of non-native animal species; and
- Track the responses of biological resources to management actions.

The purpose of this monitoring plan is to inform land management of the Preserve. A wide array of monitoring tasks would be required to meet all of the monitoring objectives for these ASMDs, which may be financially unrealistic. Thus, monitoring tasks have been narrowed and prioritized, with the highest priority given to providing information necessary to: 1) ensure invasive non-native plant species are controlled, 2) manage grazing to benefit target resources in grassland habitats (e.g., SKR, ephemeral aquatic habitats, and native plants), and 3) ensure long-term persistence of arroyo toads in Santa Maria Creek. For the purposes of this Plan, Priority 1 monitoring tasks are the highest priority, and Priority 2 monitoring tasks, while important, are a lower priority. Monitoring the responses of natural resources to management actions (e.g., changes in vernal pool hydrology and quantitative species population responses to managed grazing), while important, is not considered a priority for management of the Preserve. Monitoring is not intended to track the abundance or status of individual species, such as species covered the proposed North County MSCP. These ASMDs will be revised upon approval of the North County MSCP to include any monitoring required by MSCP. Monitoring will be conducted as funding allows.

Biological Monitoring Goal G.1 – Monitor the changes in distribution of vegetation communities, sensitive native plant species, and invasive non-native plant species within the Preserve.

Task G.1.1 (Priority 1): Annually conduct surveys of the Preserve to determine the distribution and abundance of non-native invasive plant species that should be removed or controlled. These surveys should focus on areas where invasive non-native plants have been detected in the past, but also look for new occurrences in the Preserve.

Task G.1.2 (Priority 1): Every 3-5 years or after significant events, such as flooding, fire, or altered grazing regime, map vegetation communities within the Preserve. Mapping attributes should include generalized species composition and disturbance factors. Areas with sensitive native plant species, including San Diego thornmint, purple needlegrass, small-flowered morning glory, round-leaved filaree, graceful tarplant, southern tarplant, alkali barley, Parish's brittlescale, Coulter's saltbush, and other sensitive plants detected in the future, should also be

identified. Mapping attributes for sensitive plants should follow the protocols provided in Attachment E.

Task G1.3 (Priority 1): As active grazing management is implemented in clayey grassland management units (e.g., Management Units 3B, 3C, and 3D) supporting rare plants, monitor the response to grazing by collecting quantitative information on composition and structure (e.g., RDM, cover) of the grassland community. Existing monitoring locations are shown in Figure 16. Survey protocols are provided in Attachment E.

Task G.1.4 (Priority 2): Every 3-5 years, photo-document changes in vegetation cover and structure in the Preserve at established photo-monitoring points. Photo-monitoring points have been established at vernal pools e44, e45, e53, e54, and riparian transects RT1-11, and grassland plot 13 (Figure 16).

Biological Monitoring Goal G.2 – Monitor the changes in distribution and relative abundance of SKR, the characteristics of their habitat, and abundance and composition of the raptor community.

Task G.2.1 (Priority 1): Annually conduct semi-quantitative surveys of SKR abundance and habitat characteristics at 15-20 sentinel plots within core SKR habitat in the Preserve. The purpose of these surveys is to document the persistence of SKR in the Preserve, fluctuations in their abundance, and variations in habitat characteristics in response to changes in rainfall and grazing patterns that would allow Preserve managers to work with the grazing lessees to adjust grazing intensity if needed. Sentinel plots will consist of a 50-meter radius circle. Within each sentinel plot, the density of SKR burrows and habitat characteristics (e.g., percent bare ground and cover by forbs, grasses, and thatch) will be visually estimated. Surveys should be conducted during the dry, late-summer season (July–October). Description of field surveys is included in Attachment E.

Task G.2.2 (Priority 2): Annually conduct quantitative surveys of breeding and wintering raptors.

Biological Monitoring Goal G.3 – Quantitatively monitor the changes in riparian vegetation community structure and composition, water quality, arroyo toad abundance and distribution, and breeding riparian bird species community composition, and channel characteristics in the Santa Maria Creek corridor.

Task G.3.1 (Priority 1): Annually monitor the distribution and relative abundance of arroyo toads and characteristics of their habitat in Reach A of the Preserve. The purpose of these surveys is to document the persistence of arroyo toads, successful breeding and recruitment of juveniles into the populations, and the characteristics of their habitat (e.g., vegetative cover and relative abundance of bullfrogs), rather than to quantitatively estimate population trends. Day and nighttime directed sight surveys should be conducted following the guidelines of the U.S. Fish and Wildlife Service (1999), augmented with recommendations from United States Geological Survey (USGS 2003; additional USGS survey protocols in preparation), as described in Hollingsworth et al. 2006. Surveys should focus on Reach A of Santa Maria Creek, but be

expanded upstream as conditions dictate. A minimum of two biologists should walk along the edge or within the creek to detect the presence or absence of arroyo toads to document the presence and relative abundance of adults and egg masses/metamorphs.

Task G.3.2 (Priority 2): Annually, or as dictated by rainfall and stream flow, monitor water quality upstream and downstream of the Preserve to determine the retention of water quality constituents. Collect samples as established monitoring stations (Figure 16). Sampling frequency and methods are defined in the Santa Maria Creek Restoration Water Monitoring Quality Assurance Project Plan (City of San Diego Water Department 2004). Analyze samples for suspended solids, nutrients (nitrogen and phosphorus compounds), biological oxygen demand, metals, and bacteria (fecal coliforms, *Enterococcus*). At each monitoring event, collect standard field measurements (temperature, dissolved oxygen, pH, etc.) and, potentially, benthic macroinvertebrates (CDFG 2003).

Task G.3.3 (Priority 2): Every 3-5 years or after significant flooding events, monitor the structure and composition of the riparian vegetation community. The locations of established monitoring locations (RT1-11) are shown in Figure 16. Survey protocols are provided in Attachment D.

Task G.3.4 (Priority 2): Monitor the distribution and abundance of breeding riparian bird species. Monitoring should be conducted every 3-5 years thereafter to detect changes in riparian bird communities. Censusing should be conducted utilizing the spot-mapping technique as described in Lovio (2006). This method is not a form of sampling, but rather a complete census of all birds breeding in a specific area. During each census visit, the locations and behaviors of all individuals of all species detected are recorded on a map of the census area. Map registrations from each visit for a given species are transferred to a summary map that displays the cumulative point locations and associated data. Over repeated visits, the cumulative map registrations for each species tend to form distinct clusters that represent different pairs (or other breeding units, as discussed below) of a given species. The spot-mapping method provides the advantages of a direct measure of abundance and density for each species and, when superimposed on an aerial photograph or vegetation map, a direct measure of distribution of each species with respect to areas of different habitats.

An alternative survey method to spot-mapping would be fixed point-count surveys, which require significantly less effort, but provide only an index of abundance, sample rather than completely census the study area, and do not provide unambiguous information on habitat relationships in areas of high habitat edge, such as occur along Santa Maria Creek.

Task G.3.4 (Priority 2): Monitor changes in the morphology of the Santa Maria Creek Channel by measuring the physical dimensions of the channel and substrate composition along a series of established cross-sections (RT1-11, Figure 16). These are the same cross-sections used for riparian vegetation monitoring. Channel geomorphology should be monitored at 5-10 year intervals, or following major flooding events.

Biological Monitoring Goal D.4 – Quantitatively monitor the changes in vernal pool vegetation composition.

Task G.4.1 (Priority 1): Annually monitor vegetation community composition. The locations of vernal pools selected for quantitative monitoring is shown in Figure 16. Detailed survey protocols are provided in Attachment D.

Biological Monitoring Goal G.5 – Qualitatively monitor the presence of sensitive vernal pool fauna.

Task G.5.1 (Priority 2): Every 3-5 years, qualitatively survey vernal pools for the presence of San Diego fairy shrimp and western spadefoot toads. Surveys should be conducted in years of adequate rainfall when vernal pools have filled.

Biological Monitoring Goal G.6 – Quantitatively monitor the changes in alkali playa vegetation composition.

The ecology of alkali playas in the Preserve is not well understood. Monitoring should initially focus on developing a better understanding of the baseline conditions and functions of these systems. The monitoring program for alkali playas should be revisited after several years of monitoring efforts. Only a single alkali playa was monitored in 2005 and 2006 (RAAP 100, Figure 16). Five to 6 additional alkali playas should added to the monitoring program.

Task G.6.1 (Priority 1): Annually monitor vegetation community composition, including the presence of rare plant species such as Parish's brittlescale and Coulter's saltbush. Detailed survey protocols are provided in Attachment D.

7.0 OPERATIONS AND MAINTENANCE SUMMARY

7.1 Staffing

The Preserve contains approximately 8,000 acres and the County of San Diego and TNC are the owners of the conserved lands within the Preserve. It is envisioned that all conserved lands in the Preserve will ultimately be transferred to County ownership. The DPR is the habitat manager of the Preserve. TNC retains a management interest in the properties that they originally acquired via a conservation easement on these properties.

DPR currently has 3 full-time employed Park Rangers, 2 full-time Park Attendants (temporary), and one live-in Volunteer (20 hours/week at Gower), who over see the day-to-day operations of the Ramona/Mountains/Borrego (Dist. 3) District's open space facilities. These facilities include: Borrego Preserve (324 acres), Volcan Mt. Wilderness Preserve (2,700 acres), Santa Ysabel Open Space Preserve (5,600 acres), Mount Gower Open Space Preserve (1,590 acres), Simon Open Space Preserve (681 acres), Barnett Ranch Open Space Preserve (719 acres), Luelf Pond Open Space Preserve (88 acres), and Holly Oaks Park (41 acres). The total acreage of all eight facilities is 11,743 acres that range from desert dunes, mix conifer forests, oak woodlands, oak savannah, riparian woodland, grassland, coastal sage scrub, chaparral, etc. Existing staff

will provide the basic day-to-day service and maintenance for the recently acquired Cagney parcel and DPW mitigation properties (420 acres total) within the Preserve. Staff will be augmented to manage and maintain properties within the Preserve that are acquired by the County or transferred in fee title to the County.

Primary duties of staff include visitor information, emergency response, public education and outreach, trail maintenance and routine facility maintenance. Other secondary duties will involve planning and movement of grazing operations, fuel modification planning and treatments, assistance in restoration projects, coordination and collaboration with interested stakeholder groups, agencies, and jurisdictions. The Operations Division of DPR will also provide maintenance and trail crew to complete larger scale maintenance and trail projects on an as-needed basis. Administrative and management support will be provided through the District Park Manager and the Resource Management Division, with the primary goal of the overall Operations and Maintenance objective be to stay within the scope and desires of all elements of the Resource Management Plan.

