Baseline Biodiversity Survey For The Santa Ysabel Ranch Open Space Preserve

U.S. Geological Survey

Prepared for:

The Nature Conservancy
San Diego County Department of Parks and Recreation

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
WESTERN ECOLOGICAL RESEARCH CENTER

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Abstract

Santa Ysabel Ranch Open Space Preserve, a 5,400-acre property previously operated as a cattle ranch, became part of the San Diego County Parks and Recreation Department in the fall of 2001. Following this acquisition, the U.S. Geological Survey conducted surveys to establish baseline species data. Aquatic surveys detected four native amphibian species and two non-native fish species. Herpetofauna pitfall arrays detected four native and one non-native amphibian species, eight lizard species, and eleven snake species. Forty-three ant species were recorded using ant pitfall traps co-located at the herpetofauna pitfall arrays. Diurnal and nocturnal bird point counts including targeted California spotted owl surveys and incidental bird sightings recorded 108 bird species present on or near the study site. Fifteen bat species were detected using foraging and roost site surveys. Twelve small mammal species were captured in pitfall buckets at the herpetofauna pitfall arrays. Remotely triggered cameras and scent stations documented the presence of nine native and four non-native medium and large bodied mammal species. Additional incidental observations and detection of non-target species through sampling efforts brought the total number of species detected on the Santa Ysabel Ranch Open Space Preserve to 225. This list includes one federally endangered species, 20 federal species of concern, 28 California Department of Fish and Game Species of Special Concern (eight of which are also federal species of concern), and 10 non-native species.

1. Introduction

For several generations, the Edwards Ranch was a cattle ranch owned and operated continuously by the Edwards family. In 1998 and 1999, The Nature Conservancy acquired approximately 5,400-acres and incorporated it as the Santa Ysabel Ranch Open Space Preserve (SYROSP). In the fall of 2001, the two properties that comprise the preserve were transferred to the San Diego County Parks and Recreation Department. Funds for the purchase of the SYROSP were provided, in part, by grants from the Federal Transportation Enhancement Act and the State Wildlife Conservation Board. Per grant agreements with those programs, an inventory of biological resources on the preserve was initiated. In 2002, the U.S. Geological Survey (USGS) began baseline biodiversity surveys. This project was multifaceted and included surveys designed to detect ants, fishes, reptiles, amphibians, birds, bats, and small, medium, and large mammals. A variety of techniques were utilized to detect presence and, when possible, relative abundance, for these taxonomic groups. The survey techniques used for this study followed standard protocols used by the USGS San Diego Field Station in other baseline biodiversity studies (Fisher & Crooks 2000, Hathaway et al. 2002). These data will serve as a basis for the development of public use and biological management guidelines for the preserve, as well as establish baseline conditions for a long-term monitoring program. This report summarizes our findings and will include the raw data in a Microsoft Access database.

The research approach taken here forms the basis for broader applications as an ecosystem function based design where the relationships between various taxonomic groups can be compared to a variety of reserve level covariates. One example is to determine patterns of diversity of native species in specific habitats to examine the effects of invasives

such as grasses. This type of design is more robust for conducting adaptive management experiments over time where the response is measured in biodiversity increases/recovery over time. By conducting a series of these biodiversity surveys under different environmental conditions we are able to begin to determine repeated patterns of co-occurrence across taxonomic groups and develop robust conceptual models of the relationships of these animal communities to habitat features. As we develop long-term monitoring strategies, the multi-taxa baseline data will be used to identify potential indicator taxa or groups to monitor that will be representative of ecosystem function and biodiversity. This will help to optimize the use of resources for monitoring.

2. Study Area

The Santa Ysabel Ranch Open Space Preserve (SYROSP) is located north, west, and east of the village of Santa Ysabel, California, approximately 40 miles (63 km) northeast of downtown San Diego (Figure 1). The preserve is comprised of two separate parcels: an east parcel, which is approximately 3,800 acres and is located east of CA 79 and north of CA 78 and a west parcel, which is approximately 1,512 acres and is located west of CA 79 and north of CA 78.

Two major drainage systems have their headwaters within or immediately adjacent to SYROSP. Santa Ysabel Creek, a tributary to the San Dieguito River, flows westward along the northern boundary of the east property and bisects the west property. Its headwaters also extend to the immediate east and north of the preserve on the western slopes of Volcan Mountain and it serves as the primary drainage to SYROSP. The east property also contains the headwaters of the San Diego River, which flows south into the Pacific Ocean.

The habitats within SYROSP are part of the California Floristic Province, which includes the cismontane areas from southern Oregon to coastal northwest Baja California. This floristic region is characterized by a Mediterranean climate, which has shaped the evolution and biogeography of its species and habitats (Munz 1974; Raven & Axelrod 1978; Wiggins 1980; Beauchamp 1986; Holland 1986; Oberbauer 1992; Hickman 1993).

SYROSP supports numerous native vegetation communities, including coastal sage scrub, chaparral, Engelmann oak woodlands, mixed oak woodlands, riparian scrub/forest, Coulter pine/black oak woodlands, grasslands, and chaparral (CBI 2000). Soils consist of sandy loams over decomposed gabbro or weathered granodiorite parent material and the hillsides feature outcrops of granite and granodiorite (CBI 2000).

3. Methods

Surveys were begun in early 2002 and continued through summer 2003, depending on the taxonomic group, survey technique, and the necessary temporal sampling regime. Specialists in the different survey techniques and project tasks were used and the leads for each project are listed below:

Project	Study Lead
Project management	Hathaway
Aquatic surveys	Ervin, Fisher
Herpetofauna	Rochester, Fisher
Ants	Pease
Avifauna	Mendelsohn, Madden-Smith, Turschak
Bats	Stokes
Small mammals	Rochester
Large mammals	Turschak
Geospatial data and maps	Hathaway
Data development	Rochester, Hathaway, Brown
Report compilation and editing	Haas, Hathaway

The various sections of the report are primarily authored by the leads on the various projects.

3.1 Aquatics

Potential aquatic habitats were identified by looking at the topographic maps for the properties combined with reconnaissance surveys to better refine potential survey locations. Three reconnaissance visits were conducted and we identified a total of 15 wetland sites within the preserve to be included in the surveys. These 15 sites represented multiple aquatic features. All of the surveyed wetlands were classified by hydroperiod, which is defined as the length of time pooled or flowing water occurs above the substrate. The range of terms used to categorize wetland hydroperiod forms a continuum from permanent to short duration. The terms considered were: perennial, semi-permanent, seasonal, and temporary. Site names were formed and assigned to any presumably unnamed wetlands we surveyed by combining the habitat type with a sequential number (i.e., Spring 1, Spring 2). We used established names when possible and applied a sequential numbering method when a named habitat was subdivided into artificial segments (i.e., Santa Ysabel Creek 1, Santa Ysabel Creek 2).

On the west property, we surveyed the entire length of the seasonal Santa Ysabel Creek (Santa Ysabel Creek 1), a temporary unnamed tributary to Santa Ysabel Creek (named in this document as unnamed tributary to Santa Ysabel Creek), a temporary cattle pond (Cattle Pond 2), and a perennial cattle pond (Cattle Pond 3) (Figure 2; Appendix 1). Cattle Pond 3 is located mainly outside the preserve with the high water line encompassing an area within the preserve. Consequently, only after sufficient input from rainfall or runoff does the pond surface water advance onto the preserve property. Therefore, we also identified this perennially marshy input drainage to Pond 3 as potential refugia for aquatic-associated species. On the east property, we sampled the entire length of the mostly seasonal Santa Ysabel Creek, which was divided into six reaches using existing road crossings or changes in land ownership as transition points (Santa Ysabel Creek 2-7). We also surveyed the temporary headwaters of the San Diego River and several upland wetland habitats, consisting of an additional temporary cattle pond (Cattle Pond 1) and two perennial springs (Spring 1 and Spring 2) (Figure 2; Appendix 1).

We targeted a variety of species with very divergent life histories. Therefore, we employed a variety of different survey methods and techniques throughout the preserve and surveyed temporally across seasons. These methods included: visual encounter surveys, hand capture, dip netting, aural detections (for male frog vocalizations), and focused surveys for the arroyo toad and California red-legged frog habitat. Trapping was not used as a survey technique with the exception of those detections of aquatic species that were made using the passive capture method of pitfall trapping (see Section 3.2).We used a combination of survey methods and techniques to detect the greatest number of species within the shortest amount of time. The methods are discussed below and some examples of species they targeted are provided.

3.1.1 *Visual Encounter Survey*

We used a modified version of the visual encounter surveys described by Crump and Scott (1994). Our techniques varied in that they were neither time nor area constrained. The visual encounter surveys consisted of walking through an area or habitat in search of all aquatic (larval stage amphibians, fishes) and aquatic-associated organisms (garter snakes, turtles, newts, frogs and toads). We concentrated our efforts on the wetted portions as well as the perimeter and vicinity of the aquatic habitat. An additional component of the visual encounter survey was the identification and notation of sub-areas, or habitat patches, which fit the criteria for suitable arroyo toad habitat (see Section 3.1.5). All 15 aquatic sites identified were initially visually surveyed during daylight hours; any follow-up visual encounter surveys were conducted during daylight hours and/or after sunset.

3.1.2 *Hand Capture*

We located and attempted to capture by hand at least one individual per species at each sample site to confirm species identification and on occasion take a digital photograph to serve as a record of species presence and activity.

3.1.3 *Dip Netting*

Dip nets were used to capture individual animals visually detected or to sample areas between and among debris. This method is most effective in smaller bodies of water and shallow streams which characterize the wetlands that occur on site. This method has been shown to be effective in capturing small fish, all amphibian life stages, large macroinvertebrates, and reptiles (Heyer et al., 1994; Warburton et al. 2002). Dip nets were used to sample deeper pools in each of the Santa Ysabel Creek survey reaches where more complex microhabitats (thick algae growth, cobble substrates) were found. Dip nets were not required in the shallow waters of the upland spring habitats.

3.1.4 *Aural Detection*

This method is limited to species that produce detectable and identifiable species-specific vocalizations. Male anurans (frogs and toads) in breeding condition were the only group of aquatic species to fit this criterion. The advantage of aural detection over visual

surveys is that the animals advertise their presence, whereas the observer must locate them during visual surveys. In addition, the male anuran advertisement calls permit detection from a distance. Aural detections were used to supplement the basic visual encounter surveys by enabling us to detect species presence by their vocalization.

3.1.5 *Focused Surveys for Arroyo Toads*

The arroyo toad is a species of concern to resource agencies and this preserve is within the arroyo toad's distribution range. During our preliminary visual encounter surveys we identified suitable arroyo toad habitat on-site. Therefore, we conducted focused surveys for the federally endangered arroyo toad (*Bufo californicus*) along several segments of Santa Ysabel Creek. This species is considered to have the most specialized habitat requirements of any amphibian found in California (Jennings & Hayes 1994). Although the arroyo toad is a terrestrial species most months of the year, it requires aquatic habitat for breeding; it is not known to breed in lentic habitats. Based on Jaeger (1994), we developed a patch sampling approach to plan and conduct focused surveys for the endangered arroyo toad (Ervin et al. 2003). This method emphasizes searching a habitat patch within a broader environment for a specific species and is most useful for species that are strongly associated with specific habitat types (Jaeger 1994).

Initial surveys for the arroyo toad consisted of hiking up riparian corridors (all Santa Ysabel Creek segments, the unnamed tributary to Santa Ysabel Creek, and the San Diego River; Figure 2; Appendix 1) during daylight hours and searching for habitat features known to be associated with suitable arroyo toad habitat (i.e., low gradient drainages, predominantly sandy substrate and adjacent banks, and terraces composed of friable soil types). All other aquatic species were noted during the focused surveys. The physical habitat features used to characterize riparian habitats in terms of quality for arroyo toads included: 1) any given drainage, or portion there of, with a gradient (degree of slope) of ≤ 2%, 2-3%, or > 3%, 2) the channel substrate type being predominately composed of depositional sand with the presence of sandy banks, 3) the presence of flat sandy terraces immediately adjacent to channel, and 4) the degree of channel braiding. In combination, the occurrence of a low gradient (≤ 2%) with sandy depositional substrate results in conditions conducive to the formation of seasonal quiet backwater breeding pools (Sweet 1992; Campbell et al. 1996). Assessments were based on physical features and channel morphology, and not necessarily on the presence of surface water (seasonal breeding pools). The following four habitat quality types are based on various conditions and combinations of upland (terrestrial) and stream channel (potential aquatic breeding pools) characteristics:

<u>High Quality</u>: Portion of drainage of low gradient (≤ 2%), with predominantly sandy substrate and banks, adjacent terraces with friable soils, and often having a watercourse of braided channels.

<u>Good Quality</u>: Portion of drainage of relatively low gradient (2-3%) and having only one of the following characteristics: predominantly sandy substrate and banks, adjacent sandy terraces, and a watercourse of braided channels.

Marginal Quality: Portion of drainage of relatively low gradient (2-3%) and lacking all three of the following characteristics: predominantly sandy substrate and banks, adjacent sandy terraces, and a watercourse of braided channels.

Poor Quality: Portion of drainage with a gradient of > 3%, and lacking all three of the following characteristics: predominantly sandy substrate and banks, adjacent sandy terraces.

Those sites which were characterized as 'High Quality' or 'Good Quality' were subsequently revisited during the evening hours to survey for arroyo toads. These nocturnal presence surveys entailed walking along drainages in search of any of the various life history stages (i.e., calling males, egg strings, larvae, metamorphic individuals, and foraging juveniles and adults in upland habitats) using multiple cues (direct observation and calling males). Headlamps with 45,000-candle power were used to provide the required amount of illumination to maximize detection. We followed a modified version (USGS San Diego Field Station, unpublished protocol) of the USFWS arroyo toad survey guidelines (USFWS 1999b), which recommends commencing nighttime surveys 60 minutes after sunset on nights with an ambient temperature of 15^{o}C (at sundown) in the absence of wind, hard rains, and a full moon (USFWS 1999b). Modifications made to the USFWS guidelines for our nocturnal presence surveys included commencing surveys at approximately 30 minutes after sunset (to take advantage of the darkness but prior to lower air temperatures).

All surveys for aquatic species were conducted between the months of March and September 2002 and May through August 2003. Not all sites were surveyed on each survey day, however each site was visited at least once.

3.2 Herpetofauna

Pitfall trap arrays have been widely used to obtain data on a variety of arthropods, amphibians, reptiles, and small mammals throughout southern California (Fisher & Case 2000). In this study, each array consisted of seven 5-gallon buckets connected by shade cloth drift-fences. From a center bucket, three arms of drift fence extended out 15 m, thus forming a Y (Figure 3). In addition to the center bucket, each arm of the Y had a bucket placed in the middle and at the end. A meter long hardware cloth funnel trap was placed along each of the three arms for capturing large snakes and lizards. Each snake trap had a funnel on each end, allowing animals to enter but not exit, contained a piece of PVC pipe to provide shelter for captured animals, and was covered with boards to provide shade. Sampling was conducted at each array for four consecutive days every 4-6 weeks (Appendix 2). The traps were kept closed between the sampling periods.

Captured animals were individually marked either by toe-clipping (lizards and amphibians) or scale-clipping (snakes) and then released. In addition, individuals were weighed, measured (snout to vent), sexed, and age classed. Twenty-four pitfall arrays were established across the preserve (Figure 4; Appendix 3). A sample period was represented by all arrays being open for four consecutive days. A total of 10 four-day sample periods and two three-day sample periods were performed, resulting in 46 survey nights. For more in depth methods see Fisher et al., in review.

3.2.1 *Vegetation and Site Characterization*

Vegetation was recorded in the vicinity of each array following established protocols of the California Native Plant Society (Sawyer & Keeler-Wolf 1995). Local landscape features were also recorded and entered into a GIS database. The flora and vegetation at each array were measured with two 25 m orthogonal line transects. These transects were north and south of the center bucket of each array. Data were collected at points every 0.5 m for plant species, canopy height, leaf litter depth, and substrate type. We determined the proportion of habitat type at each pitfall trap array based on the typical plant indicators of those habitat types (Holland 1986). We also characterized the substrate type into seven categories at each array: sandy soil, bare rock, organic soil, moss, leaf litter, cobble stone, and cryptogamic crust.

3.3 Ants

Ants were sampled in association with the herpetofauna and small mammal sampling locations (24 locations; Figure 4; Appendix 3). Five ant pitfall traps (50 mL centrifuge tubes) filled with approximately 25 mL of Sierra™ brand antifreeze were installed at each herpetofauna array. This brand of antifreeze preserves the specimens without threatening the health of the environment. Holes were made in the soil using a metal stake. A PVC sleeve constructed from a 1" pipe was inserted into each hole and an ant pitfall trap was inserted into the sleeve so that the opening of the centrifuge tube was flush with the ground. The five traps overlaid the existing herpetofauna array in the shape of a "+", with a trap at the center bucket and one located (in each direction) 15 m away from the center bucket (Figure 3). The four corners of the "+" were separated by approximately 20 m.

Each ant pitfall trap was left open for 10 consecutive days. In order to reduce and prevent incidental captures between sampling efforts, the sleeves were closed using empty 50 mL centrifuge tubes with the lids remaining on. The ants were identified and counted after the samples were sorted to remove ants from non-ants and debris. When necessary, representative specimens of unknown species were sent to Dr. Andrew Suarez at University of California, Berkeley and Dr. Phil Ward of University of California, Davis to be identified. The five tubes from each array were pooled for analysis to determine the number and relative abundance of ant species at each array. Winged queens and males were noted but not used in analysis since they may have originated from outside the site.