Park Rangers and Attendents within District 3 are all trained and equipped to deal with public criminal contacts (Peace Officer Standards & Training 832), fire management and tactics (S-190), emergency medical aid (Wilderness First Responder & Emergency Medical Technician), resource and cultural interpretation (various trainings). Primary responsibility for fire and law enforcement protection will be provided by California Department of Forestry (CDF) and San Diego County Sheriff's Department. Preserve staff will provide basic level public service such as interpretation, emergency response, public safety, and general maintenance and Preserve services such as natural and cultural resource management and fire control and management will need to be address with additional help. Staff will has have to provide oversight and management of numerous volunteer groups (Sheriff's Mounted Patrol, DPR Ramona Mounted Patrol, WRI, San Diego Tracking Team, etc.) and research groups while they are in the Preserve, planning for projects in the Preserve, or hosting tours or events in the Preserve.

7.2 Volunteers

DPR relies on volunteers for additional help with interpretation, resource management and minor trail maintenance activities. DPR has a large volunteer base supported by multiple organizations and agencies. DPR's Volunteer Coordinator in conjunction with Preserve staff will be responsible for organizing special events such as guided hikes, school group programs, clean up days, and other educational outreach programs. Volunteers will supplement Preserve staff and will be under the direction of staff. The limited available resources will make volunteer support a critical element in the operations of the Preserve. Although it is very important to maintain volunteer support, they should never be used to supplant Preserve staff in performing critical operation and maintenance roles.

7.3 Interpretive Plan

It is recommended that Preserve staff and management develop an interpretive plan to assist in establishing visitor programs and services. The following goals should be incorporated into the

plan to assist in the understanding of the Ramona Grasslands Preserve and surrounding communities.
Goals:

- Enhance visitor understanding through education and experience.
- Interpret San Diego County's unique ecosystem and diverse cultural history.
- Establish a greater ranger presence in the Preserve through regular contact with visitors and community outreach programs.
- Develop special events programs that correspond to natural seasonal changes or historical events.
- Develop partnerships in surrounding communities that promote Preserve stewardship.
- Integrate interpretive programs with local school's curriculums as a field element.

7.4 Trails

As part of the ASMDs, a complete trail analysis should be conducted to determine the full extent of the existing trails, easements and utility corridors within the Preserve. Then a determination will need to be made as to whether these areas should continue to be maintained as trails or restored to previous natural condition (see Public Use Element, Section 6.3).

7.5 Public Safety

Public safety has become an increasing responsibility for all parks and preserves, especially in the urban and suburban areas. Preserve staff will be responsible for basis public safety needs in the preserve during open or daylight hours. After hours public safety support will be the responsibility of local law enforcement and fire suppression agencies. Since the Grassland are so large, away from main street in Ramona, and has a relatively small population surrounding Preserve, it is recommended that Preserve staff work with the Sheriff's Department and CDF to provide training and awareness understanding of the Preserve so that personnel responding to an incident will have knowledge of ingress and egress, infrastructure issues, and after hour contacts. It is also recommended the DPR inter into an MOU with the Sheriff's Department to increase patrols in and around the perimeter of the Preserve during non-daylight hours. It is not expected that there will be heavy after hour use of the facility, but experience has taught us that people tend to trespass on public lands more frequently than they would on private lands.

7.6 Operations and Maintenance Goals

The following are operations and maintenance goals for the Preserve:

1. Provide Excellent Public Service
    a. Call for service
    b. Incident response
    c. Public information
2. Create a Sustainable Future
    a. Resource protection
    b. Habitat enhancement
    c. Low impact maintenance

3. Encourage Community Collaboration and Partnerships
    a. Volunteers
    b. Project partners
    c. Interpretive Activities
4. Promote Innovative Management and Employee Development
    a. Internal communications
    b. Internal education of Preserve resources
5. Promote Service Excellence for Preserve Visitors
    a. Easy access to points of contact
    b. Easy access to information

7.6.1 Operations and maintenance expected time use in the Preserve:

- Vegetation Management/Fuel Modification 15-20% year dependent
- Road/Trail Maintenance/Construction 20%
- Preserve Monitoring/Patrol/Enforcement 20%
- Customer Services/Administration/Training 12%
- Resource Management 18%
- Interpretation and Volunteer Management 13%

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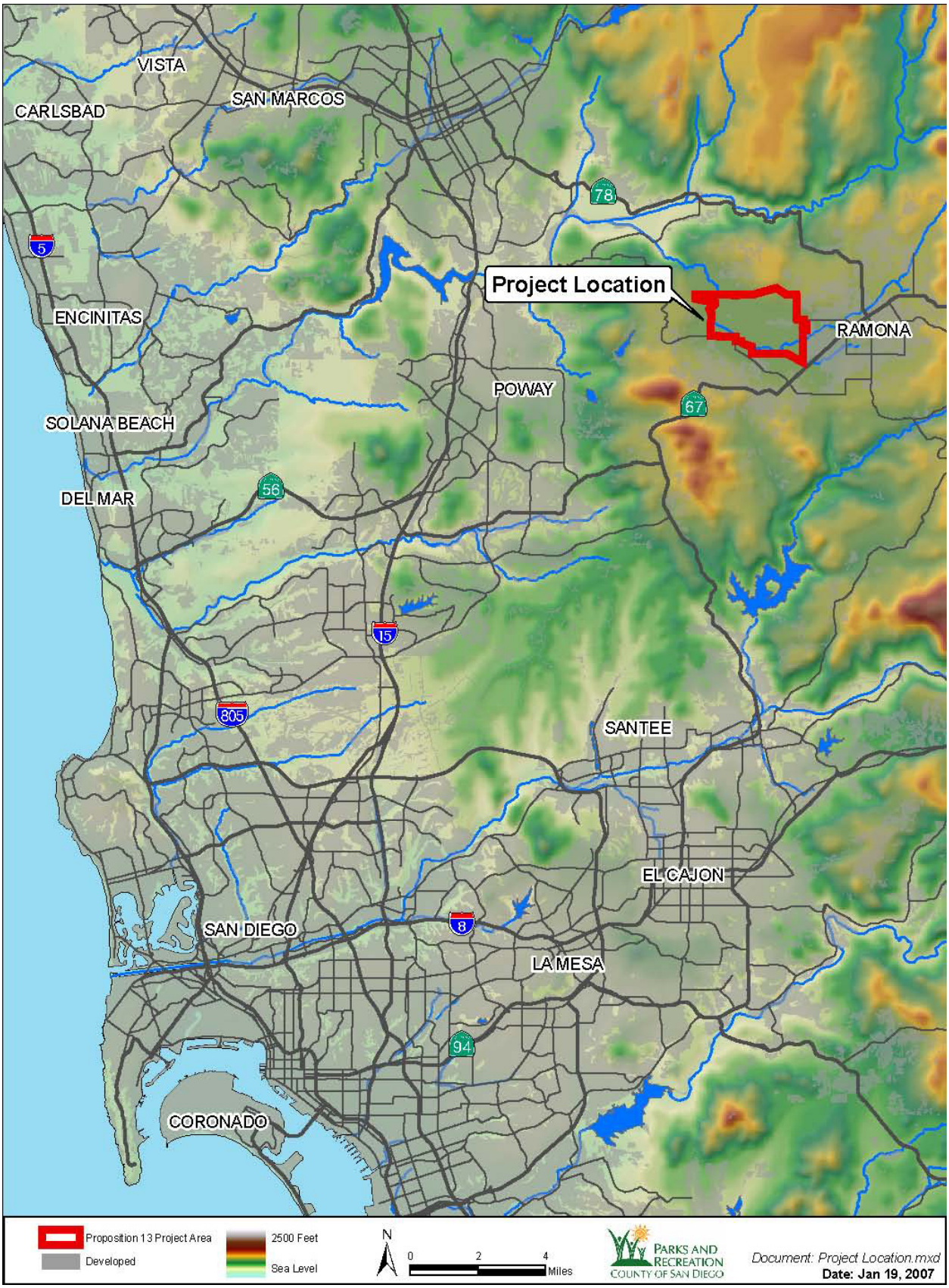

Figure 1. Project Location.

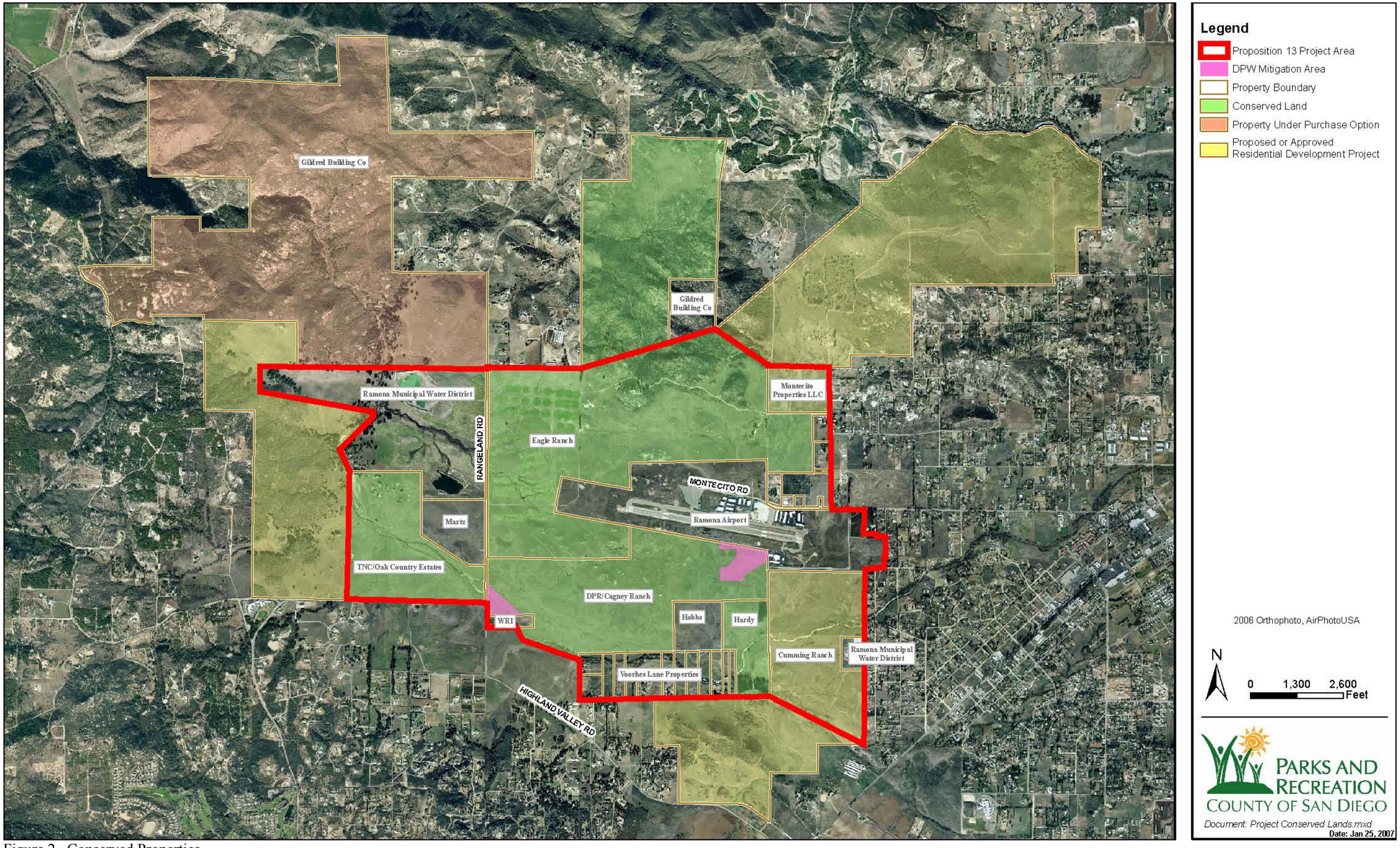

Figure 2. Conserved Properties.

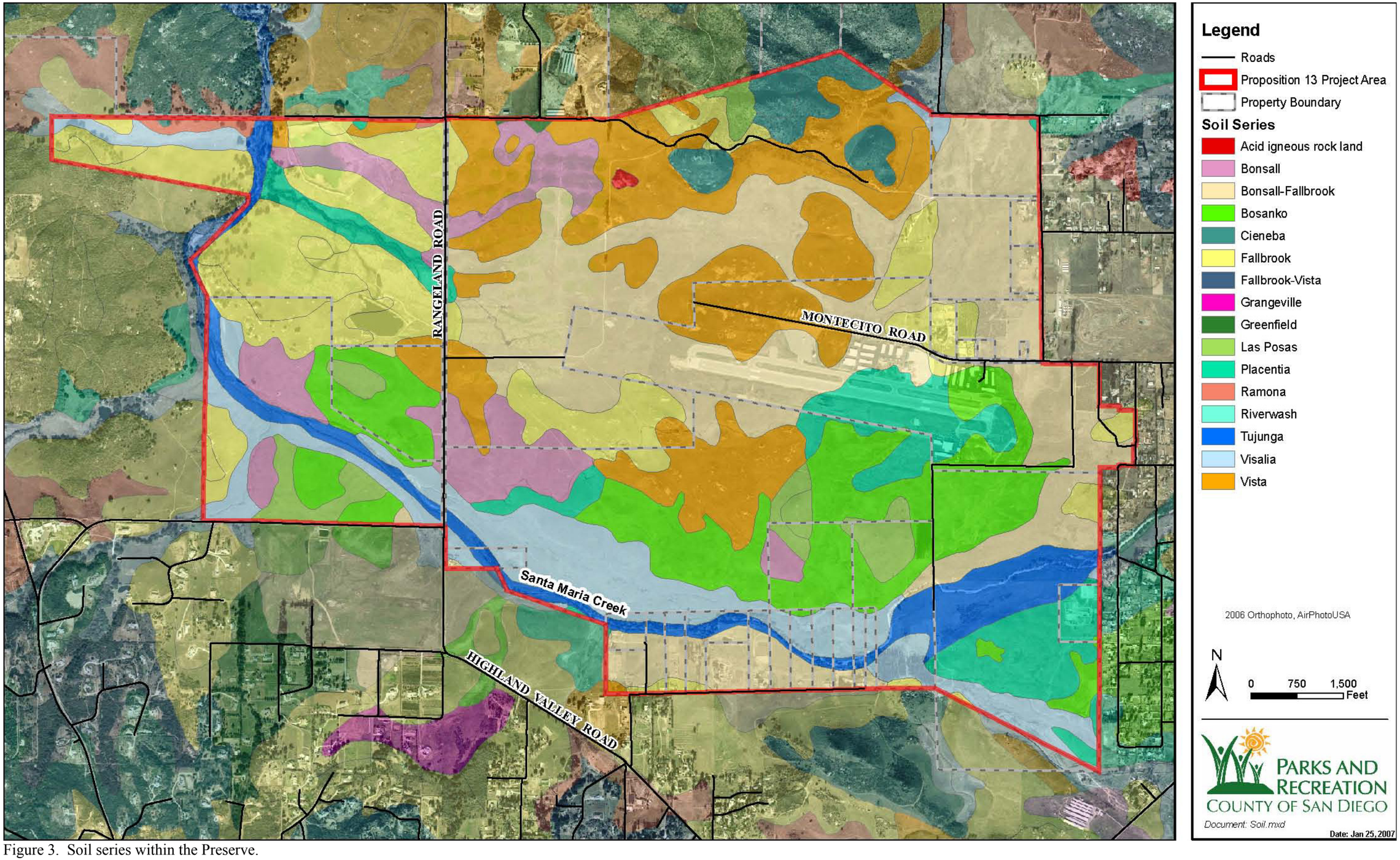

Figure 3. Soil series within the Preserve.

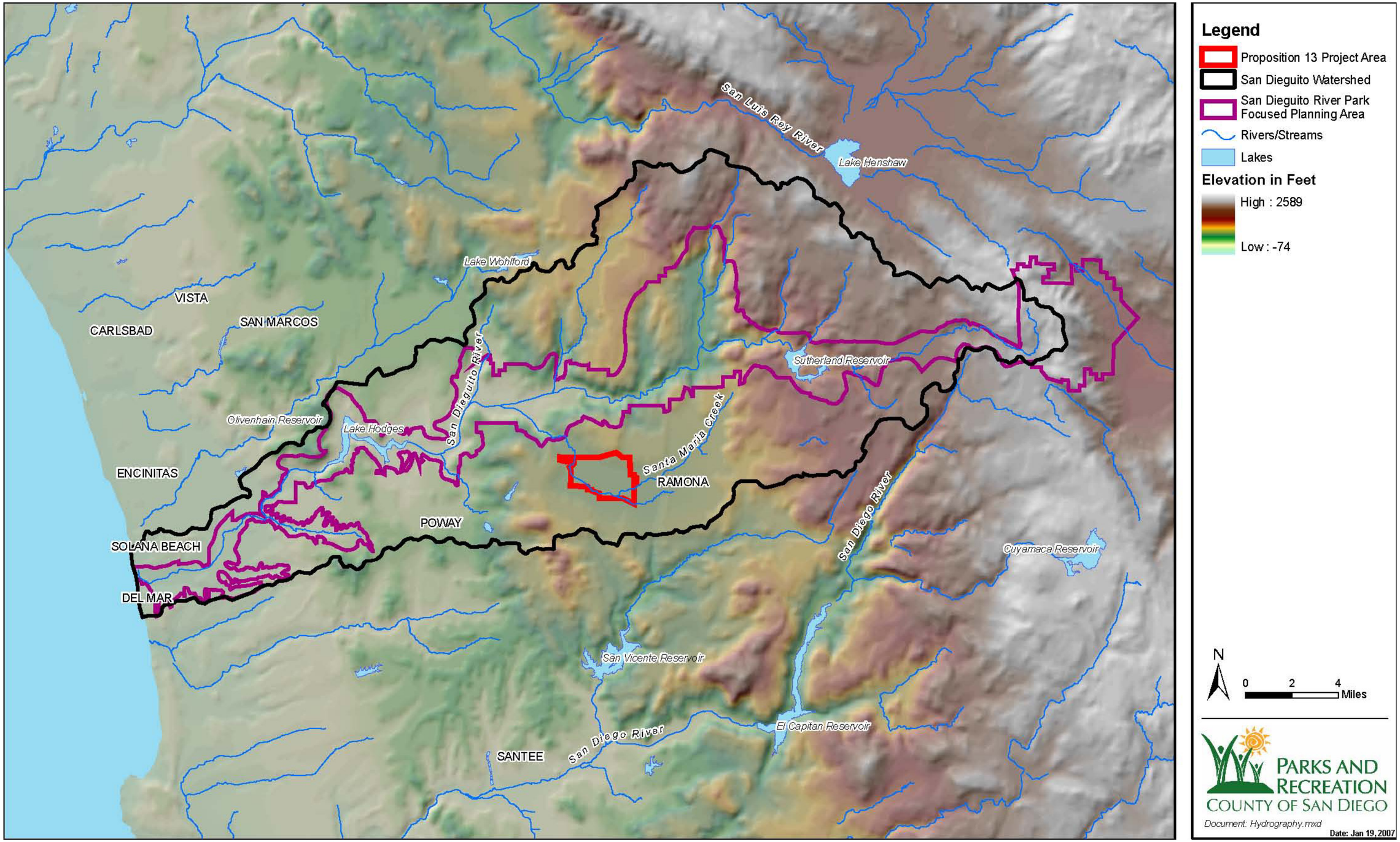

Figure 4. Location of Preserve within the San Dieguito River watershed.