3.4 Avifauna

Avian species were observed and recorded through morning (diurnal) point counts, night driving surveys, and incidental observations from other USGS research efforts on the preserve. Additional focused species surveys were used to target California spotted owls.

3.4.1 *Diurnal Point Count Surveys and Nocturnal Driving Surveys*

Field methods and data forms used for avifauna surveys were similar to Ralph et al. (1993). Point counts were conducted between roughly 0530 and 1100, recording all birds observed visually and/or audibly. All methods were chosen to maximize species detectability, which ultimately depends on the observer's skill, a bird's distance from the observer, and species' behavior (Nichols et al. 2000). Only mornings with favorable weather conditions (i.e., lacking heavy rain, heavy wind, fog, or abnormally cold temperatures that could hamper bird activity and/or detections) were used for surveys. Notes regarding habitat associations of birds and signs of any breeding activity were also recorded. The counts were broken down into 0-5 minute and 5-10 minute time frames so that the results could be compared to censuses done with only 5-minute intervals. Additionally, the radius of detection was divided into 0-50 m and 51-100 m, and observations for each were recorded in distinct columns. Fly-over observations were also recorded in separate columns. Temperature, percent cloud cover, and wind speed were noted at the beginning and end of each day.

Computer-generated point count locations were determined by overlaying a 0.125 km^2 grid on a GIS map of the study area and then placing a point in the middle of each grid cell, so that 0.25 km separated the two closest points. These points were then examined with an existing vegetation map (San Diego Association of Governments) in an attempt to stratify across the general vegetation types present. The goal was to create a proportional allocation of points across habitat areas based on the area covered by each habitat. Which points would be surveyed were then randomly selected within each vegetation type. The actual point counts were conducted as close as possible to these computer-generated locations, however accessibility determined the exact location. Terrain, vegetation and hydrological features, and land ownership usually determined accessibility. In fewer than five cases, points were just slightly relocated.

The total number of census points was 50 (Figure 5; Appendix 4). Flagging and GPS waypoints (Garmin 12XL) were used to mark all point count stations and to navigate to the points with relative ease. Three cycles (May, June, and July) were conducted at 50 points during each of the two survey years, 2002 and 2003. Incidental observations of avifauna species through other sampling methods (e.g., camera surveys; see Section 3.7.2), as well as raptor nesting sites, were also recorded.

For each bird identified, the general habitat type (pine woodland, oak woodland, riparian, chaparral, coastal sage scrub, grassland, and human-modified) in which it was found was recorded. Birds using urban habitat or any non-natural structures on the study area (e.g., roads, telephone/electricity poles, towers and wires, and fences) were lumped into the category "human-modified" (H). Additionally, vegetation data (measured within a 100 m radius of each point count station), substrate, hydrology, aspect, slope, and road presence data were recorded for each point. One of the variables, the percentage of this area covered by each habitat type present, was visually estimated from each point count station (Appendix 17).

We created files with 1) notes on the best access, via driving and/or walking to each point, 2) a complete list of species observed, 3) notes on the date and habitat(s) in which each species was first observed, and 4) two digital photographs of each point count station. In conducting the point counts, especially during the first cycle, time was spent following unknown birds and consulting field guides (National Geographic Society 1999; Sibley 2000) and CD's (Cornell Laboratory of Ornithology 1992) with bird vocalizations for positive identification.

In order to target nocturnal species, such as owls and Caprimulgids, four nocturnal-driving surveys (one during new and one during full moon phases, on each property, west and east) were performed in 2002 from one hour before dusk to two to three hours after nightfall. During each of the four surveys, the vehicle was stopped at at least three locations on roads throughout the study area for 30 minutes each. At each location, vocalizations of all potential owl and Caprimulgid species were played from CD's to elicit behavioral responses from such birds for detection, both by visual (aided by the use of a spotlight) and audible (callbacks) means. Data from the night surveys were recorded onto "area search forms" available on Point Reyes Bird Observatory's website - http://www.prbo.org/tools/index.html (Point Reyes Bird Observatory 2002). Nocturnal driving surveys were not conducted in 2003; rather focused surveys for California spotted owls were conducted and all incidental nocturnal avifauna species were recorded.

3.4.2 *Focused Surveys for California Spotted Owls*

A survey for the California spotted owl (*Strix occidentalis*) was conducted to determine its presence within the preserve. Calling stations were established following the USFWS Protocol for Surveying for California spotted owls in Proposed Management Activity Areas and Habitat Conservation Areas (USFWS 1993). When feasible, stations were established on prominent points such as ridge tops or hills to enhance calling distance. The stations were spaced at approximately 0.5 mile intervals. Projected calls can be heard approximately 0.25 miles from a calling station, so a distance of 0.5 miles between calling stations provided adequate coverage. Thirty-six calling stations were established throughout the preserve prior to surveying. However, due to time and personnel constraints, only a fraction of these calling stations could be surveyed. We surveyed all 15 high priority sites and one medium priority site between May and August 2003. The one year survey consisted of six visits to the property and followed the USFWS protocol (USFWS 1993) (16 stations; Figure 6; Appendix 5).

California spotted owls tend to select older forests for nesting, roosting, and foraging. In southern California, California spotted owls inhabit patches of higher elevation forest surrounded by chaparral or desert scrub (Noon & McKelvey 1992), riparian hardwood forests (Verner et al. 1992), and multi-storied coniferous forest (Gutierrez et al. 1992). With these characteristics in mind, we assigned a priority level (high, medium, or low) to each of the 36 calling stations based on the habitat quality requirements for California spotted owls. This prioritization resulted in 15 high priority sites, 10 medium priority sites, and 11 low priority sites (Appendix 5).

California spotted owls are most likely to be active and detectable directly following sunset and preceding sunrise. Each visit involved visiting a series of calling stations, beginning at sunset and extending for approximately 8 hours. To ensure that each station received at least one or two visits during the optimal detection time, the calling stations were visited in a different order on each visit. At each calling station, taped California spotted owl calls (Stokes et al. 1999) were played over a megaphone (Johnny Stewart 512 Wildlife Caller, 5100 Fort Ave., Waco, TX 76710). The calls were played for approximately 30 seconds followed by a one to two minute listening interval; this pattern was repeated until a minimum of 10 minutes had passed. Calling was discontinued if great horned owls or other predators were detected. Species and estimated location (compass bearing) were recorded each time an owl was detected. Sex and age (adult or juvenile) were also recorded following a response.

When California spotted owls responded, day follow-up surveys were conducted to determine pair status and reproductive status. Day follow-up surveys involved searching the general area in which the California spotted owl was heard, and included both a visual search of the area and playing California spotted owl calls to obtain audible responses. If an owl was located during the day, visual observations were used to determine pair status and/or reproductive success. If pair status could be determined, an activity center was established. An activity center consisted of a ½ to ¾ mile radius around the point where a pair was detected. After an activity center was determined, the calling stations within that center were eliminated. (USFWS 1993)

3.5 Bats

Acoustic, visual, and mist-net capture techniques were used to observe and detect bats. These techniques were used in concert during two types of surveys: foraging bat surveys and roosting bat surveys. Occasionally, foraging bats were detected during roost surveys and bats exiting roosts were detected during foraging bat surveys.

3.5.1 *Foraging Bat Surveys*

Foraging bat surveys were conducted at 8 of the 9 survey sites (sites 1, 2, 4-9) using a combination of an Anabat, the unaided ear, visual, and mist-net techniques (Figure 7; Appendix 6). We focused on a variety of habitat features within the preserve, including six creek/riparian reaches, an upland woodland area, and a pond. These are habitats where a number of different bat species would be expected to be found foraging based on previous experiences surveying for bats in southern California (D. Stokes, pers. obs.). We targeted these areas in order to detect as many bat species as possible in a limited survey effort.

When surveying for foraging bats, an Anabat II bat detector (Titley Electronics, New South Wales, Australia) was utilized to detect and record bat echolocation signals (O'Farrell et al. 1999). The Anabat was used at foraging sites for a minimum period of three hours beginning approximately at sunset. The calls were then analyzed and identified to the species level when possible. The unaided ear was also used to detect audible bat echolocation and social calls, which were also identifiable to the species level in most cases.

Visual techniques (i.e., a spotlight, unaided eyes) were often used simultaneously with acoustic techniques to observe foraging bats, which typically aided in species identification.

Mist-netting was conducted simultaneously with acoustic techniques during all foraging bat surveys. Mist-nets are made of fine nylon mesh and are used to capture bats in flight and are usually placed in areas likely to intercept flying bats, such as over small bodies of water or in vegetation flyways (Kunz et al. 1996a). We employed one to five mist-nets at appropriate foraging sites to capture bats. Mist-nets were used for a minimum period of three hours beginning approximately at sunset. Captured bats were processed and then released immediately. The information recorded during processing included the species, age, tooth wear (estimate of age), sex, reproductive status, parasite load, general measurements, and anything else noteworthy. In most cases, a digital camera was used to document the captured bat.

3.5.2 *Roost Surveys*

Roost surveys require first locating potential roost sites and then employing passive techniques to detect bats, including using the unaided ear, visual techniques, and Anabat bat detectors. To manage for and conserve bats, it is extremely important to locate, characterize, and monitor roosts (Pierson 1998). Some bat species are more easily detected at roost sites (e.g., Townsend's big-eared bat (*Corynorhinus townsendii*)) than foraging sites and thus this technique is used to compliment foraging bat surveys for conducting a thorough bat inventory. Roost surveys must be conducted cautiously as many bat species are very sensitive to disturbance at roost sites (Kunz et al. 1996b), therefore only passive techniques were used. An Anabat bat detector, the unaided ear, and visual techniques were used to observe and detect bats at a single roost site (corner store in town of Santa Ysabel; Figure 7; Appendix 6) on two different dates.

3.6 Small Mammals

Small mammals were passively captured in the buckets comprising each of the 24 herpetofauna pitfall arrays (Figure 4; Appendix 3; see Section 3.2 for a more detailed explanation of trap configuration and sampling methods). Small mammal species captured in pitfall traps were identified, when possible, and recorded. However, they were not weighed, measured, nor marked. Data were analyzed as the number of confirmed captures per array site. Capture rates were not calculated, since not all small mammal species captured by the herpetofauna field crews were identified to the species level and individually marked.

In addition to the small mammals documented in the pitfall traps, surveys were also conducted to determine the presence of wood rat (*Neotoma* spp.) nests near each array. A visual search for wood rat nests was performed around each array, to an approximate radius of 25 m from the center pitfall trap. When detected, wood rat nest locations were recorded with a GPS receiver.

3.7 Medium and Large Mammals

Two sampling techniques were used to document the distribution and relative abundance of native medium and large bodied mammals across the preserve: baited scent station surveys and remotely triggered camera stations.

3.7.1 *Scent Station Surveys*

Scent stations have been widely used as a means to monitor trends in carnivore populations. Following methods developed by Linhart and Knowlton (1975), track surveys have been shown to be effective measures of distribution and relative abundance of mammalian species (Conner et al. 1983; Sargeant et al. 1998).

Ten track transects were established throughout the property. Nine track transects were located along dirt roads within the property. Each 1000 m transect consisted of five scent stations at approximately 250 m intervals (e.g., transect 1: stations 1-1 to 1-5, etc…) (Figure 8; Appendix 7). To further assess the movement of medium and large bodied mammals along and across roadways bordering and transecting the preserve, additional scent stations were placed at potential movement routes across and along CA 78 and CA 79 (Figure 8; Appendix 7). Three scent stations were established at varying intervals along these two roads. Although not a true transect (it did not contain five scent stations 250 m apart in a linear configuration like transects 1-9), these three stations were collectively referred to as transect 10. Each scent station consisted of a 1 m^2 plot of finely sifted gypsum powder with a rock, placed in the middle of the station, baited with two artificial scent lures (Russ Carman's Pro Choice and Canine Call) every other day. Stations were checked for visitation on five consecutive mornings. If an animal visited a station, tracks were identified to species and the station was cleared and resifted. Scent stations were surveyed quarterly from June 2002 to June 2003 for a total of five sample periods.

To obtain an index of relative abundance, the number of visits by each species was divided by the total sampling effort. This index was calculated using the following equation:

$$I = \{v_j/(s_j n_j)\}$$

where, I = index of carnivore activity at transect j
v_j = number of stations visited by species at transect j
s_j = number of stations in transect j
n_j = number of nights that stations were active in transect j

Any scent station in which tracks were too difficult to read was omitted from the sampling night. Thus, the true sampling effort was:

$$\{s_j n_j\} - o_j$$

where, o_j = number of omits in transect j

Sampling efforts for each transect are presented in Appendix 8. This index does not provide data on the absolute number of individuals. Instead, the index is used to compare relative abundance of species across space and time (Conner et al. 1983; Sargeant et al. 1998). Track indices were pooled across seasons to derive a single track index per transect for each individual species.

3.7.2 *Camera Surveys*

Remotely triggered camera stations have increasingly become a useful tool in recording activity of various wildlife species (Griffiths & Van Schaik 1993; Jacobson et al. 1997; Karanth & Nichols 1998). Cameras provide a relatively low-maintenance means of surveying wildlife populations because visitations to the units are only made to change film and batteries.

Nine Camtrak cameras (CamTrakker, 1050 Industrial Drive, Watkinsville, GA 30677) were placed along wildlife trails and dirt roads throughout the property (Figure 8; Appendix 7). Each camera was paired with a track transect in order to compare the detection of various species along different travel routes (i.e., scent stations were placed along major dirt roads throughout the preserve; camera stations were placed off of these routes along wildlife trails, cattle paths, and abandoned roadways). Each pass of an animal by the infra-red sensor triggered the camera. Date and time of pass were recorded on each print. Cameras were operated continuously, barring drained batteries or all of the photos used between periodic visits, between April 2002 and June 2003.

To obtain an index of relative abundance, the number of visits by each species was divided by the total sampling effort. This index was calculated using the following equation:

$$I = \{v_j / n_j\}$$

where, I = index of activity at camera j
v_j = number of passes by species at camera j
n_j = number of nights that camera j was active

Sampling efforts for each camera station are presented in Appendix 8. Camera indices were compared among camera locations to detect relative activity levels of species across the property.

4. Results and Discussion

4.1 Aquatics

4.1.1 *Visual Encounter Surveys*

Visual encounter surveys detected four amphibian species, two non-native fishes, and a freshwater clam (Table 1). Five of these species were observed on the west property, including the Pacific treefrog (*Hyla regilla*), western toad (*Bufo boreas*), arroyo toad (*Bufo*

californicus), the non-native mosquitofish (*Gambusia affinis*), and the yet to be identified fingernail clam (*Cyclocalyx* spp.). All five species were observed in the Santa Ysabel Creek 1 reach; only the Pacific treefrog and western toad were observed at Cattle Pond 3 and its input drainage. No aquatic species were observed in Cattle Pond 2 or the unnamed tributary to Santa Ysabel Creek although this is not unexpected because no pooled water was present when our aquatic surveys were conducted.

Three species were detected on the east property: the Pacific treefrog, California treefrog (*Hyla cadaverina*), and a single individual of the stocked rainbow trout (*Oncorhynchus mykiss*), which was detected along the Santa Ysabel Creek 4 reach (Table 1) (see section 4.1.6 for discussion of trout status). The Pacific treefrog was the only aquatic species detected at a spring (Spring 1). No aquatic species were observed in Santa Ysabel Creek 7, Spring 2, or the San Diego River. We did not conduct thorough focused surveys at Cattle Pond 1, since there was no pooled surface water observed. No emergent wetland plants (i.e., *Typha*, *Scirpus*) were noted in this pond.

4.1.2 *Hand Capture*

Of the four anuran species detected during the aquatic surveys, only the Pacific treefrog was hand captured. The arroyo toads were not handled because they were observed on a fairly cool evening (temperature was 13.5^{o}C) and were easily photographed.

4.1.3 *Dip Netting*

Pacific treefrog and California treefrog eggs and tadpoles and mosquitofish were easily captured by dip nets. The fingernail clams were an incidental capture during routine capture and examination of amphibian larva.

4.1.4 *Aural Detection*

The mating behavior most commonly associated with frogs and toads is the advertisement call produced by the male. Male frogs and toads in breeding condition call most vigorously after sundown, often for several hours. The Pacific treefrogs and California treefrogs were detected on site by the males 'advertisement' call. Male arroyo toads also produce a distinctive advertisement call, but none were heard during our surveys. The male western toad also has the ability to produce an advertisement call but it is seldom used. No western toads were detected aurally. The western spadefoot (*Spea hammondii*) also has distinctive call but breeds almost exclusively in the temporary lentic wetlands such as pools and ponds. They were not observed nor heard vocalizing during our surveys, probably because these wetlands did not provide suitable breeding habitats due to the lack of adequate precipitation needed to fill and maintain pooled surface water.