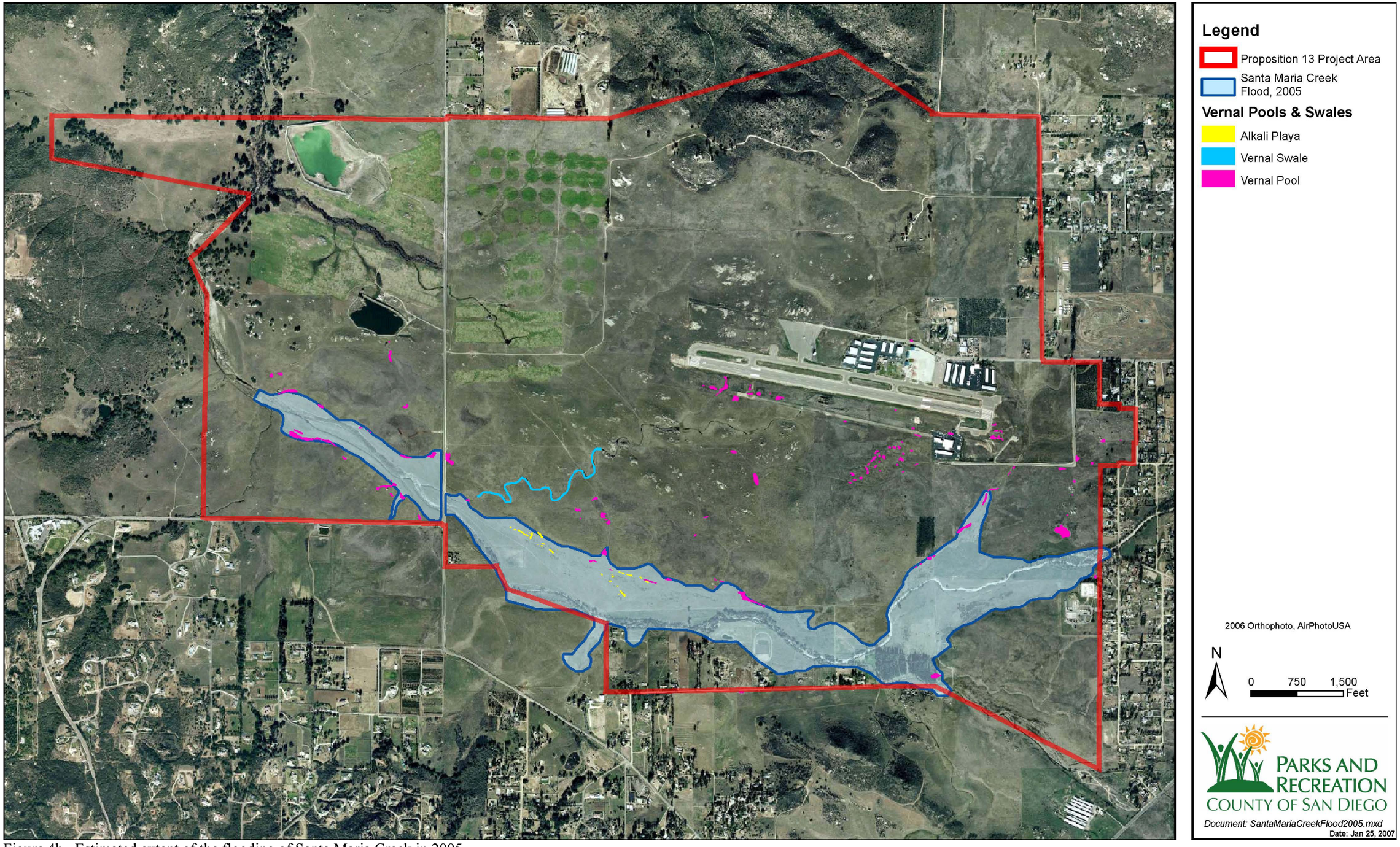

Figure 4b. Estimated extent of the flooding of Santa Maria Creek in 2005.

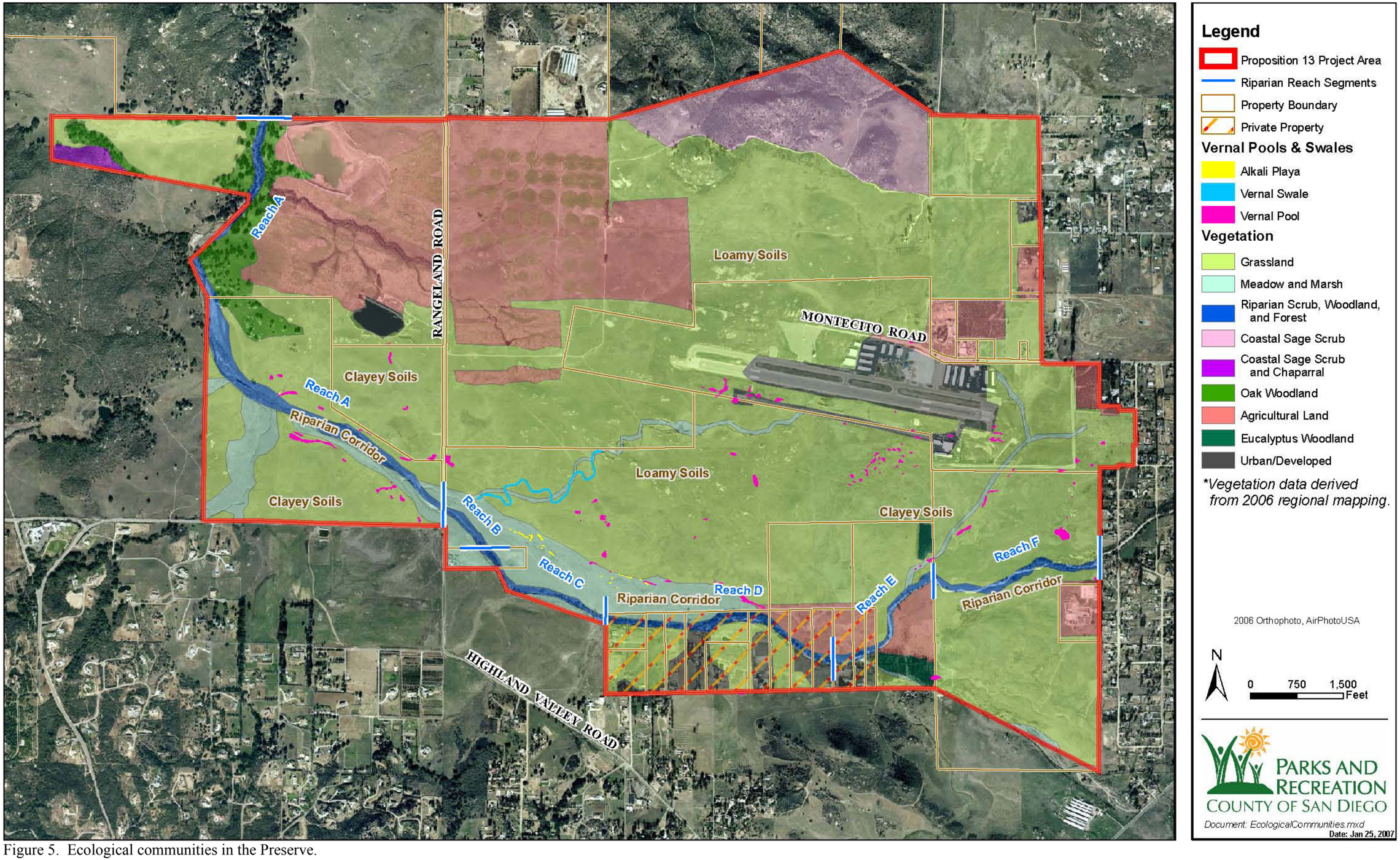

Figure 5. Ecological communities in the Preserve.

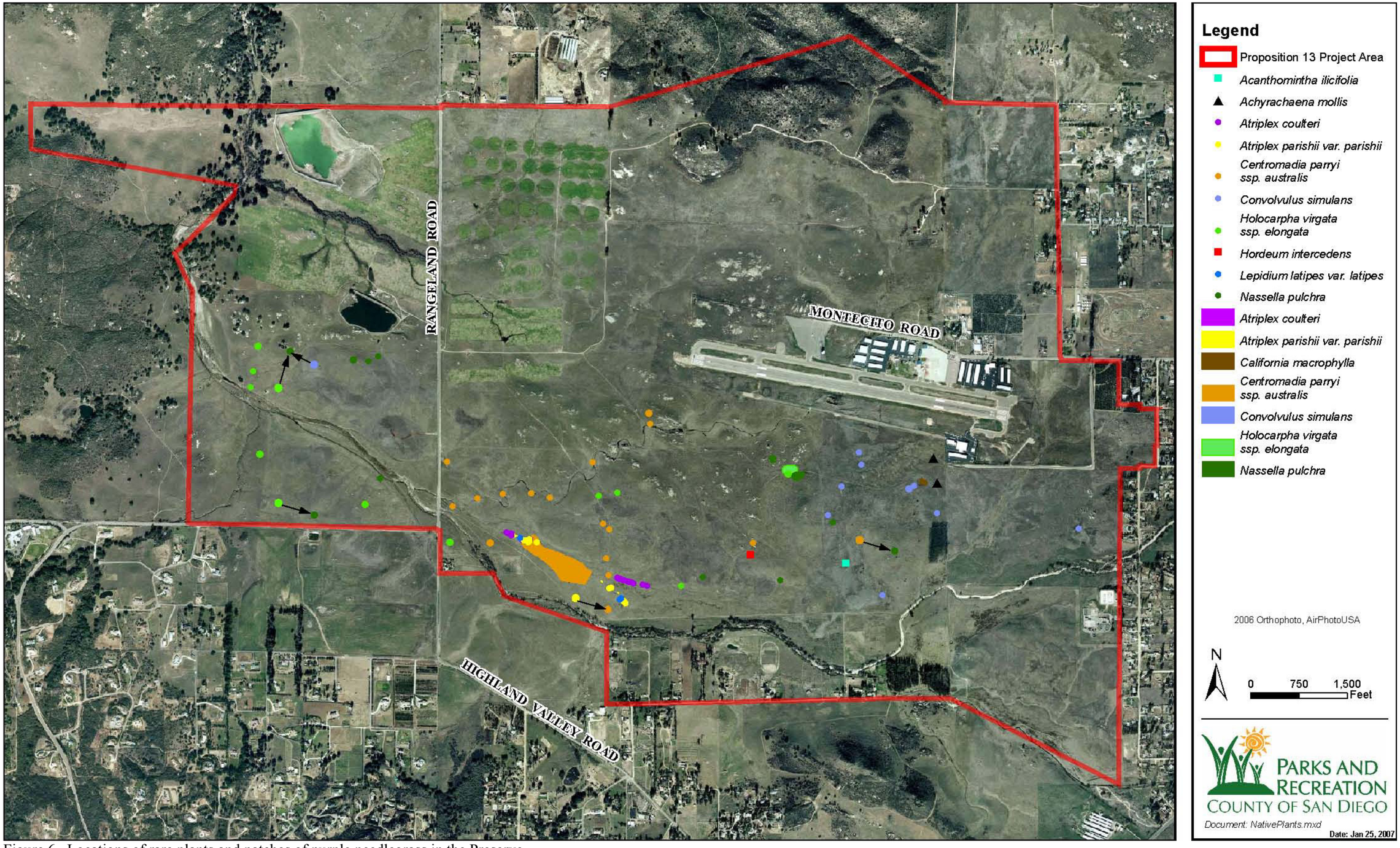

Figure 6. Locations of rare plants and patches of purple needlegrass in the Preserve.