4.1.5 *Focused Surveys for Arroyo Toads*

We identified four sections along Santa Ysabel Creek that contained High Quality arroyo toad habitat: Santa Ysabel Creek reaches 1, 2, 5, and 6. An additional area outside the

main creek was also identified along the input drainage to Cattle Pond 3. Within each of these survey sites, we further delineated potentially occupied arroyo toad habitat patches based on the presence of habitat features highly associated with toad populations (i.e., low stream gradient, a primarily sandy channel substrate, and adjacent sandy terraces). These subsets of survey segments included: North Sandy Arroyo (within the input drainage to Cattle Pond 3 site), Mortero Terrace (within the Santa Ysabel Creek 2 site), Turkey Terrace and Sandy Wash (within the Santa Ysabel Creek 5 site), and East Side Reach (within the Santa Ysabel Creek 6 site); the entire length of the Santa Ysabel Creek 1 survey site was determined to be High Quality arroyo toad habitat (Figure 2; Appendix 1). Representative photos of occupied and potential arroyo toad habitat are provided in Appendix 9.

No arroyo toads were detected during our nighttime aquatic surveys. However, there were three incidental observations of arroyo toads during one evening that a bat survey was conducted (Appendix 9). These three observations constituted at least two unique individuals and confirm the presence of the arroyo toad on SYROSP. These observations occurred within the Santa Ysabel Creek 1 site. Furthermore, several other species were detected during these nighttime surveys, including the Pacific treefrog, California treefrog, and western toad.

4.1.6 *Survey Discussion*

Our study took place during a period of below average rainfall for the mountains of San Diego County. Although weather data for Santa Ysabel were not available, data were available for nearby Julian (approximately 4 km (2.5 mi) from the SYROSP east property) and Henshaw Dam (approximately 11.5 km (7.1 mi) from the SYROSP east property). The annual precipitation (Jan – Dec) in Julian was 416.8 mm (16.4 in) in 2001, 307.1 mm (12.1 in) in 2002 and during the period sampled in 2003 (January – July), the total rainfall was 382.5 mm (15.1 in) (DWR 2004). Based on available daily data during 1971-2000, the average annual precipitation for the Julian area is 697.2 mm (27.45 in) (WRCC 2004). The annual precipitation (Jan – Dec) at Henshaw Dam was 495.3 mm (19.5 in) in 2001, 299.5 mm (11.8 in) in 2002 and during the period sampled in 2003 (January – July), the total rainfall was 447.8 mm (17.6 in) (DWR 2004). Based on available daily data during 1948-2004, the average annual precipitation for the Henshaw Dam area is 697.2 mm (27.45 in) (WRCC 2004). As a result a result of the below average rainfall in this area, surface water and the durations of surface flow of lotic habitats were at a minimum within the SYROSP. The majority of wetland habitats (springs, marsh, riparian, ponds) within the SYROSP are non-permanent. Perennial wetland habitats included Spring 1, Spring 2, and Cattle Pond 3 (including the marshy habitat of the input drainage). Seasonal habitats included Santa Ysabel Creek segments1-7. Temporary habitats included Cattle Pond 1, Cattle Pond 2, the unnamed tributary to Santa Ysabel Creek, and the headwaters of the San Diego River. Aquatic species may be more diverse, common, and widespread during wetter years.

It is difficult to make meaningful comparisons between habitat types (creek, pond, spring) and the aquatic species we detected because some habitats did not contain surface waters during aquatic surveys (i.e., Cattle Pond 1), while others only contained little surface waters for a few months (i.e., Santa Ysabel Creek). Thus, we identified those sites where we

expect certain native species to occur, based on the known ecology of the individual species (Table 1).

The collection of fingernail clams (*Cyclocalyx* spp.) in Santa Ysabel Creek is, to our knowledge, the first record of fingernail clams from San Diego County (Burch 1975; Thorp & Covich 1991). The specimens have been sent to Dr. Taehwan Lee, a Sphaeriinae expert at the University of Michigan Museum of Zoology, Mollusk Division, for species identification.

Two fish species, both stocked, were detected within the preserve. The mosquitofish, a common and widely distributed non-native fish in southern California, was the only species detected on the west property. All age classes were observed, confirming that an established population exists. Because the entire portion of the Santa Ysabel Creek within the west property is seasonal (non-permanent), effectively extirpating the mosquitofish in late summer, they are likely persisting (perhaps via stocking for mosquito abatement) upstream in perennial pools on the private property immediately to the east and are washed downstream onto the preserve during flooding events. No mosquitofish were observed within the preserve on the east property. Being a top-water fish, they are highly visible; consequently, we have a high confidence that they do not occur on the east property. On the east property, the only fish species detected was an adult rainbow trout. It is likely that this individual migrated up the Santa Ysabel Creek from Sutherland Reservoir, where the California Department of Fish and Game (CDFG) regularly plants hatchery-stock rainbow trout to enhance recreational angler opportunities, or from stockings they have done in the creek proper.

Additional data relating to the status of the rainbow trout detected come from our examination of CDFG fish stocking files currently being held at the Chino Hills, CDFG headquarters. We were able to obtain CDFG fish stocking records for San Diego County. In most cases, these records spanned from the 1940's to the 1990's and included the number and type of fish stocked at locations throughout the region. These data did not include specific geographic coordinates for stocking locations but give locality descriptions. Years during which a given site was stocked were recorded. The number of years each location was stocked was then determined. From this database we found that Santa Ysabel Creek was stocked with rainbow trout beginning in 1950 and was last stocked in 1974. During this time period it was stocked for 23 of these 24 years. We could not get any more recent stocking records for the creek.

Trout are known to prey on native amphibian larvae and have the ability to completely eliminate them from small pools (Cooper et al. 1986). The placement of trout into streams and rivers that were previously fishless has been shown to negatively affect native amphibians at the population level (Bradford et al. 1993; Fisher & Shaffer 1996; Backlin et al. 2002). Tadpoles are particularly vulnerable to predatory fish when they do not possess effective anti-predatory mechanisms (Sexton & Phillips 1986; Bradford 1989; Hecnar & Closkey 1997) and this has been demonstrated to be the case with arroyo toad larvae (Sweet 1992). Consequently, successful recruitment could be significantly reduced in the presence of trout, thus resulting in artificially lowering the abundance of local populations of arroyo toads and other aquatic breeding amphibian species (i.e., western toad, Pacific treefrog, California treefrog). Thus the almost annual stocking of trout in the creek

from 1950-1974 and possibly longer may have had a large impact on aquatic species in this system.

The presence of egg masses, tadpoles, and/or metamorphic individuals indicate that breeding populations of anurans (frogs and toads) occur onsite. On the west property, larvae of the Pacific treefrog and the western toad were observed, confirming the presence of breeding populations. On the east property, larvae of the Pacific treefrog and California treefrog were observed, confirming the presence of breeding populations. Especially significant was the observation of the federally endangered arroyo toad. The potential for occurrence of this toad was high because of the presence of the physical habitat characteristics known to constitute suitable habitat for this species (Sweet 1992; Campbell et al. 1996; USFWS 1999a). In regards to the potential occurrence of the arroyo toad on the east property, several areas along Santa Ysabel Creek were identified as potential arroyo toad breeding habitat in that they contained a low gradient with primarily sand channel substrate and adjacent sandy terraces. These potential arroyo toad habitat patches occur within the Santa Ysabel Creek sites 2, 5, and 6. Based on the physical attributes at these habitat patches, and the confirmation of arroyo toads a few kilometers downstream on the west portion, it is possible that the toad also occurs within the preserve on the east property.

Four rare or sensitive aquatic dependent species that were expected to be detected during these surveys were not. The coast range newt (*Taricha torosa*) occurs in central San Diego County in some tributaries of the San Diego River system, and could occur on the preserve, but it was not detected. It may have never occurred at this site due to natural reasons. The threatened California red-legged frog (*Rana aurora draytonii*) was not observed onsite, nor was suitable habitat currently present, it is possible that a population could exist outside the preserve boundaries within the permanent waters such as Cattle Pond 3. Consequently, there is a possibility that this frog may frequent the preserve during wetter periods (i.e., greater rainfall) when these frogs disperse (Jennings & Hayes 1994). We did find two historic records for California red-legged frogs at SYROSP or nearby. Both of these records are very old. The first is for Santa Ysabel, at Witch Creek, which was a specimen at the U.S. National Museum collected in 1893 and the second is in the field notes of Laurence Klauber (from the San Diego Natural History Museum) from Santa Ysabel on May 6, 1928. We could find no additional records after these.

In addition, the western pond turtle (*Emys marmorata*), which also requires longer duration pooled water than was found within the preserve, may occur in Cattle Pond 3. If either the western pond turtle or the California red-legged frog does occur in this pond, proper management would be problematic because the water level fluctuates greatly and the pond advances onto the preserve property from private property only during high water levels. We found few records for *Emys marmorata* from above Sutherland Lake within the Santa Ysabel Creek watershed, although there are very few museum records for this species in general. They do currently occur below the lake in Santa Ysabel Creek (Tod Reeder, pers. comm.), and if habitat was identified or created for them it is possible that a population translocation into the preserve could take place.

The red-sided gartersnake (*Thamnophis sirtalis)* was not found onsite but may occur in the marshy habitat where willows dominate, such as the input drainage to Cattle Pond 3 or along the Santa Ysabel Creek. There are historic records for this species from this system early last century, but they became rarer over time. There are no recent records for red-sided gartersnakes from the San Dieguito River system with the most current records dating over 50 years. Appendix 10 lists the expected aquatic-associated species that may be present on SYROSP but were not detected through our aquatic survey efforts.

It is also notable that a non-native amphibian species, the bullfrog (*Rana catesbaeiana*), was heard calling in this vicinity near pitfall array number seven. This species has a voracious appetite and will consume anything it can capture that will fit in its mouth from invertebrates to vertebrates including other frogs, turtles, lizards, snakes, birds, and rodents. This species can be difficult to manage due to its ability to travel across the landscape over at least several kilometers.

Springs are an important component of this system because they provide a source of surface water beyond the period of initial storm runoff. They are uncommon and widely distributed across the preserve, occurring within the main course of the Santa Ysabel Creek up through the headwaters of smaller feeder tributaries. Wetland vegetation for the spring habitat varies in relation to their location to the Santa Ysabel Creek drainage system. For example, indicator species for spring habitat along the Santa Ysabel Creek proper are willow (*Salix* sp.) and/or alder (*Alnus rhombifolia*) trees, while rushes (*Juncus* spp.) serve as indicator species of 'upland' springs in the grassland and/or oak woodland habitats. The portion of Santa Ysabel Creek on the east property has several segments lined with alder trees, indicating the seeps are probably perennial. However, the limited duration of this study did not afford us the opportunity to delimit the number, precise location, and length of these segments. The 'hidden' emergent waters (seeps/springs) along Santa Ysabel Creek were also difficult to delimit. Consequently, they were not individually named nor treated separately from the creek.

Since the 1930's, translocated wild turkeys (*Meleagris gallopavo*) have been periodically released into oak woodlands and associated habitats on private ranches and on National Forest lands of San Diego County extending from the foothills to the mountains (CDFG 1995). However, we do not have information on the exact release locations, when release took place, how often, or how many individuals were liberated at any particular release. As a result of these introductions, turkeys have migrated onto SYROSP and have become a common sight. In terms of diet, turkeys have been shown to consume a great variety of food types such as hard mast (acorns, seeds from grasses and forbs), soft mast (grasses, sedges, and various forbs), and a variety of invertebrate and vertebrates, including insects, snails, crayfish, salamanders, frogs, tadpoles, and lizards (Hurst 1992; CDFG 1995).

In this study, both the turkey (through observations of footprints and droppings) and the arroyo toad co-occur on open sandy stream benches and terraces along Santa Ysabel Creek. Turkeys were detected at several scent and camera stations situated along Santa Ysabel Creek (track transects 8 and 9; camera stations 2 and 9). The presence of turkeys in these areas adjacent to arroyo toad breeding habitat may increase vulnerability to predation. These toads are naturally subject to predation specific to various stages of their development,

including egg masses, tadpoles, juveniles, and adults. It is during the juvenile phase in which the arroyo toad would become most vulnerable to predation by turkeys. One of the most distinctive characteristics of the arroyo toad is the tendency for metamorphic individuals to remain on the open sand benches at the margins of the natal pool (rather than immediately dispersing). The metamorphs may occupy the sandy benches and bars, if conditions permit, for up to four months (from late June well into October) and grow to 30-35 mm (Sweet 1992). Although they make themselves more vulnerable to predation, that may be offset by the opportunity for rapid growth afforded by abundant insect prey and elevated body temperatures (Sweet 1992). It is also possible that predation by turkeys and introduced trout may be having an additive effect on the reduction of arroyo toad populations.

4.2 Herpetofauna

The pitfall trap arrays at SYROSP were surveyed for a total of 46 days across 12 sample periods from April 2002 through July 2003 (Appendix 2). A total of 580 herpetofauna captures were recorded representing 24 species (Table 2), 23 of which are native and one which is introduced (Stebbins 1985; Fisher & Case 1997). These species include 5 amphibians, 8 lizards, and 11 snakes; the one non-native species was a bullfrog (*Rana catesbeiana*) which was heard calling near array 7. Only one herpetofauna species known to occur on site was not detected in the pitfall trap arrays, the arroyo toad. However, this species was detected as an incidental observation during bat surveys (Table 1). Included in these 24 species are six of the CDFG Species of Special Concern: the large-blotched ensatina (*Ensatina klauberi*), western spadefoot (*Spea hammondii*), western skink (*Eumeces skiltonianus*), coast horned lizard (*Phrynosoma coronatum*), western patch-nosed snake *(Salvadora hexalepis*), and two-striped garter snake (*Thamnophis hammondii*).

Pitfall array captures were dominated by the lizard species, which accounted for over 90% of all herpetofaunal captures. The western fence lizard (*Sceloporus occidentalis*) was the most commonly captured species during this study (231 captures). The western whiptail (*Aspidoscelis tigris*) was the second most commonly captured species (79 captures) followed by the southern alligator lizard (*Elgaria multicarinatus*) and the western skink (each with 54 captures), and the side-blotched lizard (*Uta stansburiana*) (49 captures) (Table 2).

These same five lizard species were also the top five most widely distributed species. The western fence lizard was the only species detected at all 24 arrays. The western skink was detected at 18 of the 24 pitfall arrays, the southern alligator lizard occurred at 16 arrays, the side-blotched lizard at 15 arrays, and the western whiptail at 14 arrays. No other species occurred at more than 10 of the pitfall arrays (Table 2).

Snake species accounted for 6% of the herpetofauna records from SYROSP. The gopher snake (*Pituophis catenifer*), striped racer (*Masticophis lateralis*), and racer *(Coluber constrictor)* were the most frequently detected snake species with nine, seven, and seven captures, respectively. Gopher snakes and striped racers, which were each detected at six arrays, had the highest array occurrence. Ring-necked snakes (*Diadophis punctatus*) were the third most widely occurring snake species, detected at four arrays (Table 2).

Amphibians made up less than 2% of the captures reported during pitfall array sampling. The only amphibian species captured more than once was the large-blotched salamander, which was reported six times at two pitfall arrays (two captures at array 5 and four captures at array 23). All other amphibian species were only detected once in the pitfall sampling effort (Table 2).

Arrays 20 and 2 yielded the most captures (59 and 42, respectively), whereas arrays 9 and 18 yielded the fewest captures (8 and 9, respectively) (Table 2). The number of species captured was highest at arrays 11 and 13 (8 species at each array) and lowest at arrays 6, 16, 17, 18, 23, and 24 (four species at each array) (Table 2). The highest number of species captured was observed during the month of June (16 species); the lowest number of species captured was observed during the months of January and November (2 species each) (Table 3). Pitfall trap arrays were not sampled during the month of February. Capture rate trends followed number of species captured trends, peaking in June (23.0 individuals/day) and bottoming out in January (1.0 individual/day) (Table 3).

Herpetofauna species captures were compared with the vegetation transect data. Table 4 presents the number of captures per habitat type, along with the number of species detected within each habitat type. Habitat types included oak woodland (OAK), riparian (RIP), pine woodland (PIN), non-native grassland (NNG), chaparral (CHAP), and coastal sage scrub (CSS). Oak woodland (OAK) had the highest total number of captures (180); however this habitat type contained the greatest number of arrays (8). The lowest total number of captures was in the riparian habitat (RIP), which resulted in 15 captures across two arrays. The habitats with the greatest number of species (12) occurred in oak woodland (OAK) and non-native grassland (NNG). The two riparian arrays produced the least number of species of the six habitats sampled; seven species were detected between the two arrays. Because the six different habitats were sampled by varying numbers of arrays during this study, capture rates were averaged across the number of arrays within each habitat type. Pine woodland (PIN) revealed the highest average capture rate per array (45.0 captures/array), whereas arrays in riparian habitats (RIP) produced the lowest average capture rate per array (7.5 captures/array). Riparian arrays also resulted in the lowest average number of species per array within a habitat type (4.5 species per array). Coastal sage scrub (CSS) lead with an average of 7.5 species per array (Table 4).

Five species were detected in all six habitat types, including the southern alligator lizard, western skink, western whiptail, western fence lizard, and side-blotched lizard. The western fence lizard was the most commonly captured species in all but one habitat type, non-native grassland; in this habitat type the western whiptail was the most common capture. Several species showed an affinity for a particular habitat type. Eight of the nine Gilbert's skinks (*Eumeces gilberti*) detected were at coastal sage scrub (CSS) arrays, 30 of the 31 coast horned lizards captures occurred in the chaparral (CHAP) arrays, and six of the seven racer captures were in the riparian (RIP) arrays (Table 4).

SYROSP is within the range maps of several other herpetofauna species (Stebbins 1985) which were not detected during the course of this study. Species that may be present but were not detected include the California red-legged frog (*Rana aurora draytonii*),

California newt (*Taricha torosa*), garden slender salamander (*Batrachoseps major*), western pond turtle (*Emys marmorata*), San Diego banded gecko (*Coleonyx variegatus*), southern sagebrush lizard (*Sceloporus graciosus*), granite night lizard (*Xantusia henshawi*), California legless lizard (*Anniella pulchra*), coachwhip (*Masticophis flagellum*), rosy boa (*Charina trivirgata*), glossy snake (*Arizona elegans*), California mountain kingsnake (*Lampropeltis zonata*), long-nosed snake (*Rhinocheilus lecontei*), California black-headed snake (*Tantilla planiceps*), California lyresnake (*Trimorphodon biscutatus*), red-sided gartersnake *(Thamnophis sirtalis)*, and red diamond rattlesnake (*Crotalus ruber*) (Appendix 10). Several rosy boas were found on CA 78 as researchers traveled to and from the study site, but all were closer to Ramona than to Santa Ysabel. The majority of these expected species are secretive, cryptic, habitat specialists, and have been hard to detect at other study sites as well. Further trapping and survey efforts, designed to target a specific species, would be needed to confirm the presence or absence of these species. For example, the banded gecko has been shown to be an indicator species whose presence reflects a rich herpetofauna community (Case & Fisher 2001). The absence of detection of this species in this study should not be taken as an absence of presence; rather that additional monitoring would be needed to determine the presence of this species on SYROSP. The data presented here only covers one and a half years of pitfall surveys consisting of 46 survey nights, much of which was during a drought. Other herpetofauna pitfall study sites around San Diego County have continued to document new species into the fifth survey year (USGS San Diego Field Station, unpublished data).

In addition to the species which were not detected, several other species which were documented may be under-represented due to site access restrictions during inclement weather conditions. For example, four out of the five amphibian species detected by the pitfall traps were represented by only a single capture each. A possible explanation as to why there were so few amphibian captures could be that site access was restricted during and immediately after any rain events. Sampling during and immediately after these events would have likely increased the detection and capture rates for many of the amphibian species present on the preserve.

Photographic documentation of selected species can be found in Appendix 11.

4.2.1 *Vegetation and Site Characterization*

Seven plant communities were identified, including oak woodland (OAK), riparian wetland (RIP), pine woodland (PIN), native grassland (NG), non-native grassland (NNG), chaparral (CHAP), and coastal sage scrub (CSS) (Appendix 12). Pine woodlands occurred at arrays 20 and 22, with pines representing greater than 20% of the vegetation along the transect (Appendices 12 and 13). For both of these arrays, non-native grasses filled the understory and comprised a greater proportion of habitat type at the points along the transects (Appendix 12). However, we classified these arrays as pine woodland since that habitat type constituted greater than 20% of the habitat surrounding the arrays. Oak woodlands were represented by 8 of the 24 pitfall arrays, with 20% or more of the vegetation being one of several oak species (Appendices 12 and 13). Like the arrays in the pine woodlands, while most of these pitfall arrays actually had a higher percentage of non-native grasses than oaks,

they were still classified as oak woodland, since this habitat type was greater than 20% of the habitat surrounding the arrays. Two arrays (19 and 24) were classified as riparian wetlands due to their proximity to natural and human-modified seeps (Appendices 12 and 13). Six of the 24 arrays were categorized as chaparral (Appendices 12 and 13). Five of these arrays consisted of greater than 50% chaparral plant species (arrays 2, 8, 12, 13, and 14). Although chaparral only accounted for 35% of the vegetation at array 18, it was the most common vegetation type at the array. The vegetation at two arrays (11 and 15) was made up of greater than 20% coastal sage scrub species, with a larger percentage of non-native grasses comprising the remaining vegetation (Appendices 12 and 13). While non-native grasses occurred at nearly every array, only four were categorized as such. Each of these arrays (7, 9, 17, and 21) contained greater than 50% non-native grasses along the transect; no other habitat type representing a significant portion of the vegetation was encountered (Appendices 12 and 13). A complete list of plant species, common names, scientific names, and four-letter codes can be found in Appendix 14.

Seven substrate categories were identified, including sandy soil (SS), leaf litter (LL), cryptogamic crust (CR), organic soil (OR), moss (MOSS), cobble stone (CS), and bare rock (BR) (Appendix 12). Leaf litter was the most frequent form of substrate and was present at each of the 24 arrays. Only at array 14 did leaf litter represent less than 50% of the substrate; here cobble and bare rock were at their highest levels of any of the arrays.

The arrays ranged in elevation from ~897 to ~1291 meters (using TOPO! Version 2.5). Array 7 was the lowest array and array 22 was the highest. Across the 24 arrays, the average elevation was 1086 meters.

Photographic documentation of each array can be found in Appendix 15.

4.3 Ants

We captured 3,017 individual ants, representing four subfamilies and 43 species across three sampling periods: summer 2002 (July), winter 2002 (November), and winter 2003 (February) (Table 5). After identification, a subset of the ants from the site were sent out for confirmation. All ants detected were native to the area. The most abundant species, determined by total number of individuals captured, were *Formica francoueri* (559), *Pheidole hyatti* (454), and *Dorymyrmex bicolor* (434), (Table 5). However, the number of individuals for both *Dorymyrmex bicolor* and *Pheidole hyatti* were biased by one unusually large sample of each species at array 2. The most widespread species, determined by the highest percent array occurrence, were *Pheidole hyatti* (75%), *Liometopum occidentale* (54%), *Formica moki* (54%), and *Tapimona sessile* (50%) (Table 5).

Arrays 2 and 24 yielded the most captures (789 and 563), whereas arrays 10 and 19 yielded the fewest captures (22 and 26). The number of species captured was highest at array 8 (21 species), 2 (16 species), and 5 (15 species). The number of species captured was lowest at array 19 (2 species), 13 (4 species), and 24 (3 species) (Table 5).

With a few exceptions, most ant species do not function well below 20° C, and cease to function below 10 ° C (Hölldobler & Wilson 1990). Consequently, 20 and 14 species were detected in each winter sample effort, and 31 species were found in the summer sample. The total number of species from both winter sampling efforts was 23. The total number of individuals sampled in summer 2002 was 1275, in winter 2002 was 525, in winter 2003 was 96, and in summer 2003 was 1280. The data support a clear relationship between outside temperature (and probably other related environmental factors) and the number of foraging workers.

Because the pitfall trap design is geared toward the collection of epigeic (aboveground foraging) ants, this technique may potentially under-sample hypogeic (belowground foraging) and arboreal ants. However, evaluation of pitfall traps as a sampling method for ground-dwelling ants found that most epigeic ants are well represented, especially in open habitats (Bestelmeyer et al. 2000). Also, Suarez et al. (1998) found reasonable epigeic diversity estimates using the proposed sampling technique in coastal sage scrub habitat.

Photographic documentation of selected species can be found in Appendix 16.

4.4 Avifauna

4.4.1 *Diurnal Point Count Surveys and Nocturnal Driving Surveys*

During our point count surveys, we detected 92 species, representing 5,592 individual bird records (Tables 6). The points with the greatest number of detected species were station 49 (42 species), station 13 (39 species), and station 10 (37 species); the points with the fewest number of species detected were station 42 (12 species), station 41 (16 species), and station 15 (18 species) (Table 6). Included in the table is an "unidentified hummingbird" species, which was detected at several point count stations. In most instances, these were likely female and/or juvenile Black-chinned, Anna's, or Costa's Hummingbirds, based on size, and bill and plumage characteristics therefore it was not used in counting the number of species per station. Incidental observations recorded while traveling about the preserve (i.e., while installing and monitoring herpetofauna pitfall arrays, performing vegetation transects, traveling between point count locations, and reported sightings from coworkers) resulted in an additional 11 species not observed during point count surveys. These species included the cattle egret (*Bubulcus ibis*), ferruginous hawk (*Buteo regalis*), northern harrier (*Circus cyaneus*), greater roadrunner (*Geococcyx californianus*), white-throated swift (*Aeronautes saxatalis*), Lewis's woodpecker (*Melanerpes lewis*), Cassin's vireo (*Vireo cassinii*), pygmy nuthatch (*Sitta pygmaea*), hermit warbler (*Dendroica occidentalis*), palm warbler (*Dendroica palmarum*), and MacGillivray's warbler (*Oporornis tolmiei*). The nocturnal driving surveys produced an additional four species not observed during daylight, including the western screech owl (*Otus kennicottii*), great horned owl (*Bubo virginianus*), short-eared owl (*Asio flammeus*), and lesser nighthawk (*Chordeiles acutipennis*). Including the California spotted owl, which was detected during focused surveys for that species (see Section 4.4.2), as well as an unconfirmed but "probable" detection of a varied thrush (*Ixoreus naevius*) recorded during point counts, a total of 108 species were observed across the preserve. Finally, we

were given unconfirmed reports of an observation of a pair of zone-tailed hawks (*Buteo albonotatus*) by the rare plant surveying team in June 2002 just east of bird point 28 and herpetofauna array 16. Although there were no confirmed raptor nesting locations found, raptors are undoubtedly breeding on the preserve.

The approximate percentage of each habitat type covered by the point count stations was oak woodland (39.6%), grassland (26.2%), chaparral (11.8%), coastal sage scrub (11.1%), riparian (7.6%), pine woodland (3.5%), and human-modified (0.2%). The habitats and dominant plant species for each point are presented in Appendix 17. We examined the distribution of the 92 species detected at point count locations and found that while many species overlap multiple habitat types, greatest number of species (82% of the species observed during point counts; 3,025 individuals; 75 species) was recorded in oak woodland (Table 7). That was not unexpected due to both its high areal coverage on the preserve and previous literature (Appendix 17). For example, CalPIF (2002) suggests that California oak woodlands rank among the top three habitat types in North America for bird richness. Also consistent with the literature (Knopf et al. 1988), riparian habitats were especially rich in species, contributing 63% of the species (436 individuals; 58 species) observed during point counts, despite comprising only 7.6% of the area sampled during the point count surveys (Table 7; Appendix 17). Although they combined to cover just 15.3% of the habitat sampled, chaparral and pine woodland habitats both revealed relatively large proportions of the complete suite of species observed on the study area (Appendix 17). Chaparral contributed 42% (425 individuals; 39 species) and pine woodland contributed 30% (127 individuals; 28 species) of all species detected (Table 7). Grasslands have been described as habitats of "simple" structure (Cody 1985), and this could likely explain the relatively low proportions, mainly in individual abundance, contributed by this extensively sampled habitat type (Table 7; Appendix 17).

Although fly-overs were recorded as non-habitat-specific, biologically speaking many species do have preferences of vegetation associations over which they tend to fly (M. Mendelsohn, pers. obs.). While habitat generalists such as the European starling may be seen aerially over any number of habitats, habitat specialists are usually seen aerially over a specific habitat (e.g., acorn woodpeckers over woodlands; yellow warbler over riparian areas). Thus, many fly-over observations could likely be, at least for the habitat specialists, considered supplementary to each of the habitat-specific columns. Flyover detections resulted in 934 individuals and 42 species (Table 7).

Twenty-three species or subspecies listed as rare, threatened, endangered, of special concern, or fully protected by state and/or federal wildlife agencies were recorded on the study area. SYROSP is within the range maps of several other bird species (Unitt 1984; Sibley 2000). Sensitive species that may be present but were not detected include the osprey (*Pandion haliaetus*), sharp-shinned hawk (*Accipiter striatus*), Swainson's hawk (*Buteo swainsoni*), merlin (*Falco columbarius*), peregrine falcon (*Falco peregrinus*), prairie falcon (*Falco mexicanus*), loggerhead shrike (*Lanius ludovicianus*), and gray vireo (*Vireo vicinior*) (Appendix 10). The limitations of point count surveys (see Ralph et al. 1993 and others) are evident with rare and difficult-to-survey species, and so, must be considered when using these data to make management decisions. We suggest more intensive and species-specific

survey protocols for these and other species, especially when trying to accurately assess the presence or absence and true populations of rare, threatened, or endangered birds.

In July 2003, a female golden eagle was found freshly dead on the east property, about 1km west of Volcan/Farmer Rd. and slightly north of Santa Ysabel Creek. Illegal hunting was ruled out as a cause of death, but the necropsy was performed too late to determine whether it could have died due to West Nile Virus or some other natural cause. Singular golden eagle observations occurred during two point counts (one in June of each year) in that same vicinity, and at least once more incidentally by USGS researchers [e.g., one foraging on the ground in a non-native grassland/oak savanna near station 7, while being repeatedly harassed by a flock of American crows (*Corvus brachyrhynchos*) in July 2002]. The assumption that this was a single eagle pair ranging across the entire preserve (and likely beyond) was supported by the Volcan Mountain/Santa Ysabel Ranger observations of a male eagle hovering above the female's carcass for some time after her death (A. Inwood, J. Rundell, and V. Moran, pers. comm.). As this species is a top predator (CDFG 2002), the male eagle should be monitored closely in the future to follow his attempts to find a new mate or disperse from the area.

Non-native avifauna species observed on the preserve include the European starling (*Sturnus vulgaris*), wild turkey (*Meleagris gallopavo*), and rock dove (*Columba livia*). The rock dove (or domestic pigeon) was only observed once and is not expected to have any significant impacts on the native fauna of the preserve. The turkeys and starlings, on the other hand, were common observations on the preserve, both during point counts and incidentally. Starlings have colonized many areas of the preserve, likely moving in from the agricultural areas adjacent to the preserve. Starlings are problematic since they aggressively outcompete native cavity-nesting avifauna from accessing nesting sites (CalPIF 2002). The turkey, which has been introduced into southern California as an important game bird since the 1930s, is also a weighty consumer of acorns (CalPIF 2002), thus potentially depriving native fauna of an essential food source. Additionally, the California Native Plant Society is concerned that the excessive "scratching" characteristic of turkeys while foraging is detrimental to native flora and fauna (E. Ervin, pers. comm.). These latter two non-native species should be monitored in the future for their effects on such sensitive species as the ground-dwelling burrowing owl (*Athene cuicularia*), and the cavity-nesting purple martin (*Progne subis)* and western bluebird (*Sialia mexicana)*, as well as other native flora and fauna.

The brown-headed cowbird (*Molothrus ater*), an invasive native species, was found to be widespread at SYROSP. Cowbirds are well-documented brood parasites and their presence can have an impact on the reproductive success of songbirds (RHJV 2003). Wholesale clearing of forested land has allowed this species to extend its historic range from just the Great Plains region to across most of North America. Livestock grazing, like that which historically occurred at SYROSP, is known to provide foraging habitat for the brown-headed cowbird (Goguen & Matthews 2000; RHJV 2003). Future research should revolve around managing the habitat in ways that will minimize the cowbird's adverse effects (CalPIF 2002).

4.4.2 *Focused Survey for California Spotted Owls*

During nocturnal surveys for the California spotted owl, four owl species were detected, including the barn owl (*Tyto alba*), the great horned owl (*Bubo virginianus*), the California spotted owl (*Strix occidentalis*), and the western screech owl (*Otus kennicottii*) (Table 8). Calling station 16 detected all four owl species, while stations 17 and 20 detected three species. Calling stations 9, 24, and 36 did not detect any owls. The barn owl was the most commonly detected species; followed by California spotted owl, western screech owl, and great horned owl. California spotted owls were detected at calling stations 14-18 and 20. A male and female California spotted owl were detected in close proximity (< 1/4 mile apart) to each other during day follow-up surveys on two separate occasions (6/18/03 and 6/25/03), confirming pair status (USFWS 1993) (Appendix 18). As such, an activity center was determined based on the pair's location and calling stations 14,15,16,18, and 19 were subsequently eliminated after four visits. Nesting and reproductive status of the California spotted owl pair could not be determined. Stations 1, 9, 10, 17, and 20-25 were visited six times. Finally, calling station 36 was visited only once; it was the only calling station located on the west property.

Data collected suggests that Santa Ysabel Creek is an important drainage for California spotted owls and other owl species on the preserve. The majority of owl detections occurred along Santa Ysabel Creek in the riparian hardwood forest habitat. The California spotted owl activity center was determined to lie at the junction of Santa Ysabel Creek and a small, side drainage on the eastern property of the preserve (Figure 9). Although the nesting and reproductive status of the pair could not be determined during our 2003 surveys, an incidental observation of an adult California spotted owl and three fledglings occurred on June 13, 2002 (V. Moran, pers. comm.). The location of this sighting was within the activity center identified during the 2003 surveys, and indicates that breeding is taking place within the preserve. Finally, the Santa Ysabel Valley riparian corridor is considered a critical connectivity zone by a state-wide working group (Penrod 2000).

SYROSP is within the range of several other owl species that went undetected by this survey: the northern pygmy owl (*Glaucidium gnoma*), northern saw-whet owl (*Aegolius acadicus*), and burrowing owl (*Athene cuicularia*) (Appendix 10). Although the long-eared owl (*Asio otus*) was not detected by the California spotted owl survey, that species was detected at two different locations during the diurnal point count surveys in 2003 (stations 17 and 37).