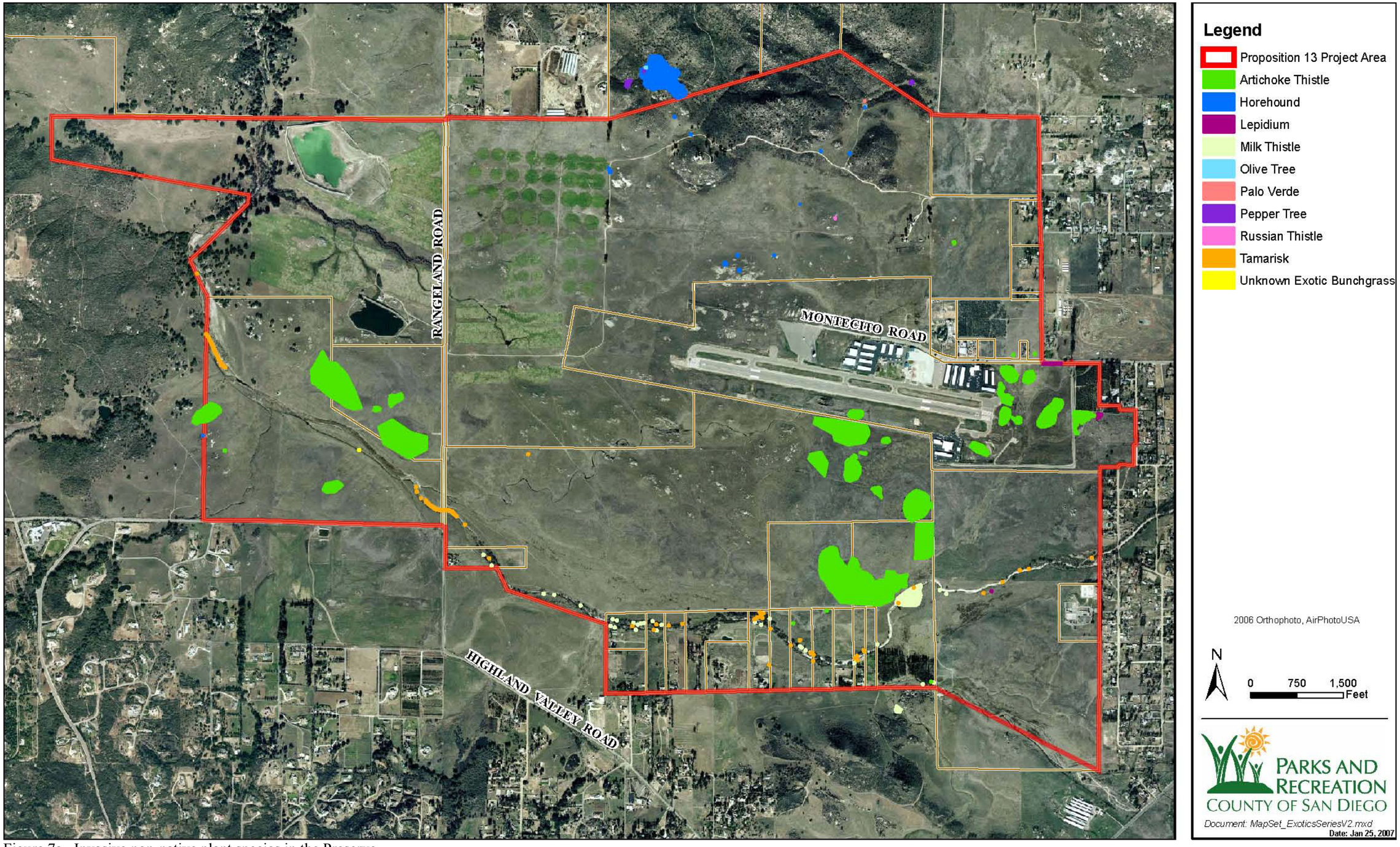

Figure 7a. Invasive non-native plant species in the Preserve.

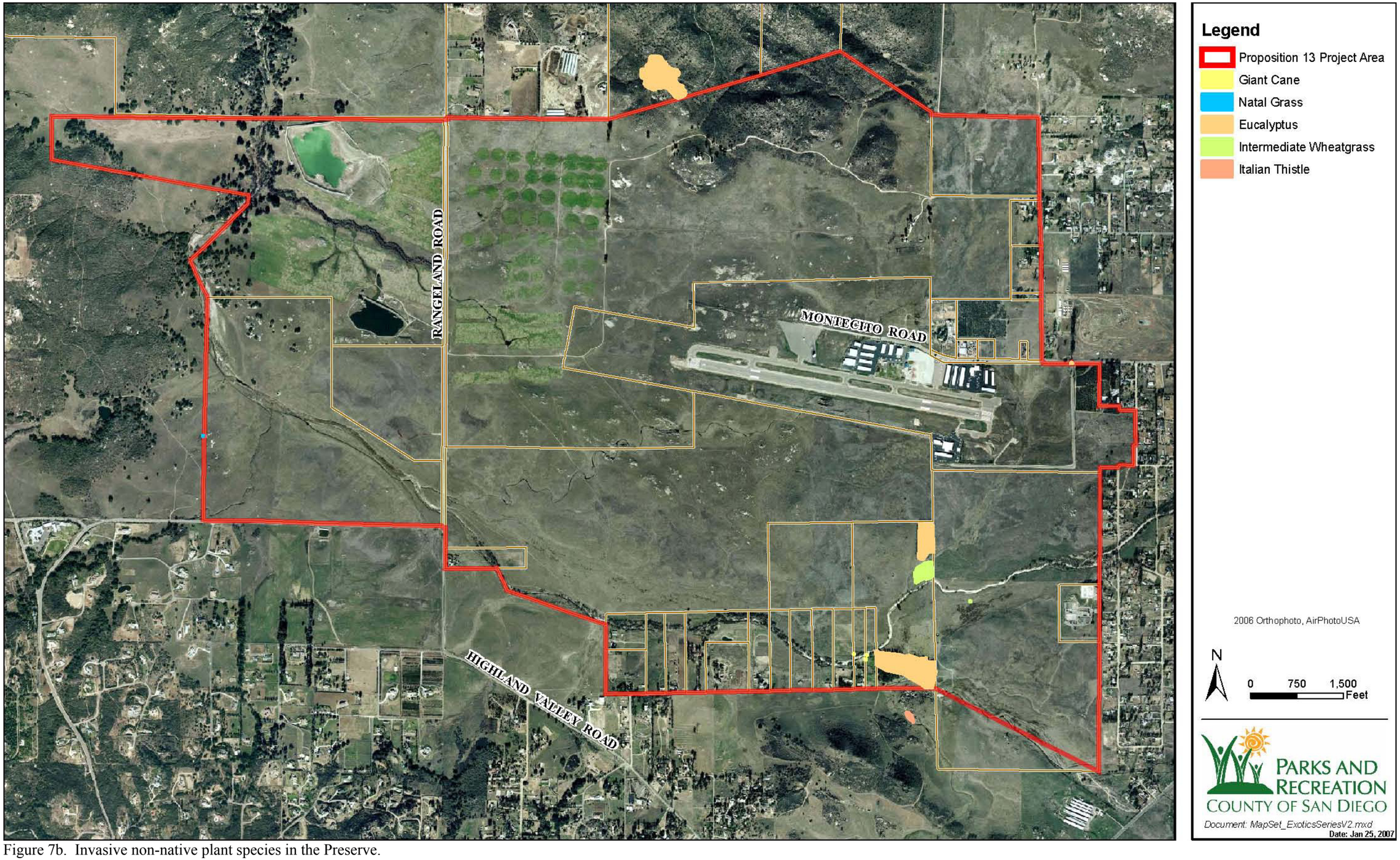

Figure 7b. Invasive non-native plant species in the Preserve.

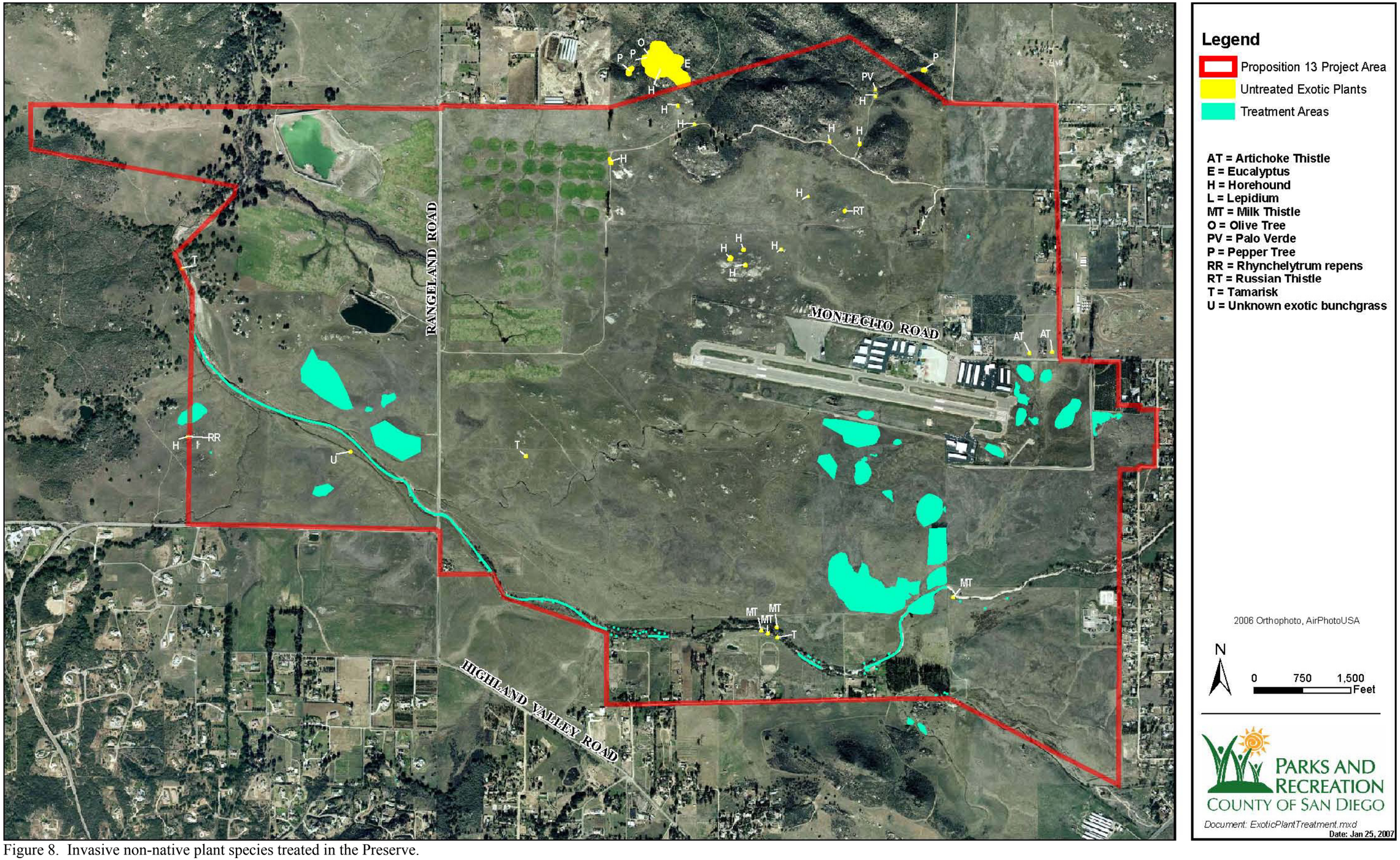

Figure 8. Invasive non-native plant species treated in the Preserve.

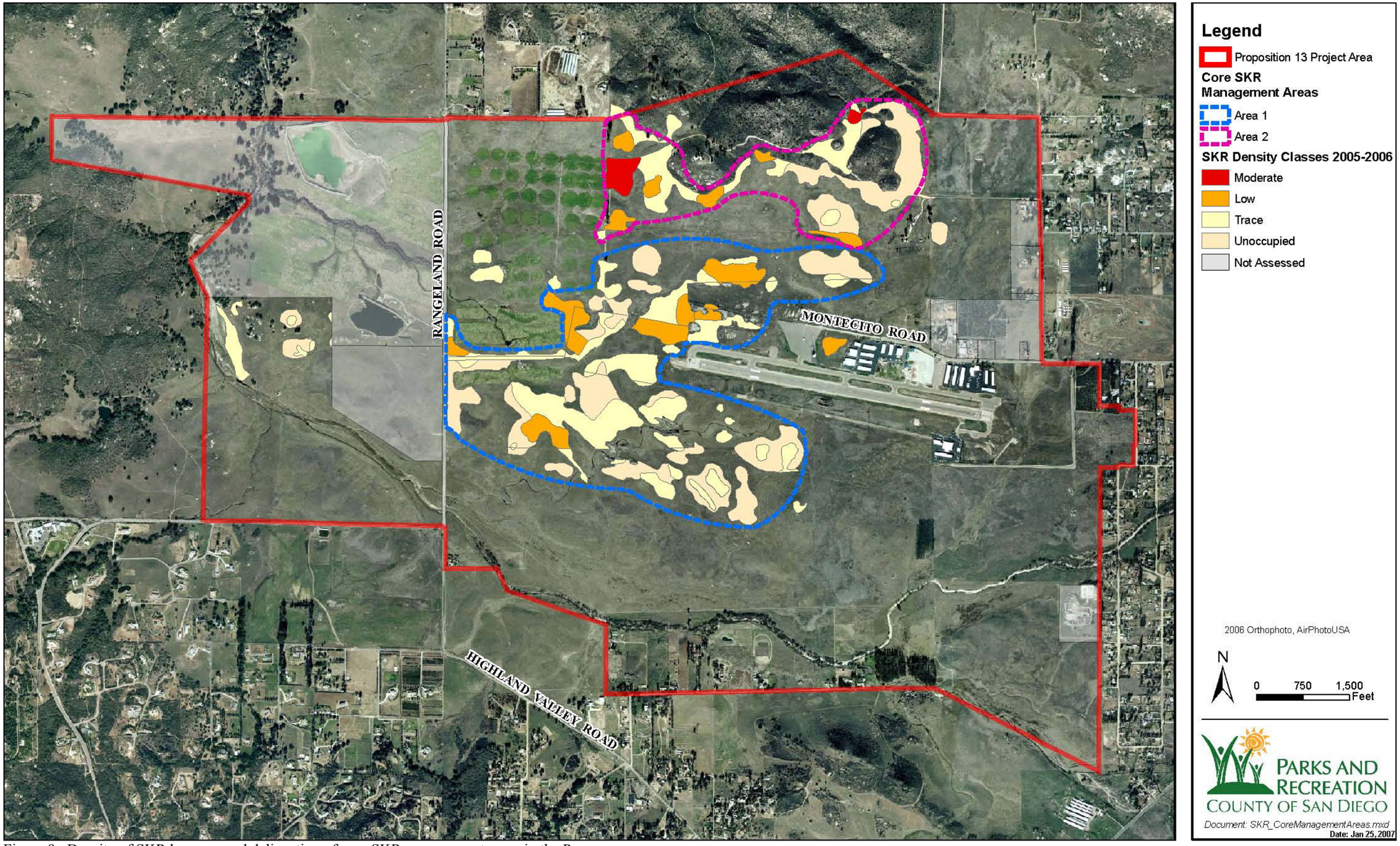

Figure 9. Density of SKR burrows and delineation of core SKR management areas in the Preserve.

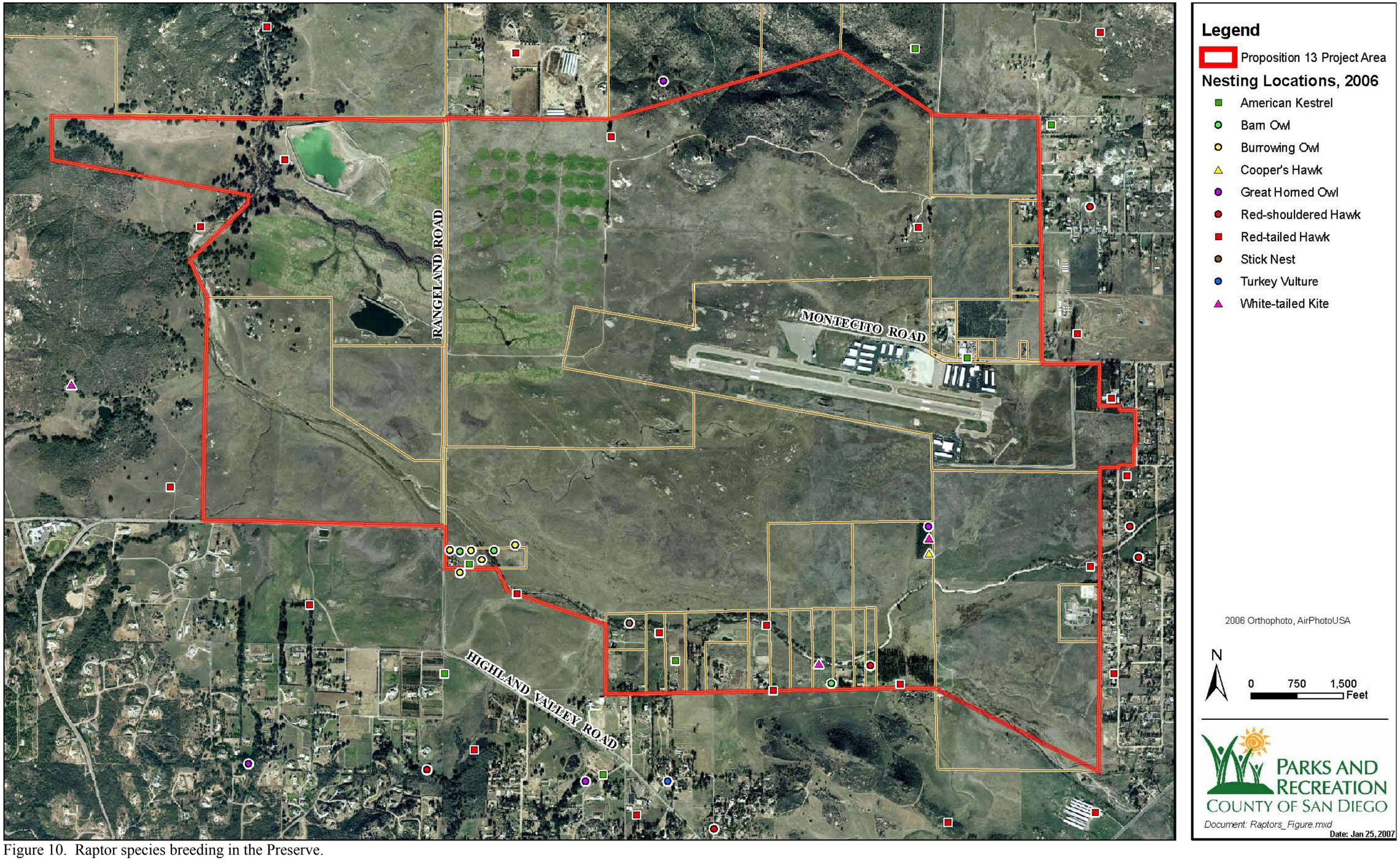

Figure 10. Raptor species breeding in the Preserve.