4.5 Bats

4.5.1 *Foraging Bat Surveys*

Foraging bat surveys were conducted on 18 nights at eight of the nine survey sites (sites 1, 2, 4-9) using a combination of an Anabat, the unaided ear, visual, and mist-net techniques (Table 9). A total of 15 of the 23 bat species known to occur in San Diego County (Miner & Stokes, in prep.) were detected on SYROSP during foraging bat surveys (Table 10). This includes 10 state and/or federally sensitive species. Big brown bats

(*Eptesicus fuscus*) and Mexican free-tailed bats (*Tadarida brasiliensis*) were detected at all eight foraging survey sites on the preserve, whereas the western yellow bat (*Lasiurus xanthinus*) and long-eared Myotis (*Myotis evotis*) were each detected only at a single foraging site. Bat species that were detected foraging on the preserve that are noteworthy because of their apparent rarity and sensitivity status include the Townsend's big-eared bat (*Corynorhinus townsendii*) and the coastal form of the pallid bat (*Antrozous pallidus*).

All 15 bat species detected at SYROSP during foraging bat surveys were detected acoustically (Anabat and/or unaided ear) while only seven of these species were captured in mist-nets (Table 10). While the number of bat species detected at the eight different foraging bat survey sites varied, the number of bat species detected on the west property was similar to the number of bat species detected on the east property. The variability of bat species detections from site to site is likely a function of night to night variability in bat activity, species detectability, and survey effort. It is suspected that the foraging bat community is fairly constant across the entire preserve with some exceptions. For instance, western pipistrelles (*Pipistrellus hesperus*) are largely dependent on rock crevices for roosting and they are thought to forage only within a few kilometers of their roosting sites (Barbour & Davis 1969). At the SYROSP, exposed rock habitat is found mainly on the west property and at the western end of the east property. Western pipistrelles were detected foraging only in these areas.

Of the 31 bats captured in mist-nets at foraging sites, 21 were females and 10 were males. Several of the bat species captured in mist-nets at foraging sites were found to be in breeding condition. This included pregnant female Yuma Myotis (*Myotis yumanensis*), California Myotis (*Myotis californicus*) and big brown bats (*Eptesicus fuscus*). Lactating and/or post-lactating female California Myotis and big brown bats were also captured. One captured male big brown bat was found to be in breeding condition (descended testes). Other captures included juvenile California Myotis and big brown bats. Appendix 19 provides photos of two captured bats: the hoary bat and the red bat.

4.5.2 *Roost Surveys*

No bat roosts were documented on SYROSP during this study. However, there was one roost that was surveyed on two occasions where bats were known to previously occur referred to here as survey site number three. This site is the corner store in the village of Santa Ysabel. This store has supported bats for a number of years now (storeowner, pers. comm.). There have been observations of at least two species known to occupy this building: the Mexican free-tailed bat and the pallid bat (D. Stokes, unpub. data). A survey visit to this site in summer 2001 revealed that the pallid bats were breeding females and, thus, was at that time and is still likely a maternity site. This is one of only two maternity sites of the coastal form of the pallid bat currently known in San Diego County (D. Stokes, unpub. data). Pallid bats and Mexican free-tailed bats were confirmed at this location during a roost survey visit on August 7, 2002. The current storeowner has expressed displeasure with the bats in that there is a foul odor associated with the bat droppings during the heat of mid-summer. In the winter of 2002, the store was modified such that there are now obstructions located in the areas where the bats previously entered and exited the building. A roost survey visit on June

30, 2003 (well after the modifications had been made) revealed that both bat species were still roosting in the building, although the number of bats detected appeared to be reduced compared to the 2002 survey visit. This roost is extremely significant and is in great need of protection. Either the storeowner should be convinced to allow the bats to stay or the bats must be safely excluded from this roost site and provided with an alternate roost site, such as a man-made bat box of the proper design.

During certain foraging bat surveys, observations were made of multiple numbers of bats foraging early in the evening, suggesting that roosts of these bats occurred nearby adjacent to the preserve. On the west property, a number of individuals of a *Myotis spp*. were observed early in the evening during several survey visits to site 1 on Santa Ysabel Creek near the west boundary of the west property. It is likely a Myotis colony exists somewhere close to the western boundary of the west property but not within the preserve itself. On the east property, a number of individuals of big brown bats were observed early in the evening during a survey on July 17, 2002 at site 5 coming from the direction of the rocky outcrop covered hillside located north of Santa Ysabel Creek, just east of CA 79. This hillside is not within the SYROSP, but is adjacent to it. It is suspected that a big brown bat colony roost site exists on this rocky hillside or near it.

There were also regular audible observations of western mastiff bats (*Eumops perotis*) and acoustic detections of pocketed free-tailed bats (*Nyctinomops femorosaccus*) relatively early during survey evenings coming from an area northeast of SYROSP. It is suspected that colonies of these species are roosting somewhere northeast of the preserve.

4.5.3 *Survey Discussion*

The preserve is supporting at least part of the needs of a rich bat population likely as a result of the diversity of habitats used by bats found on the preserve and the intermediate elevation of the preserve. Their habitats include the numerous riparian and upland trees that support bat foraging and roosting needs, the large amounts of grassland and scrub habitats that support foraging needs, the open water that supports drinking and feeding needs, and the exposed rock areas that also support roosting needs. The intermediate elevation of the preserve and associated habitats and climate allow bats typically found at low to middle elevations along with bats usually found in middle to higher elevations to co-occur on the preserve. Also, the position of the preserve in relation to the desert has provided foraging opportunities for species typically found in the desert, such as the western yellow bat (*Lasiurus xanthinus*).

There were numerous hoary bat (*Lasiurus cinereus*) and red bat (*Lasiurus blossevillii*) detections on the preserve (Table 10). In San Diego County, both of these bat species roost in the foliage of trees including broad-leaf riparian species such as sycamores, cottonwoods, and willows (Krutzsch 1948). Sycamores and other riparian trees are abundant along Santa Ysabel Creek and are probably used as roost trees for these bats. It is likely that SYROSP supports a number of hoary bats and red bats based on the amount of roosting habitat available to them and the number of observations of these bats on the property. Both these species are thought to make seasonal movements along elevational gradients, with most

individuals occurring in the lowlands during the winter and then certain individuals (males and non-reproductive females) shifting to higher elevations during the summer. Breeding red bat females, however, stay in the lowlands during the summer while breeding hoary bat females probably migrate north (Krutzsch 1948; Pierson et al. 2000; Cryan 2003). The San Dieguito River and associated tributaries, including Santa Ysabel Creek, likely act as a movement corridor for males and non-reproductive females of these species, providing continuous habitat from coastal lowlands to inland highlands. SYROSP is probably preserving a fairly significant portion of this suspected hoary bat and red bat movement corridor.

There are four bat species that could potentially occur on SYROSP that were not detected during our surveys. These include the spotted bat (*Euderma maculatum*), the fringed Myotis (*Myotis thysanodes*), the long-legged Myotis (*Myotis volans*), and the silver-haired bat (*Lasionycteris noctivagans*). The first three species are generally rare throughout their ranges, including San Diego County, and the fourth species is considered a rare migrant in San Diego County (Miner & Stokes, in prep.). Though these species could occur on the preserve, their rarity makes them difficult to detect.

There were a large number of sensitive, rare and/or declining bat species detected on the preserve, including the Townsend's big-eared bat and pallid bat. Of the bats captured on the preserve, a large percentage were female. In addition, several species captured were found to be in breeding condition. Breeding female bats are suspected to be largely found in the highest quality of habitats (D. Stokes, pers. obs.) The presence of so many sensitive species, the fairly large ratio of females compared to males captured, and the presence of breeding bats are all indicators that SYROSP is potentially very important for bats on a local and regional level. While habitats are lost or altered around San Diego County and throughout the south coast ecoregion, it is likely that the preserve in its current condition will continue to support at least some of the needs of a rich bat community. However, because bats depend on and utilize a variety of habitats on a landscape level, the future of the bat community on SYROSP will depend largely on management actions and other activities on the preserve itself, as well as on the lands surrounding the property.

4.6 Small Mammals

Extensive pitfall sampling resulted in 346 captures representing 12 small mammal species (Table 11). Results documented the widespread presence of the Botta's pocket gopher (*Thomomys bottae*) (captured at 23 arrays) and the California vole (*Microtus californicus*) (captured at 22 arrays). Other species captured included the desert shrew (*Notiosorex crawfordi*) (captured at four arrays), ornate shrew (*Sorex ornatus*) (captured at 10 arrays), and California mouse (*Peromyscus californicus*) (captured at two arrays). Arrays with the least number of species captured were arrays 7, 10, and 14 (each with two species). Arrays with the greatest number of species captured were arrays 20 and 22 (seven species each) and 4 (six species). Arrays 5 and 6 yielded the most captures (40 and 33, respectively), whereas arrays 7 and 10 yielded the fewest captures (five and three respectively) (Table 11).

Although pitfall sampling only detected desert wood rats (*Neotoma lepida*) at array 22, visual surveys detected wood rat nests over a wider range of arrays. This is not surprising, as wood rats are typically under-sampled in pitfall traps. They are large enough to escape the buckets used for this type of survey. Wood rat nests were detected in the vicinity of 9 of the 24 arrays. The search around array 17 detected the highest number of wood rat nests (six nests).

Camera surveys detected an additional small mammal not captured at the pitfall arrays: the kangaroo rat (*Dipodomys* spp.). Two camera sites documented the presence of this genus: cameras 3 and 4 (Figure 8). The photo of a kangaroo rat taken at camera 3 was verified as the Dulzura kangaroo rat (*Dipodomys simulans*) and it is likely that the individuals recorded at camera 4 were the same species (W. Spencer, pers. comm.).

It is advantageous to perform both pitfall and Sherman trap sampling for a complete small mammal survey. Species such as the desert shrew (*Notiosorex crawfordi*), ornate shrew (*Sorex ornatus*), , and the western harvest mouse (*Reithrodontomys megalotis*) are preferentially captured in pitfall traps because of their small size which often is not enough to trip shut a Sherman trap and/or, as in the case of Botta's pocket gopher (*Thomomys bottae*), their preference for alternate foods. Larger mammals, such as the California mouse, and *Neotoma* and *Dipodomys* species are preferentially captured in Sherman traps because of their decreased likelihood of falling into pitfall traps and ease of escape. Most medium sized species of the genus *Peromyscus* (except *boylii*) and *Chaetodipus* can be effectively captured using either method.

SYROSP is within the range maps of several other rodent species (Jameson & Peeters 1988). Species that may be present but were not detected are the broad-footed mole (*Scapanus latimanus*), Dulzura pocket mouse (*Chaetodipus californicus*), brush mouse *(Peromyscus boylii),* southern grasshopper mouse (*Onychomys torridus*), and Stephens' kangaroo rat (*Dipodomys stephensi*) (Appendix 10). Portions of the west property (along CA 78) and east property (along CA 79 and throughout Kanaka Flat) have been identified as containing a very high habitat value for the federally endangered Stephens' kangaroo rat (Spencer 2003). Further trapping and survey efforts would be needed to confirm the presence or absence of this species.

4.7 Medium and Large Mammals

Eight target species and a number of human associated and non-target species were detected across the preserve. The target species include all native large to mid-sized carnivores and mule deer. The human associated species include humans, cattle, horses, domestic dogs, and opossums. Non-target species include all other species detected and are noted separately. Scent station surveys detected nine species, including both target and human associated species (Table 12). Camera stations detected eleven species including both target and human associated species (Table 13). Both scent survey stations and camera stations also detected a suite of non-target species, including small mammals, birds, and herpetofauna. When possible, these non-target animals were identified to genus or species, and the number of detections was listed in Tables 13 and 14.

4.7.1 *Scent Station Surveys*

Nine target species were detected throughout the preserve, including six native species (mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), bobcat (*Felis rufus*), gray fox (*Urocyon cinereoargenteus*), striped skunk (*Mephitis mephitis*), and spotted skunk (*Spilogale gracilis*)), and three human associated species (domestic dog (*Canis familiaris*), opossum (*Didelphis virginiana*), and humans (*Homo sapiens)*) (Table 12). Transect 7 was visited by all nine species; transect 2 was visited by eight species, and transect 4 was visited by seven species. Transects 6, 8, and 9 were visited by six species, and transects 1, 3, 5, and 10 were visited by only five species. Coyotes and striped skunks were detected on all 10 transects within the preserve. Bobcats were detected on nine transects; gray foxes and domestic dogs were detected on eight transects. Coyote activity was highest along transect 1 and lowest along transect 8. Bobcat activity was highest along transects 2, 4, and 7; no bobcats were detected on transect 10. Gray fox activity was highest along transect 4. Striped and spotted skunk activity was highest at transect 5. Mule deer were detected only at transects 7 and 8. Scent stations also documented the presence of several non-target species including smaller mammal, bird, and herpetofauna species, including squirrels, rabbits, rodents, turkeys (*Meleagris gallopavo*), lizards, and snakes (Table 12).

4.7.2 *Camera Surveys*

Examining target and human associated species, eleven species were detected at camera stations, including seven native species (mountain lion (*Puma concolor*), mule deer, coyote, bobcat, gray fox, raccoon (*Procyon lotor*), and striped skunk) and four human associated species (opossum, domestic cow (*Bos taurus*), domestic horse (*Equus caballus*), and humans) (Table 13). Eight species were detected at camera 5, seven species were detected at cameras 3 and 9, and six species were detected at cameras 1 and 4. Bobcats and mule deer were detected at all nine camera stations. Gray foxes were detected at five cameras; coyotes and mountain lions were recorded at four cameras. Mountain lions were photographed at cameras 1, 5, 8, and 9; the highest activity was at camera 5. Bobcat activity was highest at camera 3, mule deer activity was highest at camera 2, and gray fox activity was highest at camera 1. Several non-target species were also detected at the camera stations, including the Dulzura kangaroo rat (*Dipodomys simulans*) (cameras 3 and 4), the desert cottontail or brush rabbit (*Sylvilagus* spp.) (camera 8), a squirrel species [California ground squirrel (*Spermophilus beecheyi*) or western grey squirrel (*Sciurus carolinensis*)] (camera 8), the greater roadrunner (*Geococcyx californianus*) (camera 3), and the wild turkey (*Meleagris gallopavo*) (cameras 1, 2, 3, 4, 5, and 9) (Table 13). Photos were also taken of rodents and birds (including quail). However these individuals could not be identified to species. Appendix 20 contains representative photos of species detected at camera stations.

4.7.3 *Survey Discussion*

Large mammals represent an excellent group of species for conservation, in that they are wide-ranging, exhibit low population densities, and are large patch or interior dwelling species (Meffe et al. 1997). Further, the disappearance of top predators from fragmented systems may have community-wide implications (Robinson 1953, 1961; Linhart & Robinson

1972; Voight & Earle 1983; Schmidt 1986; Johnson et al. 1989; Sovada et al. 1995; Ralls & White 1995). As a group, carnivores (Order Carnivora) are collectively listed as state mammal species of special concern. Furthermore, the preserve lies at the nexus of two critical connectivity zones, the Cuyamaca-Palomar corridor and the Santa Ysabel Valley riparian corridor (Penrod 2000).

At least two distinguishable mountain lions were recorded at four camera stations (1, 5, 8, and 9) on the preserve with the majority of activity at camera 5. Data collected from camera stations suggests that the SYSOSR likely serves as a component of two or more mountain lion home ranges. Mountain lions possess large body sizes, home ranges, and habitat requirements and hence are the most sensitive predator species to fragmentation effects (Beier 1993; Crooks 2002). Specifically, the preserve alone is too small to permanently support resident lion populations with long-term viability, and thus this preserve likely serves as a critical component of several mountain lion home ranges that extend much further than the boundaries of the preserve. At least two individuals, one male and one female, were identified in the photos. The male was a GPS-collared individual whose 475.4 km^2 home range incorporated portions of SYROSP (Sweanor et al. 2003). Preliminary data taken on four collared mountain lions for a minimum of six months indicates that home ranges average 410 km^2 in this region (Sweanor et al. 2003). Elsewhere in southern California, mountain lion home ranges range from 218 km^2 (average female home range) to 767 km^2 (average male home range) (Beier & Barrett 1993). Monitoring for mountain lions throughout the preserve can be best achieved by maintaining long-term camera stations. Although track transects are a cheaper means to document activity, they are only operated quarterly. Thus for large-ranging animals, such as mountain lions, the frequency of track transects reduces the potential for these species to be detected, particularly where there are a wide variety of travel routes (i.e., no choke points). However, camera stations can be operated over much larger time frames, thus increasing the likelihood of detecting the presence of a mountain lion on the preserve. In this study, a mountain lion was not detected until the 47^{th} day that camera 9 was active; mountain lions were never detected at scent stations.

Bobcats were the most commonly detected mammal species on the preserve with a combined 281 detections at the track transects and camera stations. Bobcats were recorded at every camera station and every track transect with the exception of transect 10. Camera stations detected bobcats nearly four times as often as the track stations on the preserve. The highest bobcat activity occurred at camera 3. This camera was located along a dirt road on the northwest property of the preserve. Bobcats are intermediate in their sensitivity to habitat fragmentation (Haas 2000; Crooks 2002); they can still exist in fragmented and disturbed habitats, but only those with adequate movement corridors. Bobcats are therefore less sensitive to disturbance than are mountain lions, which seldom use fragmented areas, yet are more sensitive than coyotes, which can persist in all but the most disturbed habitat isolates.

Coyotes followed bobcats as the second most detected mammal species on the preserve. Coyotes were detected on 270 occasions by the camera and scent stations. Coyotes were much more likely to be detected by scent stations than camera stations on the preserve; only 8 of the 270 detections occurred at the camera stations. Coyote activity was

highest along transects 1, 2, and 7. These areas of the preserve contain large portions of open, grassland, and are the closest to residential/ranch lands. Coyotes are widespread and relatively abundant throughout the region, however coyote populations can experience local extinction in habitat fragments, especially those that are too small, disturbed, or isolated (Crooks & Soulé 2000).

Spotted skunk activity was highest along transects 5 and 6; these transects were located in the central region of the east property. However, no spotted skunks were detected at camera stations. Unlike the larger and more conspicuous striped skunks, spotted skunks are a relatively secretive species with restricted habitat requirements and low population densities (Crooks 2002). As such, spotted skunks are difficult to monitor which limits their utility as target species for management and conservation plans. Nevertheless, the status of the spotted skunk in southern California is currently unclear.

Mule deer not only represent a critical component to a functioning ecosystem (in that they are top herbivores), they also comprise the majority of mountain lion diet (Beier 1995). Although mule deer were detected at every camera station, indicating a wide distribution across the entire preserve, the key to maintaining their populations (as is the case for all species) is to provide adequate crossing structures in order for them to successfully pass under roadways (Reed et al. 1975; Foster & Humphrey 1995; Haas 2000). Although traffic densities remain relatively low – moderate along CA 78 and CA 79, future increases in road width and traffic volume could necessitate the need for adequate crossing structures for mule deer. Furthermore, in the event that traffic volumes increase, considerations should be given to providing adequate wildlife fencing (to reduce vehicle-related mortality), enhancing existing crossing structures, and providing additional crossing structures. Such considerations are important in maintaining connectivity (Haas 2000; Lyren 2001).

These survey techniques also detected several non-target species that were not detected with other sampling methods, including rabbits, squirrels, and several bird species. For example, kangaroo rats were not detected at herpetofauna pitfall trap arrays and the Greater Roadrunner was never detected during diurnal point count surveys. Although tracks and photos of rabbits, squirrels, and other rodents were not identified to species, they do provide information on the distribution and relative abundance of prey species across the preserve. Occasionally snake tracks were observed in the scent stations; several snake species can be identified based on their track patterns, which may complement pitfall survey efforts.

SYROSP is within the range of several other sensitive mammal species that went undetected by these survey methods: the kit fox (*Vulpes macrotis*), American badger (*Taxidea taxus*), long-tailed weasel (*Mustela frenata*), black-tailed jackrabbit (*Lepus californicus*), and ringtail (*Bassariscus astutus*) (Ingles 1965) (Appendix 10). However, there was an incidental sighting of a long-tailed weasel on the eastern edge of the east property. Some burrows were noted on both the east and west properties, notably in the vicinity of herpetofauna pitfall arrays 1 and 2 (west property) and in the grasslands along the east side of CA 79 (east property). However, it is unclear whether or not the burrows were utilized by badgers. More intensive, species specific survey efforts may be necessary to

determine whether or not these species may be present on the preserve. Such techniques may include hair snares, hair tubes, scat surveys, spotlight surveys, and video monitoring. These additional techniques, when conducted in concert with the methods used in this study, may provide for a more complete preserve-wide inventory and monitoring of these focal species.

5. Conclusions and Management Recommendations

Our survey efforts resulted in the detection of 225 species throughout the SYROSP (Appendix 21). These survey efforts have generated a valuable data set which will aid in the further development of the management plan of the preserve to preserve the biological diversity of the native wildlands of San Diego County. Included in our species detected list are a fingernail clam species, two fishes, 43 ants, seven amphibians, 19 reptiles, 108 birds, 45 mammals (15 bats, 13 small mammals, and 17 medium and large bodied mammals). This list includes a federally endangered species, 20 federal species of concern, 28 California Department of Fish and Game Species of Special Concern (eight of which are also federal species of concern), and 10 non-native species (two fish, one amphibian, three birds, and four mammals). Species status was obtained from the California Natural Diversity Database (CDFG 2003). In addition to those species with listing status, we identified an additional 14 sensitive species based on our knowledge of their current status and distribution (Appendix 22). The locations of where these 55 species were detected are presented in Figure 9.

Although our surveys for the different taxonomic groups were not conducted uniformly throughout the preserve and because few specific areas were surveyed for each taxonomic group (i.e., herpetofauna pitfall arrays locations were not the same locations from which aquatic, avifauna, and mammal surveys were conducted), it is difficult to identify specific locations within the preserve that contain the greatest concentrations of sensitive species. However, several areas within the preserve contained high concentrations of sensitive species. On the west property, sensitive species were concentrated along Santa Ysabel Creek and in the northeast corner of the preserve. On the east property, sensitive species were concentrated along the entire stretch of Santa Ysabel Creek (Figure 9). Our surveys also detected 10 non-native species within the preserve (Appendix 22). The locations where these species were detected are presented in Figure 10. The majority of these detections occurred along the SYROSP boundaries; few non-native species were detected in the northeast corner of the west property and in the center of the east property (Figure 10).

5.1 Aquatics

We identified and surveyed a total of 15 wetland sites within the preserve. All of the surveyed wetlands were classified by hydroperiod. A diverse assemblage of aquatic animals was detected within SYROSP during the course of the aquatic surveys from a currently unidentified species of fingernail clam (*Cyclocalyx* spp.), to four amphibian species (Pacific treefrog, California treefrog, western toad, and the endangered arroyo toad), and two non-native fishes (mosquitofish and rainbow trout). The observation of the arroyo toad on the west property of the preserve is a new location for this species and is the highest elevation for the entire San Dieguito River watershed.

However, we confirmed the presence of introduced rainbow trout, mosquitofish, bullfrog, and the Rio Grande turkey. Management actions should be taken to address these species such as removal or reduction of artificial permanent water, with regards to the fish and frog. Where possible, the water impoundments on SYROSP should be allowed to develop into a natural pattern of drying and refilling. The maintenance of water levels in artificial ponds bordering the preserve (i.e., Cattle Pond 3) may allow for non-native species to become established. For example, the bullfrog detection occurred in the vicinity of Cattle Pond 3. A natural drying pattern in this artificial pond would result in removing many of the non-native species that may occur, particularly fish species (Hathaway et al. 2002). Management recommendations for the enhancement of artificial ponds for native species include draining in fall (to kill bullfrog tadpoles and) and trapping for non-natives when pools are holding water (to remove crayfish). We did record an adult western spadefoot toad (*Spea hammondii*) in pit-fall traps on site. They were expected to be found at several of the ponds, however, the ponds were very dry and it did not appear this species bred on site during our surveys. We recommend further surveys of the ponds where we expect this species might breed (see Table 1) during a normal or high rain year to verify reproduction on site.

We recommend restricting access to areas of high biological value, such as riparian zones, creek crossings where arroyo toads occur, and upland pools that serve as breeding habitat for these amphibians. We also recommend the development of a specific management plan for the prevention of the introduction of invasive and ecologically destructive aquatic species. Included in this plan would be the steps to remove any non-native species immediately upon detection to prevent their establishment. Currently, the seasonal nature of surface flow of Santa Ysabel Creek provides an obstacle for the permanent establishment of non-native predatory game fish (i.e., trout and green sunfish) and the bullfrog, within the preserve, should they be introduced. However, the perennially moist sections of the creek would provide refugia for highly invasive semi-aquatic pest species such as the crayfish. Consequently, if they were introduced they would likely become established and may likely prove difficult to eradicate. Therefore, it is important to maintain the natural hydrologic regime of the riparian systems.

To protect and conserve populations of the aquatic fauna within the SYROSP we make the following recommendations. Preserve and protect all existing wetlands (i.e., upland pools, springs, creeks) identified during our surveys from incompatible usage and degradation. Restrict potentially negative impacts which may include, but are not limited to, crushing of flora and fauna by recreationalists (i.e., mountain bikes, horseback riders, hikers), diversion of runoff that maintains wetlands, draining wetlands for alternative water usage, isolating wetlands (creating barriers for animals), and subjecting wetlands to unnatural levels of artificial light after dark

To better understand the diversity and distribution of the aquatic fauna within the SYROSP we make the following recommendations. Conduct additional aquatic surveys during periods of greater than normal rainfall to better understand the aquatic species that occur onsite, their distribution, and when they are surface active and more effort can be dedicated to identifying unmapped surface water. Further clarification of these issues is

critical to the development of conservation plans for the aquatic communities. For example, temporary upland ponds (Cattle Ponds 1 and 2) should be surveyed for western spadefoots, as stated above, when they fill after sufficient spring rainfall has been received. Priority should be given to areas along the Santa Ysabel Creek where the arroyo toad is expected to occur but has not yet been detected (Table 1; Figure 2).

To better understand the ecology and phenology of the arroyo toad population within the SYROSP we make the following recommendations. Conduct additional species-specific arroyo toad surveys on both the west and east properties to aid in the development of a management plan for the arroyo toad. The objectives of follow-up focused arroyo toad surveys include 1) conducting additional nocturnal presence surveys for the arroyo toads in areas identified as potential habitat under more favorable environmental conditions to confirm their presence or increase the confidence in their absence, 2) determine the distribution of arroyo toads within occupied areas, and 3) use environmental data collected to develop a phenologic profile for this high elevation population. Further clarification of the these issues would enable the County to develop specific policies to manage and conserve the federally endangered arroyo toad within the SYROSP and make informed management decisions regarding compatible recreational programs and activities. The distribution and locations of breeding sites have not been determined because amphibian eggs and larvae were not common during our aquatic surveys conducted under drought conditions and these life stages were not documented for the arroyo toad during these surveys. In addition, we are currently unable to make recommendations regarding upland use of the preserve.

However, if we can increase the quality and use of the aquatic habitats on site to the benefit of native amphibians, this in turn should result in the benefit of increases in the populations of two-striped gartersnakes and racers which will feed on these species.

5.2 Herpetofauna

Herpetofauna pitfall arrays detected five amphibian species, eight lizard species, and eleven snake species. While this may not represent the full extent of all species present at SYROSP, it most likely includes the majority. The remainder of undetected species would require a more long-term sampling effort or the establishment of alternate survey techniques. Such survey efforts should be considered as supplemental to the pitfall sampling technique employed by this survey and might include visual encounter surveys, transect sampling, and breeding site surveys (Heyer et al. 1994). One of the most important aspects of this data is that it serves as a baseline for future comparisons of species' presence/absence and capture rates at established sampling locations. For comparability, future surveys should be carried out as close as possible to the protocols established under this effort. As San Diego continues to become developed, areas like SYROSP will become increasingly isolated and impacted. Future surveys can be designed to compare with the data collected here, in an attempt to detect trends or the extirpation of species from the preserve.

Specific management recommendations for sensitive species include leaving downed wood on site. This is often viewed as a fire hazard and removed, but it is important as cover habitat for species such as the large-blotched salamander (*Ensatina klauberi*), western skinks

(*Eumeces skiltonianus*), and many snake species. The coast horned lizard (*Phrynosoma coronatum*) often sits on dirt roads and hatchlings use the fine sand for burying. Placing signage so that anyone driving or riding a bike is aware of this and therefore should be cautious while on site might help reduce mortality in this species and other species that frequently cross roads (i.e., western patch-nosed snakes, rattlesnakes).

5.3 Ants

Thus far, no non-native ant species have been detected from the ant pitfall traps. The most important non-native species to monitor for is the Argentine ant (*Linepithema humile*). The negative effects of Argentine ants on native ants, other arthropods, reptiles, and small mammals have occurred in other portions of San Diego County (Suarez et al. 1998; Laakkonen et al. 2001; Fisher et al. 2002). Likely sources for Argentine ant invasions would be on vehicles or infested plants or building materials that may be brought into the area. In the future it will be important to monitor near paved roads and any buildings within SYROSP, where humans may accidentally introduce Argentine or red imported fire ants (*Solenopsis invicta*). Specifically, new and existing water sources and habitat disturbance, particularly by new trails, roads, or other infrastructure, should be targeted for monitoring.

5.4 Avifauna

Interpretation of the lists of bird species and numbers: the intent of the study was to develop an avian species inventory, following structured, popular protocols. This resulted in a list of species and habitat associations and relative levels of abundance. In addition, although limited notes on breeding were taken and are available, this study was not intended to assess the breeding status of species on the preserve. Nor should any large or small numbers found herein be extrapolated into breeding success or failure, since abundance levels cannot be reliably converted into fitness measurements of populations (Savard & Hooper 1995).

Many of the species on site will benefit from the habitat recovery that is expected to occur as a result of managing grazing on the preserve as well as active restoration. As disturbed habitats recover, bird species that are habitat specialists will have new ranges in which to disperse (i.e., woodland species moving into existing pastures). Thus, fencing out of vagrant cattle should continue to be strictly enforced. Considering the very high numbers of individuals and species we detected, SYROSP should be managed carefully as it is a refuge for a rich assemblage of birds. In particular, the oak woodland and riparian communities should be protected from significant impacts (i.e., heavy foot, horse, and/or bicycle traffic, as well as trash dumping) that could occur with the opening up the preserve to human recreational use. Future avian surveys (point count or otherwise) conducted during the fall, winter, and early spring would likely add species detections (i.e., migrants and winter visitors) to the list presented herein and more completely characterize the bird assemblage using the preserve in all seasons. We mentioned earlier the limitations of point count surveys for detecting rare and difficult-to-survey species. This must be considered when using these data to make management decisions and we suggest more intensive and

species-specific survey protocols for these and other species, especially for rare, threatened, or endangered birds.

The preserve landscape will continue to be sensitive to any changes in the management of adjacent lands. Monitoring of raptors and other long-ranging species occurring on the preserve may also be beneficial in understanding the post-burn effects of the 2002 Pines fire on the adjacent Volcan Mountain range. Lastly, good relations should be continued with adjacent property owners, since their actions have potential to have immediate, marked effects on the preserve's landscape.

Focused California spotted owl surveys detected four owl species within the preserve. Of the four species detected, all were native. A pair of California spotted owls was detected along Santa Ysabel Creek and an activity center was delineated. The California spotted owl is listed as a state species of special concern; for this reason, management decisions should consider restricting human activity around the California spotted owl activity center (Figure 9). The California spotted owl's distribution is patchy, largely due to breaks in the natural vegetation, topography, and the rapid pace of human development (Noon & McKelvey 1992). California spotted owls possess specific habitat requirements, a discontinuous distribution, and large home ranges. These factors may make California spotted owls susceptible to local extinction and severe habitat fragmentation. Additionally, barred owls (*Strix vagaria*) have recently expanded their range into California, and have been known to displace California spotted owls from their territories (Verner et al. 1992; Gutierrez et al. 1995) thus, surveying for their presence is advised. Future surveys will be helpful in determining the status of California spotted owl populations, particularly as human recreation and adjacent land development increase.

5.5 Bats

The preserve is currently supporting the habitat needs of a diverse population of bat species, although several critical elements are lacking. There is an abundance of riparian trees, upland woodland species (such as oaks and conifers), grasslands, scrub vegetation, leaf-litter, and perennial water that all provide foraging opportunities for bats. The riparian trees can also provide roosting habitat for certain species such as hoary bats and red bats and some dead or dying trees may provide roosting opportunities for crevice and cave dwelling bat species. However, there is a general lack of other types of roosting habitats that local bat species are typically associated with. These roosting habitats include natural rock caves, rocky outcrops, artificial caves (such as abandoned mines), and man-made structures (such as buildings and bridges). Many of these habitats occur adjacent to the preserve and so do several bat colonies.

Therefore, in order to encourage bats to relocate colonies onto this protected preserve we recommend that bat boxes of various designs and colors be put up in various areas of the preserve to provide or enhance roosting opportunities for bats. The standard bat box design will accommodate several crevice-roosting bat species that have been detected on the preserve including big brown bats, Mexican free-tailed bats, Yuma Myotis, and California Myotis. However, pallid bats do not readily use the standard bat boxes so it is recommended

that pallid bat-specific bat boxes also be put up in suitable areas, as pallid bats do occur on the preserve and roost in a building adjacent to the preserve on private land. After pallid bat boxes have been put up the next potential step would be to have the pallid bat colony excluded from the corner store using appropriate exclusion methods during the appropriate season. It is recommended that bat boxes be placed in areas where they are not likely to be encountered and disturbed by humans. This would mean placing boxes away from major trails or other recreational areas of the preserve. Some areas where placement of bat boxes would be appropriate include: 1) on the west property: two boxes, one dark colored and one light colored mounted side-by-side on posts and/or one pallid bat-specific bat box post-mounted on the south facing slope on the north side of the Santa Ysabel Creek as close to the creek as possible but out of the flood zone (near bat survey site 1), 2) on the east property: two boxes, one dark colored and one light colored mounted side-by-side on posts near the cattle pond (bat survey site 4; Cattle Pond 1), 3) on the east property: one pallid bat-specific bat box post mounted on the southwest-facing slope between the cattle pond (bat survey site 4) and the corner store (bat survey site 3), 4) on the east property: two boxes, one dark colored and one light colored mounted side-by-side on posts and/or one pallid bat-specific bat box post-mounted in close proximity to the Santa Ysabel Creek at the east end of the preserve (near bat survey sites 7 and 9). Further bat box advice and both standard bat box and pallid bat-specific bat box designs can be provided by USGS.