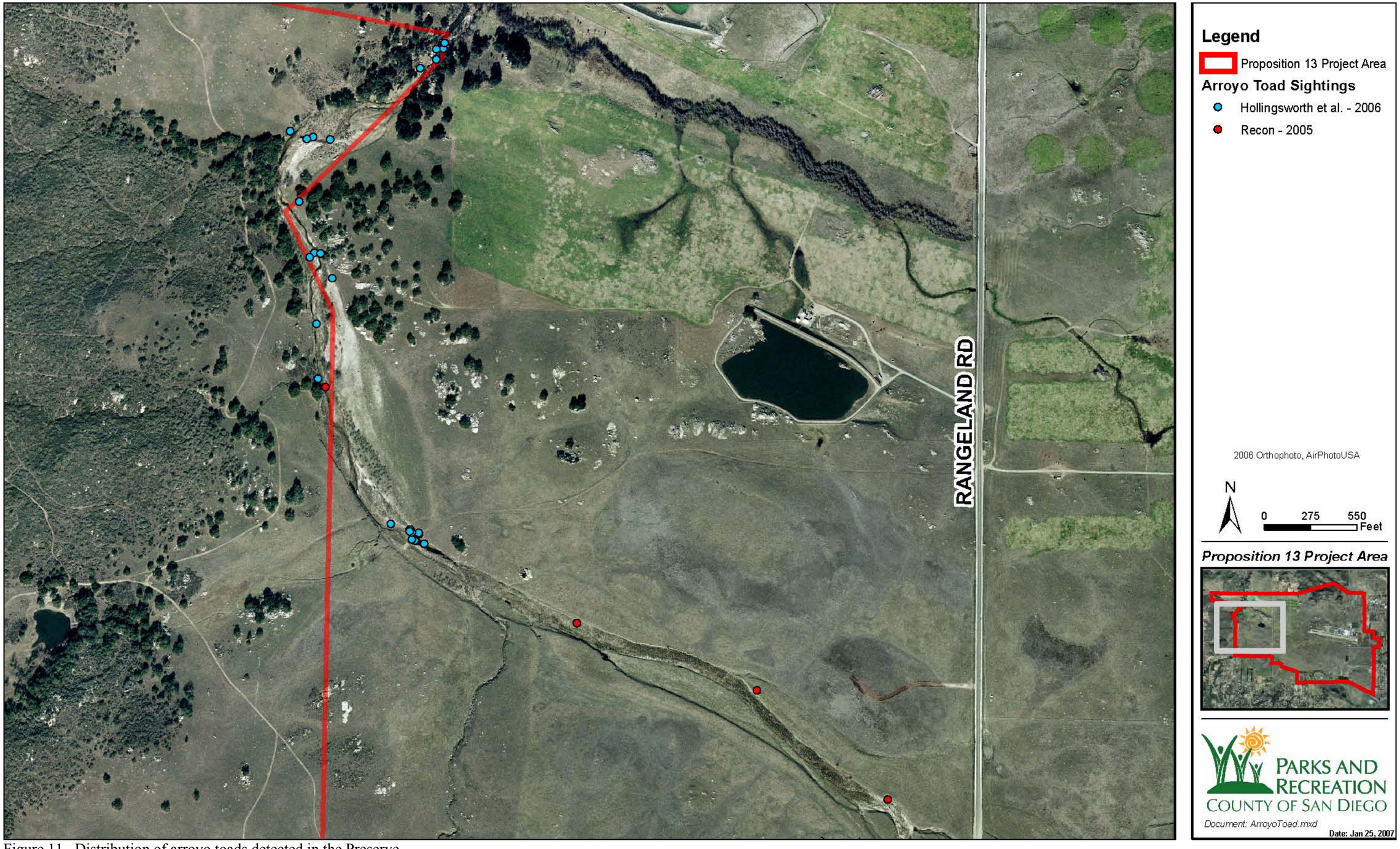

Figure 11. Distribution of arroyo toads detected in the Preserve.

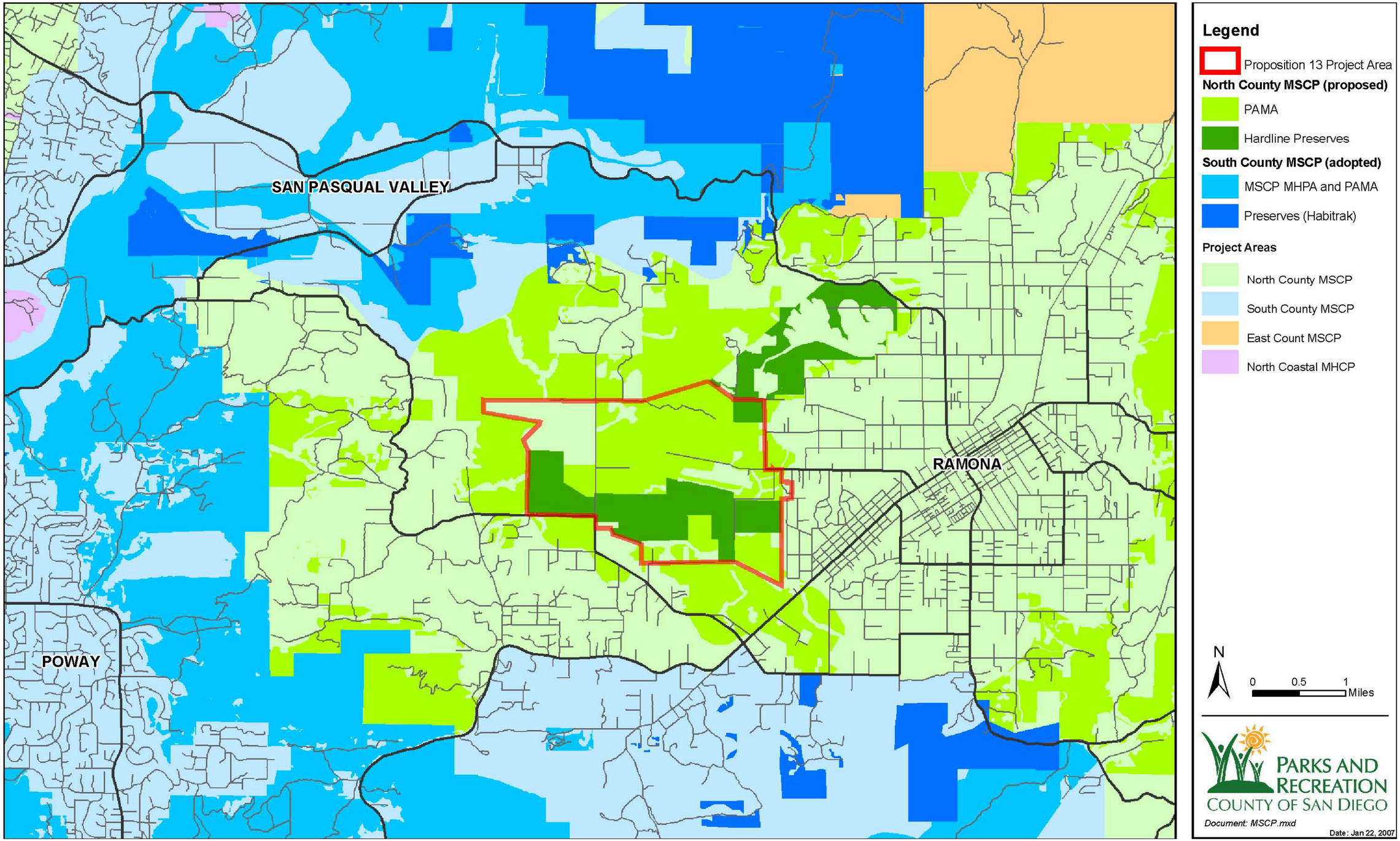

Figure 12. Location of the Preserve in relation to the South County MSCP and proposed North County MSCP.

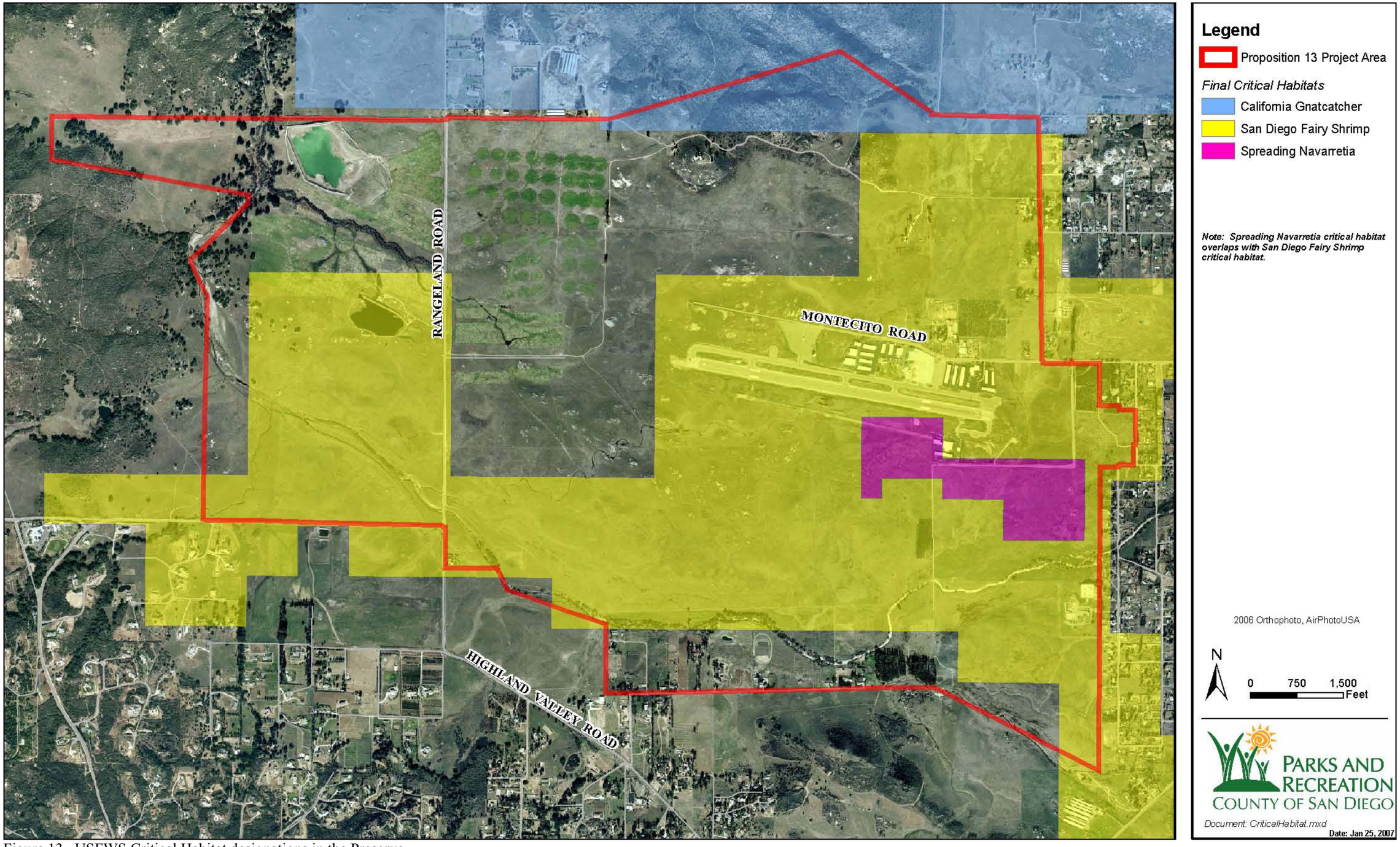

Figure 13. USFWS Critical Habitat designations in the Preserve.