Obligate cave-roosting species such as the Townsend's big-eared bat, which was detected on the preserve, are not known to use bat boxes of any kind but will use natural caves and artificial, cave-like structures (such as mines), certain bridge designs, and cavities within buildings as roost sites. There does not appear to be any suitable roosting habitats for obligate cave-roosting bat species on SYROSP, except for cavities and hollows within dead or dying trees. We recommend that at least one artificial cave-like structure be constructed and placed in a suitable location within SYROSP to accommodate obligate cave-roosting species such as the Townsend's big-eared bat. This structure, ideally constructed of a combination of concrete and wood, could be designed so that it accommodates not only cave-roosting species but crevice roosting species as well. It could also be designed to accommodate both day and night roosting bats. The designing and construction of such as structure would require collaboration between bat biologists, contractors, and volunteers. It is recommended that any artificial caves that might be constructed on the preserve be placed where they are not likely to be encountered and disturbed by humans. This would mean placing the cave(s) away from trails or other recreational areas of the preserve. Suggested locations would include the same areas where bat boxes are recommended.

There is perennial water in some reaches of Santa Ysabel Creek and there are a few cattle ponds within and adjacent to the preserve that hold water for part of the year. These open water sites are likely very important to bats for both drinking and feeding, due to the increased insect abundance associated with water. Maintenance of open water within the preserve would be important for bats. Any activities that would reduce the amount of open water available to bats would likely negatively impact bats. Examples include water diversions, pumping of local ground water, recreational activities that might degrade water quality, and conversion of open cattle ponds to covered guzzlers. If management actions at SYROSP will include at least temporary drying of artificially perennial water as

recommended to control non-native aquatic requiring species, we recommend at least some water sources remain at all times for bat foraging requirements. Also, any activities that might alter or reduce the arthropod bat prey items associated with open water would likely negatively affect bats. This would include releasing or stocking of mosquito fish, trout and other game fish, crayfish, and any other pest control practices associated with open water.

There are many trees on SYROSP that are providing foraging opportunities for bats, as well as roosting opportunities for foliage roosting species such as hoary bats and red bats. In addition, many dead trees and snags could also be providing roosting opportunities for crevice and cave roosting species. Several years of drought in San Diego County has resulted in the death of a large number of trees county-wide including on the preserve. Fire prevention practices often involve removal of dead or dying trees. This kind of activity must be done with care, as it is important not to remove important wildlife trees including potential bat roosts. Preservation of trees, including dead trees and snags, will be necessary to maintain a rich bat population on the preserve.

There is growing evidence that certain bat species, including red bats, spend much or part of cold periods buried in leaf litter where the temperature is warmer and more stable than the ambient temperature (Saugey et al. 1998). Pallid bats forage on terrestrial arthropods that are taken from the ground's surface including on the surface of leaf litter (Orr 1954). Preservation of leaf-litter would benefit these bat species. Any winter prescribed burning efforts that focus on leaf litter could potentially cause direct mortality to species such as the red bat and would remove foraging habitat for the pallid bat.

There is an abundance of grassland on SYROSP, although most of it is non-native. The pallid bat is known to feed in grassland habitats on terrestrial arthropods (Orr 1954). It is suspected that the grasslands that pallid bats feed in must be somewhat sparsely vegetated to allow the bats to land on the ground to tackle their preferred prey items (i.e., Jerusalem crickets, burrowing scorpions, centipedes, etc). Native grasslands are typically sparsely vegetated but non-native grasslands, which predominate the preserve, are typically not sparse and instead are thick and probably hinder the pallid bat's ability to find and tackle prey items on the ground. It is recommended that non-native grass control efforts be implemented to reduce non-native grasses and allow native grasses to grow. However, prescribed burns as a non-native grass control method would need to be done with care and in a way that would minimize loss of leaf litter, particularly during the winter.

It is unclear what the full effects of artificial lights have on both the flying insect and bat community. However, it is suspected that artificial lights benefit aerial hawking bat species such as free-tailed bats (Family: Molossidae) while possibly negatively affecting gleaning bat species and/or bat species that capture flying insects in close proximity to vegetative structure such as Townsend's big-eared bats. It is recommended that no artificial lights be placed anywhere on the preserve. If they are needed, they should be required to be properly shielded to direct the light and reduce light and only be turned on when necessary.

5.6 Small Mammals

Twelve small mammal species were detected through herpetofauna pitfall sampling. Future survey efforts for small mammals should include multiple techniques. The use of trapping stations containing pitfall traps and small and large size box traps is recommended. Various small mammal species present within the preserve, from robust wood rats to minute shrews, are differentially detected when using only a single survey method. Species associated with chaparral and riparian habitats were either captured in low numbers (California mouse) or not at all (brush mouse, California pocket mouse). Focused efforts in these areas of the preserve should confirm the presence of these species. We recommend monitoring to continue to track for invasive species and the recovery of diversity in restored habitats over time.

5.7 Medium and Large Mammals

For the purposes of conservation of fauna and large mammals in particular within the SYROSP, maintaining connections across CA 78 and CA 79 will be essential, particularly if traffic volumes along these roadways increase in the future. Future considerations to reduce wildlife mortality along Highways CA 78 and CA 79 include the construction of underpasses (to meet minimum mule deer requirements), wildlife fencing, and native vegetative cover leading to existing underpasses (Haas 2000; Lyren 2001).

Track and camera stations detected thirteen mid-sized to large mammal species within SYROSP. Of the thirteen species detected, four were non-native: domestic dog, domestic cow, domestic horse, and Virginia opossum. Dogs were detected at eight track transects and domestic cattle were detected at six camera stations within the preserve. Both species have the potential to negatively impact the native plant and animal species of the region. Domestic dogs could chase native species, potentially carry diseases harmful to native species, and cause native species to avoid certain areas of the preserve. Domestic cattle and horses could damage native vegetation through grazing and potentially aid the spread of non-native plants through the deposition of manure. The non-native red fox (*Vulpes vulpes*) was not detected at either scent stations or camera stations on the preserve. However, there was a possible incidental sighting of a red fox just north of herpetofauna pitfall array 8. Red foxes could adversely affect native gray fox populations and the confirmation of this species occurring within or around the preserve is critical. Management decisions should consider restricting domestic dog access, removing any feral dog populations, cattle grazing should be managed (management might include removal), and monitoring red fox populations across the preserve (if present).

Future surveys should utilize existing sampling locations (which now serve as baseline monitoring locations) and consider alternative sampling methodologies to detect both common and rare species. A variety of sampling techniques, including baited scent stations, camera stations, hair snares, spotlight surveys, etc., may be necessary to detect the entire suite of medium and large mammals in a region. Monitoring for mountain lions throughout the preserve can be best achieved by maintaining long-term camera stations. Also, more intensive, species specific survey efforts including techniques such as hair snares,

hair tubes, scat surveys, spotlight surveys, and video monitoring may be necessary to determine whether or not other species such as badgers may be present on the preserve. Furthermore, given the potential for increased levels of habitat fragmentation surrounding the preserve in the future, obtaining information on the specific movements and activity patterns of fragmentation-sensitive species through radio or GPS telemetry will provide valuable information on these populations that can otherwise not be obtained through track and camera surveys alone.

5.8 Additional Management Recommendations

SYROSP supports numerous native habitats, many of which are unique to the southern California and Baja California region. These habitats support populations of multiple vertebrate species of concern that are dependent on the stability and health of the general habitat. Although portions of SYROSP appear stable and healthy in habitat quality, other areas of the preserve have issues that need some type of management attention. Without active management of these populations and habitats, many may decline in the future. The baseline data collected in this report is a starting point for building a program that will not only monitor but also manage these populations and habitats. This program of monitoring and management will ensure that these vertebrate species and habitats continue to thrive into the future.

Most of SYROSP is faced with the same management issues which are common throughout all of the open space areas in San Diego County. These problems include invasion by non-native species (both plants and animals), illegal off-road activity, unauthorized grazing, unauthorized trail development, and a lack of patrols by staff and/or law enforcement. In order to ensure that the habitats are protected and managed correctly, a restoration and management plan will be written for SYROSP. This plan should address the problems discussed below.

5.8.1 *Restoration*

Some areas of the property could be targeted for restoration. Above we discussed some of the potential for aquatic habitat such as managing for non-native species by temporarily removing water, another key area to target would be the non-native grasslands. These habitats are often restored using a variety of techniques, and we would suggest carefully selecting methods that do not adversely impact native animal species. Post-fire recovery is an important topic and ensuring that natural habitat that is burned on site does not transition to invasive species will be important. In addition, it is highly recommended that dead tree branches be piled rather than removed or chipped. These resources provide needed habitat and chipping can prohibit regrowth.

5.8.2 *Illegal Off-Road Activity*

Although this is not a serious problem throughout SYROSP, in other areas this continues to be a very serious threat. Off-road activity can cause physical impacts to the landscape and vegetation, increase the rate of weed invasion in and around the impacts, and

can cause mortality in ground-nesting birds, reptiles, amphibians, and mammals of all sizes. Options for controlling this problem include improved fencing and signs, increased patrols by staff, and public education of the impacts of such actions. Some areas on the preserve are currently fenced, but fence destruction or removal allows access to the open space. In many cases, destruction or removal of fencing occurs and is not or cannot be fixed immediately; this often results in long-term access for illegal off-road activities. Many open space areas would benefit from improved signs and other methods of public education.

5.8.3 *Unauthorized Grazing*

We documented numerous locations within SYROSP in which cattle from some of the properties adjacent to the preserve were grazing. The greatest levels of activity, as recorded by the remotely-triggered cameras, occurred on the west property, along Santa Ysabel Creek (camera 2) and within the drainage upstream of Cattle Pond 3 (camera 4) and, on the east property, along Santa Ysabel Creek and the northern boundary of the preserve (cameras 8 and 9) (Figure 8). Multiple private property owners surrounding SYROSP maintain cattle grazing on their lands, but in some places the cattle have open access to the preserve, either through open gates or discontinuous fencing. If it is determined that management of grazing include removal, the best solution to this problem is improved fencing by either the County or the surrounding property owners. Such fencing may need to be more than barbed wire fencing. As noted above, fence destruction and removal is not uncommon and may be deliberate acts to increase grazing access for cattle to the preserve. Efforts should be made to develop a plan which determines whether cattle grazing should be included or excluded on the property and determine how that decision will be upheld.

5.8.4 *Unauthorized Trail Access and Development*

Public access and use is an important issue for management of SYROSP. The public should be allowed to enjoy the open space areas of the preserve, but not at the expense of the natural resources. However, increasing the level of public use within SYROSP may result in unauthorized access trails which may have serious impacts on the rare habitats and plant populations.

As the county of San Diego continues to grow in population size, public use of the preserve will continue to grow. This increase in public usage is very likely to be accompanied by an increase in unauthorized trail access and development for horses, mountain bikes, and hikers. As with the off-road activity, the solutions to this problem include better fencing, improved signs and public education, and increased patrols.

5.8.5 *Collection*

As with unauthorized trail access and development and illegal off-road activity, the collection of the natural resources of SYROSP will likely increase as nearby populations rise. Both plants and animals can be affected by the seemingly innocent collection of a sample of these wildlife species. As is posted at many of the parks and preserves throughout the

county, the public should be notified of the nature of the preserve and encouraged to enjoy the wildlife experience, but to leave what they encounter in place.

At greatest risk to collection would be flowering plants, reptiles, and amphibians. Of the vertebrate species on SYROSP, reptiles and amphibians would be the most likely to be collected as visitors move across the landscape. Visitors will likely encounter such reptile species as the Common kingsnake (*Lampropeltis getulus*), gopher snake (*Pituophis catenifer*), and coast horned lizard (*Phrynosoma coronatum*) throughout many of the habitats at SYROSP. These animals are small enough to be carried off the preserve and are popular as pets, although they can be relatively difficult to keep (particularly the coast horned lizard). Amphibians on the preserve are most susceptible to collection during their immature life stages, as egg masses or tadpoles. These may be collected out of curiosity, to watch the development of amphibians from egg to tadpole to an adult frog or toad. At the egg mass and tadpole stages, a larger numbers of individuals can be removed from the system than if a visitor finds and collects a single adult animal. The matter gains seriousness with the potential of endangered species breeding on the site.

5.8.6 *Patrol by County Staff*

Although SYROSP is patrolled by County staff, the level of patrol activity may be inadequate. Even with the patrols, some areas may have problems relating to illegal encroachment, off-road and off-trail use, trash dumping, and other destructive activities. Without an increase in patrols and other forms of oversight, management plans will not be effective. However, when developing patrol routes sensitive habitats within the preserve, particularly within the breeding habitat of sensitive species (i.e., arroyo toad, California spotted owl) should be considered. Additionally the patrol can be trained to identify and record a variety of non-native species on the site such as the turkeys and cattle. Through their help in identifying locations that are problems they can help direct removal efforts.

5.8.7 *Education*

We recommend that information kiosks be placed at trailheads. These kiosks should provide educational material to the public that informs them of 1) the prevalence of wildlife species on the preserve, 2) interpretive signs including the benefits of certain species to the natural ecosystem, 3) the importance of not disturbing or molesting or removing any plant or wildlife they may encounter, 4) the potential danger(s) of handling and collecting wild animals, and 5) maps of official trails. In addition, educational pamphlets could be provided that contain information similar to what is provided at the kiosks. These pamphlets could be made available at stores and other suitable locations in the vicinity of SYROSP to educate people about wildlife species that they may encounter on or near the preserve. The USGS could provide advice on information details that could be provided in these pamphlets or at the kiosks. Interpretative signs could be established along official trails throughout the preserve and signage with plant species names could be strategically located near representative specimens along official trails.

Another form of education could be through the Rangers and/or interpretive personnel. It is recommended that rangers and interpretive personnel that are working on SYROSP become educated about the preserves various resources so they in turn can help educate the public.

Finally, an educational program for the general public that promotes the value of native ecosystems as well as the negative effects of non-native species may aid in the future management of SYROSP. In general, the public is largely unaware of the high biological diversity in San Diego County. If the public is informed of this, they may have a better appreciation and willingness to protect and conserve the natural resources within the preserve and beyond.

5.8.8 *Additional Surveys*

We must remember that this is only a baseline survey with two years of data. There are a number of sensitive or rare species that we expect may be present but were not detected during these surveys (Appendix 10). We suggest continuing surveys as carried out here for a longer duration for detecting most of these species. In addition, there are some species that could be best detected using targeted survey techniques such as looking under rocks for the granite night lizard (*Xantusia henshawi*) or nest surveys for raptors.

5.8.9 *Site Access*

In order to adequately sample amphibians in the future, researchers will need access to the study site during and immediately after rain events. Amphibian reproduction and dispersal is necessarily linked to heavy moisture conditions. Access will greatly increase species detection and capture rates.

5.8.10 *Baseline Survey Materials Removal*

Currently, there is still some study equipment present on SYROSP: the herpetofauna pitfall arrays and the telspar posts used for camera surveys. If no further research is going to occur in the foreseeable future, at minimum, the pitfall array materials should be removed from the ground. As the site is opened to the public and visitation increases, so does the likelihood that visitors will encounter the pitfall array material. This could lead to an increased probability that the equipment will be vandalized or tampered with. The pitfall array materials in the ground at the site represent a significant investment in time and effort for site development (over 150 hours of field time). If it is decided to keep the pitfall arrays in the ground and there is no plan to sample them in the near future, a transfer of responsibility will need to be arranged.

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Table 1. Occurrence of aquatic and aquatic-associated species as determined by surveys and incidental observations on the Santa Ysabel Ranch Open Space Preserve. Survey locations are shown in Figure 2.

		West Property									
		SYC 1		*Cattle Pond 2*		*Cattle Pond 3 (East Side)*		*Input Drainage to Cattle Pond 3*		*Unnamed Tributary to SYC*	
	Dates Surveyed	9/10/02, 6/10/03, 8/11/03		8/11/03		8/14/03		8/14/03		8/14/03	
		Expected	Detected	Expected	Detected	Expected	Detected	Expected	Detected	Expected	Detected
Mollusks											
Fingernail clam	*Cyclocalyx sp.*		D								
Fishes											
Rainbow trout	*Oncorhynchus mykiss*										
Mosquitofish [a]	*Gambusia affinis*		V, D								
Amphibians											
Western spadefoot [c]	*Spea hammondii*	●		●	P	●		●		●	
Western toad	*Bufo boreas*	●	V	●		●	V	●	V	●	
Arroyo toad [b]	*Bufo californicus*	●	V					●			
Pacific treefrog	*Hyla regilla*	●	V, H, D, A	●		●	V, H	●	V, H	●	
California treefrog	*Hyla cadaverina*										
Bullfrog [a]	*Rana catesbeiana*						I				
Reptiles											
Racer	*Coluber constrictor*	●		●		●		●	P		
Two-striped garter snake [c]	*Thamnophis hammondii*	●		●		●		●			

		East Property																	
		SYC 2		*SYC 3*		*SYC 4*		*SYC 5*		*SYC 6*		*SYC 7*		*San Diego River*		*Cattle Pond 1*		*Spring 1*		*Spring 2*	
	Dates Surveyed	9/11/02, 5/28/03, 6/10/03, 8/14/03		9/10/02, 9/11/02		9/10/02, 8/14/03		3/18/02, 8/22/02, 7/10/03, 8/14/03		3/18/02, 8/22/02, 8/14/03		7/10/03		8/11/03		3/18/02, 9/10/02, 6/25/03, 8/14/03		6/25/03, 8/14/03		6/25/03, 8/14/03	
		Expected	Detected	Expected	Detected	Expected	Detected	Expected	Detected	Expected	Detected	Expected	Detected	Expected	Detected	Expected	Detected	Expected	Detected	Expected	Detected
Mollusks																					
Fingernail clam	*Cyclocalyx sp.*																				
Fishes																					
Rainbow trout	*Oncorhynchus mykiss*						V														
Mosquitofish [a]	*Gambusia affinis*																				
Amphibians																					
Western spadefoot [c]	*Spea hammondii*	●						●		●						●					
Western toad	*Bufo boreas*	●		●		●		●		●		●		●		●		●			
Arroyo toad [b]	*Bufo californicus*	●						●		●											
Pacific treefrog	*Hyla regilla*	●	V, H, D, A	●	V, H, D, P	●	A	●	A	●	A	●		●		●		●	V, H	●	
California treefrog	*Hyla cadaverina*	●	V, H, D, A	●	V, H, D	●	A														
Bullfrog [a]	*Rana catesbeiana*																				
Reptiles																					
Racer	*Coluber constrictor*	●		●		●		●		●		●						●	P	●	
Two-striped garter snake [c]	*Thamnophis hammondii*	●		●		●		●		●		●				●	V				

[a] = *non-native species*
[b] = *federally endangered species*
[c] = *CDFG species of special concern*
V = Visual Encounter Survey
H = Hand Capture
D = Dip Netting
A = Aural Detection
P = Pitfall Trap Arrays

Table 2. Number of herpetofauna individuals and species captured at pitfall arrays by array within the Santa Ysabel Ranch Open Space Preserve.