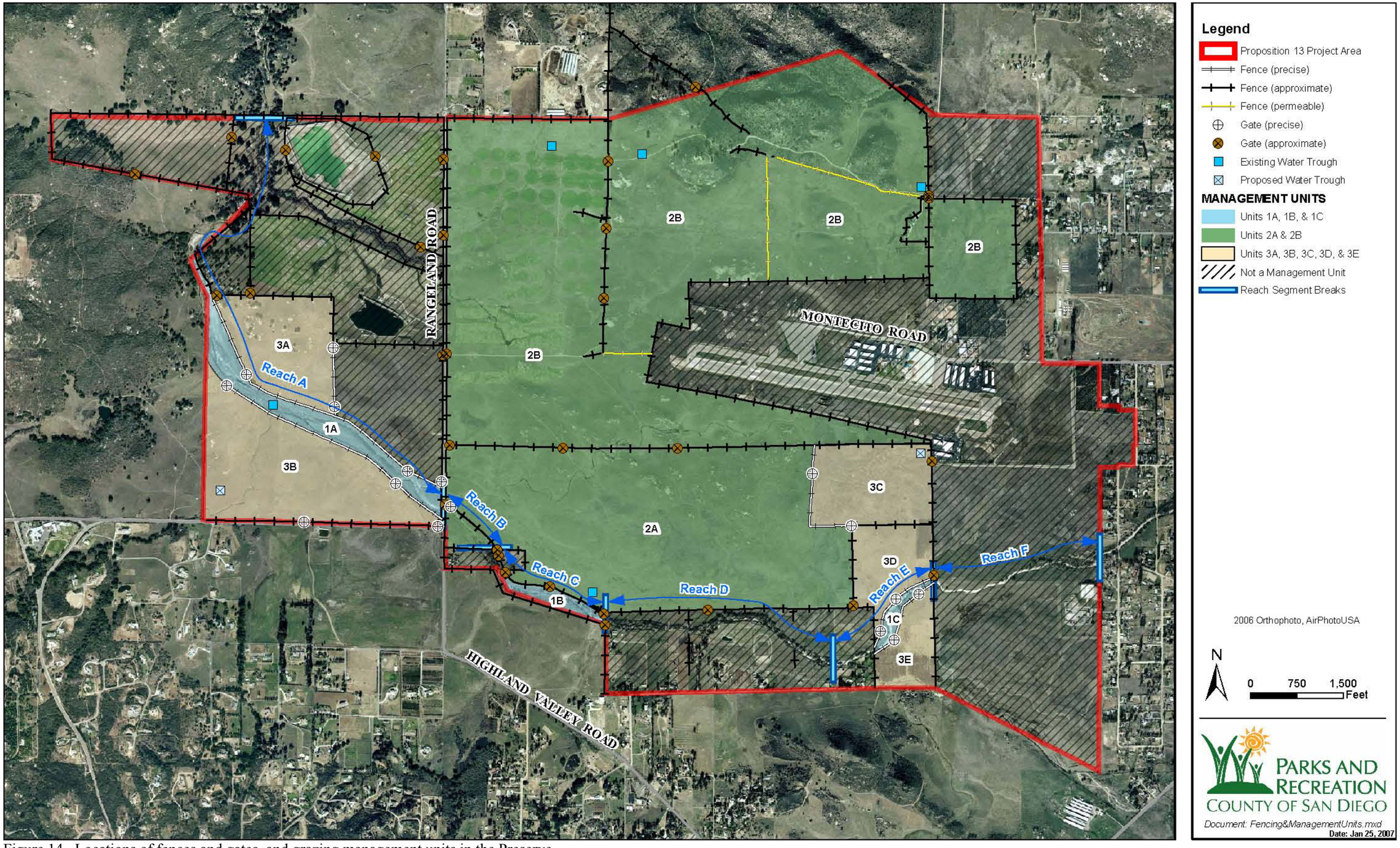

Figure 14. Locations of fences and gates, and grazing management units in the Preserve.

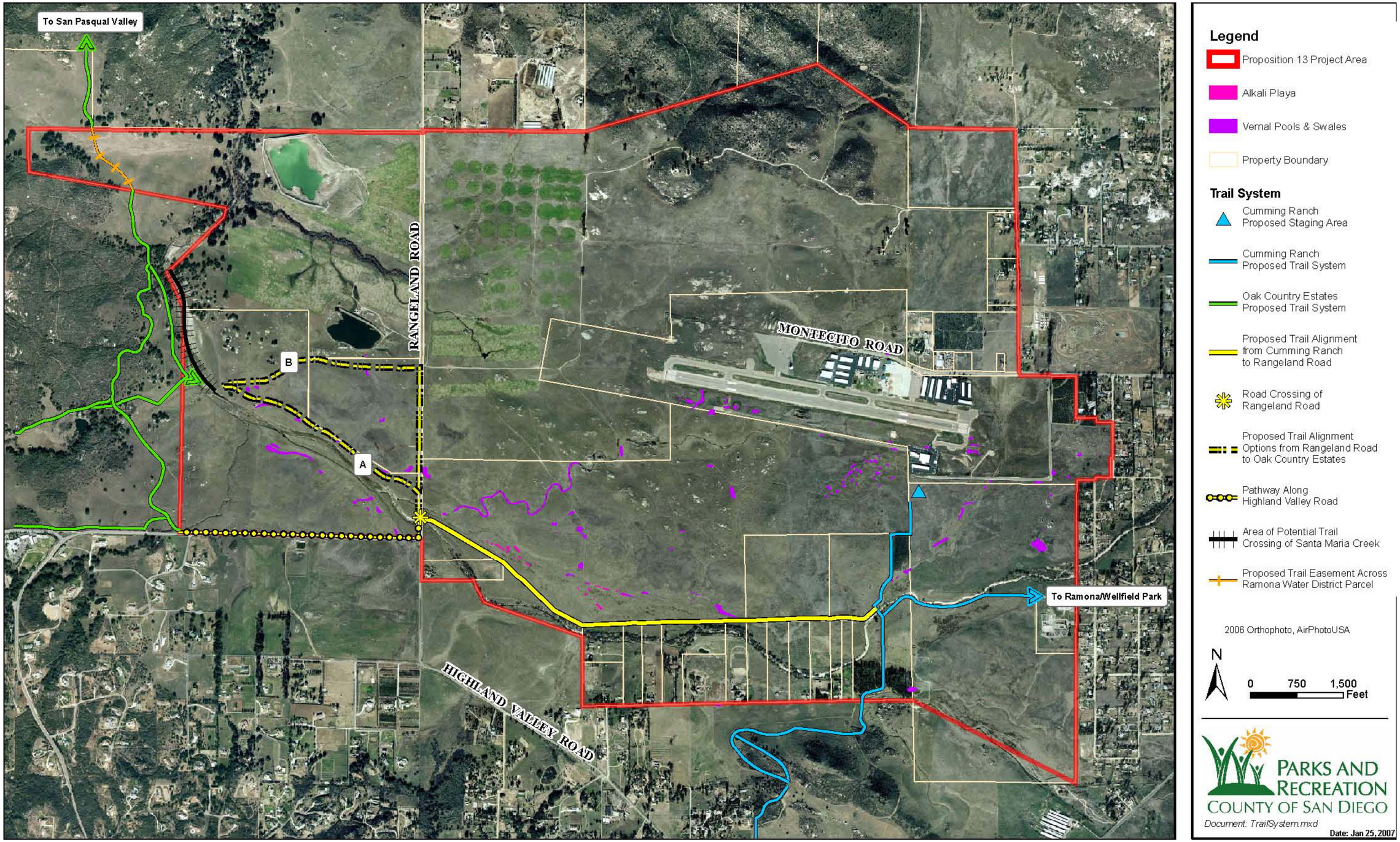

Figure 15. Proposed trails system through the Preserve.

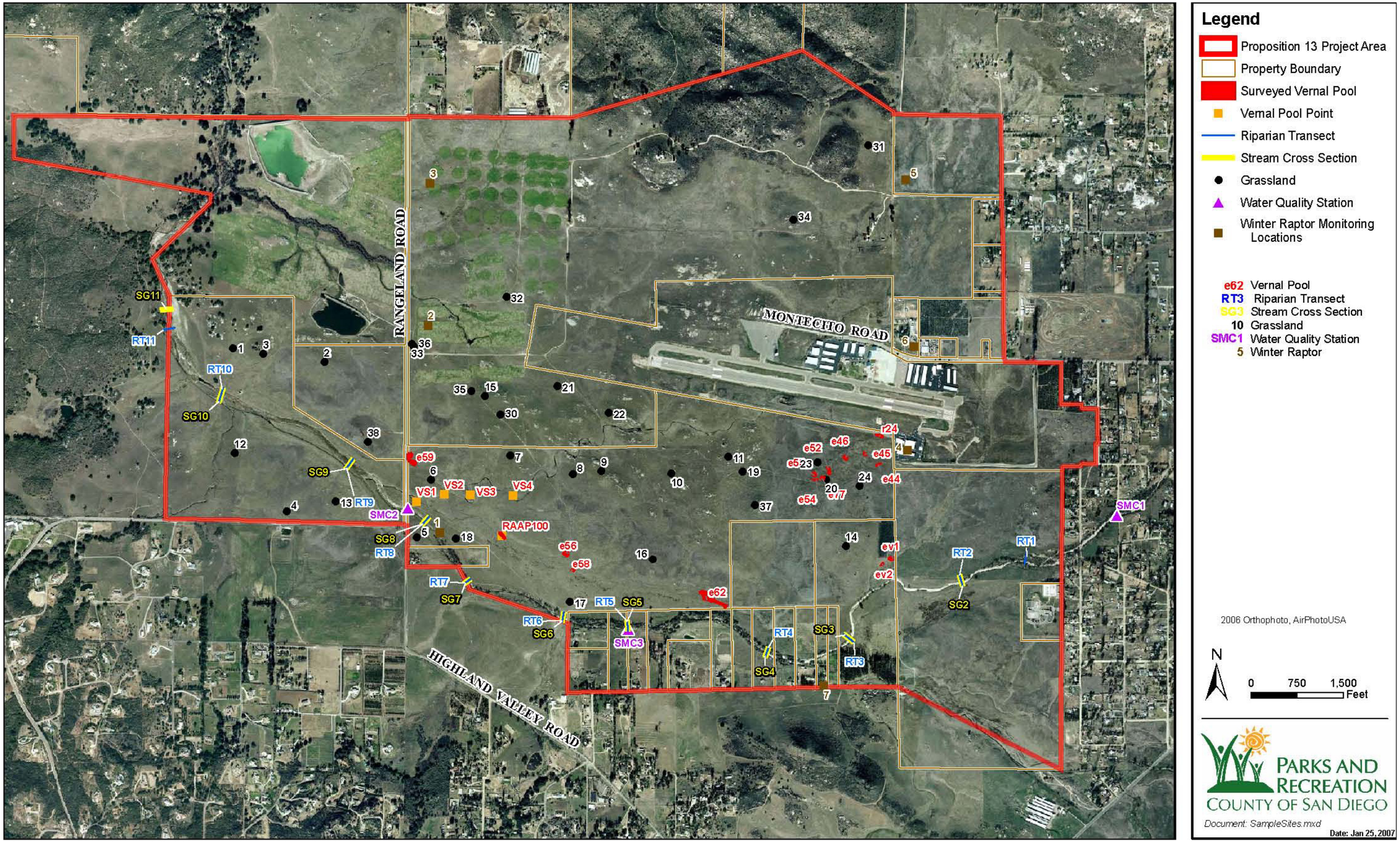

Figure 16. Locations of field monitoring stations in the Preserve.