		Array Number																									*Total Captures*	*Total # Arrays*
Species	*Common Name*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	O[a]		
Amphibians																												
Ensatina klauberi	Large-blotched ensatina					2																		4			6	2
Hyla regilla	Pacific treefrog															1											1	1
Bufo boreas	Western toad									1																	1	1
Rana catesbeiana	Bullfrog							1																			1	1
Spea hammondii [b]	Western spadefoot	1																									1	1
Lizards																												
Elgaria multicarinatus	Southern alligator lizard	2		3	1	6	2		1	1	2	2							3	2	6	1	10	9	3		54	16
Eumeces gilberti	Gilbert's skink					1						4				4											9	3
Eumeces skiltonianus [b]	Western skink	1		4	2	5	1	2			2	1		1		3	4	8	3	2	7	3	4	1			54	18
Aspidoscelis tigris	Western whiptail		8		9	2			6		1	3	6	7	4	4	2	24			2				1		79	14
Sceloporus occidentalis	Western fence lizard	5	2	11	21	7	7	2	5	1	18	7	17	10	6	11	17	2	2	3	36	9	14	5	13		231	24
Sceloporus orcutti	Granite spiny lizard		1						1				3	2	14						2	1	1				25	8
Uta stansburiana	Side-blotched lizard	6	13	2	1			3		4	3	3	1	2	2	1		2		2	4						49	15
Phrynosoma coronatum [b]	Coast horned lizard		18						2				6	3	1										1	1	32	6
Snakes																												
Leptotyphlops humilis	Western blind snake			1																							1	1
Coluber constrictor	Racer							1												6							7	2
Diadophis punctatus	Ring-necked snake	1			1																	1	1				4	4
Hypsiglena torquata	Night snake																						1				1	1
Lampropeltis getulus	Common kingsnake												1								2						3	2
Masticophis lateralis	Striped racer				2						1	1		1	1				1								7	6
Pituophis melanoleucas	Gopher snake	1					1	1						1			2					2				1	9	6
Salvadora hexalepis [b]	Western patch-nosed snake															1											1	1
Thamnophis hammondii [b]	Two-striped gartersnake											2															2	1
Crotalus mitchellii	Speckled rattlesnake																									1	1	
Crotalus viridis	Western rattlesnake									1																	1	1
Total Captures		17	42	21	37	23	11	10	15	8	27	23	34	27	28	25	25	36	9	15	59	17	31	19	18	3	580	24
Total Species		7	5	5	7	6	4	6	5	5	6	8	6	8	6	7	4	4	4	5	7	6	6	4	4	3	24	

[a] = *species observered on the study site but not in association with an array*

[b] = *CDFG species of special concern*

Table 3. Number of herpetofauna individuals and species captured at pitfall arrays by month within the Santa Ysabel Ranch Open Space Preserve.

		Month											
Species	*Common Name*	*Jan*	*Feb* [a]	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*
Amphibians													
Ensatina klauberi	Large-blotched ensatina	3			2		1						
Hyla regilla	Pacific treefrog												1
Bufo boreas	Western toad	1											
Rana catesbeiana	Bullfrog							1					
Spea hammondii [b]	Western spadefoot				1								
Lizards													
Elgaria multicarinatus	Southern alligator lizard			9	3	13	11	12		5	1		
Eumeces gilberti	Gilbert's skink					4	4	1					
Eumeces skiltonianus [b]	Western skink			13	4	1	11	13	4	6	1		1
Aspidoscelis tigris	Western whiptail					12	49	11	5	2			
Sceloporus occidentalis	Western fence lizard			22	16	24	68	35	6	31	21	3	5
Sceloporus orcutti	Granite spiny lizard			1		12	7	2	1		2		
Uta stansburiana	Side-blotched lizard			2	5	5	5	6	3	12	6	2	3
Phrynosoma coronatum [b]	Coast horned lizard			3	5	4	10	8		2			
Snakes													
Leptotyphlops humilis	Western blind snake									1			
Coluber constrictor	Racer						6	1					
Diadophis punctatus	Ring-necked snake			1		1	1						1
Hypsiglena torquata	Night snake									1			
Lampropeltis getulus	Common kingsnake					1	2						
Masticophis lateralis	Striped racer			1	1	3	2						
Pituophis melanoleucas	Gopher snake			1			5	3					
Salvadora hexalepis [b]	Western patch-nosed snake					1							
Thamnophis hammondii [b]	Two-striped gartersnake			2									
Crotalus mitchellii	Speckled rattlesnake						1						
Crotalus viridis	Western rattlesnake						1						
Total Captures		4	-	55	37	81	184	93	19	60	31	5	11
Total Species		2	-	10	8	12	16	11	5	8	5	2	5
Number of Sampling Days/Month		4	-	4	5	6	8	6	1	4	3	1	4
Capture Rate (captures/days)		1.0	-	13.8	7.4	13.5	23.0	15.5	19.0	15.0	10.3	5.0	2.8

[a] = *no sample periods fell within this month*

[b] = *CDFG species of special concern*

Table 4. Herpetofauna species captures per habitat type within the Santa Ysabel Ranch Open Space Preserve. The total number of captures of species per habitat type and the average number of captures of species per array within each habitat type are shown. The number of arrays represented by each habitat type is included in

		Habitat Type [a]												*Total (24)*	
		OAK (8)		*RIP (2)*		*PIN (2)*		*NNG (4)*		*CHAP (6)*		*CSS (2)*			
Species	*Common Name*	Total	Average	Total	Average	Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Amphibians															
Ensatina klauberi	Large-blotched ensatina	6	0.8											6	0.25
Hyla regilla	Pacific treefrog											1	0.5	1	0.04
Bufo boreas	Western toad							1	0.3					1	0.04
Rana catesbeiana	Bullfrog							1	0.3					1	0.04
Spea hammondii [b]	Western spadefoot	1	0.1											1	0.04
Lizards															
Elgaria multicarinatus	Southern alligator lizard	25	3.1	5	2.5	16	8.0	2	0.5	4	0.7	2	1.0	54	2.25
Eumeces gilberti	Gilbert's skink	1	0.1									8	4.0	9	0.38
Eumeces skiltonianus [b]	Western skink	20	2.5	2	1.0	11	5.5	13	3.3	4	0.7	4	2.0	54	2.25
Aspidoscelis tigris	Western whiptail	14	1.8	1	0.5	2	1.0	24	6.0	31	5.2	7	3.5	79	3.29
Sceloporus occidentalis	Western fence lizard	91	11.4	16	8.0	50	25.0	14	3.5	42	7.0	18	9.0	231	9.63
Sceloporus orcutti	Granite spiny lizard					3	1.5	1	0.3	21	3.5			25	1.04
Uta stansburiana	Side-blotched lizard	12	1.5	2	1.0	4	2.0	9	2.3	18	3.0	4	2.0	49	2.04
Phrynosoma coronatum [b]	Coast horned lizard			1	0.5					30	5.0			31	1.29
Snakes															
Leptotyphlops humilis	Western blind snake	1	0.1											1	0.04
Coluber constrictor	Racer			6	3.0			1	0.3					7	0.29
Diadophis punctatus	Ring-necked snake	2	0.3			1	0.5	1	0.3					4	0.17
Hypsiglena torquata	Night snake					1	0.5							1	0.04
Lampropeltis getulus	Common kingsnake					2	1.0			1	0.2			3	0.13
Masticophis lateralis	Striped racer	3	0.4							3	0.5	1	0.5	7	0.29
Pituophis melanoleucas	Gopher snake	4	0.5					3	0.8	1	0.2			8	0.33
Salvadora hexalepis [b]	Western patch-nosed snake											1	0.5	1	0.04
Thamnophis hammondii [b]	Two-striped gartersnake											2	1.0	2	0.08
Crotalus viridis	Western rattlesnake							1	0.3					1	0.04
Number of Captures		180	22.5	15	7.5	90	45.0	71	17.8	155	25.8	48	24.0	577*	24.04
Number of Species		12	5.4	7	4.5	9	6.5	12	5.3	10	5.7	10	7.5	23	5.63

[a] = *habitat types include: oak woodland (OAK), riparian (RIP), pine woodland (PIN), non-native grassland (NNG), chaparral (CHAP), and coastal sage scrub (CSS)*

b = CDFG species of special concern

Table 5. Total number of ant subfamilies, species, and individuals captured at ant pitfall traps by array within the Santa Ysabel Ranch Open Space Preserve.

Species		Array Numbers																							Total Individuals	% Array Occurrence
		1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	
Subfamily Dolichoderinae																										
Dorymyrmex bicolor	Pyramid ant		434																							434	4%
Dorymyrmex insanus	Pyramid ant	1	3			2			2				1	2			2	3	6					2		24	42%
Forelius foetidus			3	3					1			3			7	4		3				1				25	33%
Liometopum occidentale		1		1	5	7	3				3	5					104	1	2		1		1	1		135	54%
Tapimona sessile	Oderous House ant			1		1	5					1	1						2	4	5	1	34	7	5	67	50%
Subfamily Ecitoninae																										
Neivamyrmex nigrescens	Army ant		1	48																						49	8%
Subfamily Formicinae																										
Campanotus sp. CA-01	Carpenter ant		17						12																	29	8%
Camponotus anthrax	Carpenter ant		1						1					3	6											11	17%
Camponotus dumetorum	Carpenter ant		5						11				8	27	63											114	21%
Camponotus semitestaceus	Carpenter ant					1			20	53		5						11			22	2	11			125	33%
Camponotus spp.	Carpenter ant									3						1										4	8%
Camponotus sp CA-02	Carpenter ant	3				3						2			1	1	2		1							13	29%
Camponotus vicinus	Carpenter ant				5	1	2		4		3		13						3		1		6	7		45	42%
Camponotus yogi	Carpenter ant								1																	1	4%
Formica francoueri	Wood ant								1											22					536	559	13%
Formica moki	Wood ant	3		3	3	1	2		2		3		1		9		2		13		4		23			69	54%
Formica xerophila	Wood ant								1												1					2	8%
Myrmecocystus mimicus	Honey Pot ant							4										5								9	8%
Myrmecocystus testaceus	Honey Pot ant					2			2									1								5	13%
Polyergus breviceps					2		1																			3	8%
Prenolepis imparis	Winter ant	3	1	6	8		5		12	2	8						7		1							53	42%
Subfamily Myrmicinae																										
Crematogaster californica	Acrobat ant		41	1	1	1		8		8		2				44						6				112	38%
Crematogaster coarctata	Acrobat ant				2		5				5	6	3										4			25	25%
Crematogaster hespera	Acrobat ant																2							3		5	8%
Crematogaster mormonum	Acrobat ant								1				2					2	13							18	17%
Leptothorax andrei		4	1						1				2		1	3	1						1			14	33%
Leptothorax nevadensis															1											1	4%

Table 5 (continued).

Species		Array Numbers																							Total Individuals	% Array Occurrence
		1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	
Subfamily Myrmicinae (continued)																										
Leptothorax nitens																			1					3		4	8%
Leptothorax rugatulus																								4		4	4%
Leptothorax sp CA-03																								4		4	4%
Messor andrei	Harvester ant		40		38	3	1		42	2								8	2			5	1			142	42%
Messor stoddardii	Harvester ant				1			1		7											3	8	4		22	46	29%
Monomorium ergatogyna								13		11		2	1						6		5	9		2		49	33%
Myrmica rugiventris																					2					2	4%
Pheidole californica	Crazy ant																				1					1	4%
Pheidole cerebrosior						1	1																			2	8%
Pheidole hyatti		44	162	35	12	8	7	11	5	2		13	1	15			2	14	55		23	38	7			454	75%
Pheidole spp.			3																							3	4%
Pheidole vistana			72						39			10				9										130	17%
Pogonomyrmex californicus	Harvester ant	11	3				12										1									27	17%
Pogonomyrmex rugosus	Harvester ant							2																		2	4%
Pogonomyrmex subnitidus	Harvester ant	1	2			21		11	1	66						1	29									132	33%
Solenopsis molesta	Thief ant	1				2			7						1	4			1			1		2		19	33%
Solenopsis xyloni	Native Southern Fire ant								17			1				26										44	13%
Stenamma diecki						1																				1	4%
Number of Captures		72	789	98	77	55	44	50	183	154	22	50	33	47	89	93	152	48	106	26	68	71	92	35	563	3017	
Number of Species [a]		11	15	9	11	16	12	8	22	8	6	12	11	5	9	8	11	10	14	3	12	10	11	11	4	43	

[a] = number of confirmed species; Camponotus spp. and Pheidole spp.were not included in species totals since they may have been individuals of other species in that genus that were identified

Table 6. Avifauna species detected at point count stations within the Santa Ysabel Ranch Open Space Preserve, sorted from most common species to least common species.

	Point Count Number																																																		Total	Total #
Species	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	*31*	*32*	*33*	*34*	*35*	*36*	*37*	*38*	*39*	*40*	*41*	*42*	*43*	*44*	*45*	*46*	*47*	*48*	*49*	*50*	*# of Points*	*Individuals*
Lazuli bunting	3	6	4	15	8	10	4	10	5	6	9		2	7	1	13	6	14	10	10	10	12	2	1	3	14	8	8	1		2	7	10	6	6	10	4		19	5			3		13	9	14	6	4	3	44	323
Mourning dove	15	6	6	11	4	5	9	7	7	5	8	6	2	7	5	5	6	4	8	9	5	11	5	8	5	6	4	3	5	4	4	4	12	6	7	8		2	6	5	7	7	6	6		3	4	4	2	7	48	291
Ash-throated flycatcher	11	13		4	9	3	7	8	5	6	8		1	3	3	8	9	1	10	6	6	7	8	7	6	5	9	3	6	7	7	12	10	6	5	7	1	5	6	4			1	2	3	3	2	8	4	3	46	268
Spotted towhee	6	10		1	8	3	6	7	10	5	8		1			10	3	6	5	4	2	9	9	7	11	4	3	5	8	10	9	4	5	3	4	7	6	1	5	6			4	1	6	5	2	11	7	10	44	257
Acorn woodpecker	1	8	2	5	5		8			4	7	3		1	4	8	1		4	4	2			2		7	3	12	3			7	11	7	7	10	1	8	6	14	2		6	15	2	4	2	7	3	14	39	220
House wren	2	3		10	6	1	2	4	3	3	5		2	4		13	4	7	3	6	1	5	4	1	4	8	10	10	5	7	9	9	6	13		5	6	1		3						3	1	7	6	5	40	207
Violet-green swallow	1	1		1		10			1		4		4	5		15	2	1	5	6	1	2	2	5		1	5	9	3		6	8	5	4		6	1	4	7	1			8	13	7	8	1	10	20	6	38	199
Lesser goldfinch	10	4		1	4	12	1	6	8	3	7		4	7	1	7	4	7	5	7	4	7	7	3	3	11	5	4	1	4	8	2	1		2	1	1		1				2	2	3	4	1		2	6	42	183
Oak titmouse	5	8		4	2	3	2		1	2	7					2	5		5	9		10	4		2	4	3	6	7	5	4	4	2	1	5	4	6		5	4			2	1	7	11		4	8	4	37	168
Western bluebird		2	2									4	3	2	5	1	2	1	3	3	7	12										2		8	2	3		12	6	9	18	15	3	3	10	6	18		6		28	168
Lark sparrow		3	6	13	13	3	2		2	2	3	12	6	11			1	3	3	1	8			1	1	2	1	2				8	2	6	4	7		4	7		4		9	1	1	2			1		35	155
Western wood-pewee	2				6	1	5	4	2	6	5	4	1	4	4	1			6			1	4	3	1	3	3	9	6		3	5	1	12	2	9	2	10	5	9				3				2	4	7	36	155
European starling			2				1			4	2	15	16	1	1					3	1							1							1	3		2	6	4	12	3	11	58	4		1		2		23	154
Wrentit	18	9			2	2	1	7	5		6			1		2	2	5	1	4	1	3	5	6	13		5	2	9	8	7	2	4		1	4	1		2	2						1		3	2	5	35	151
California towhee	5	11	3	2	4	5	6	10	8	6	13	2	4	3		3	10	5	6	7		3	1	2	1	1			1			6	9		1	1		1					1	5	1			1	1	1	36	150
Bullock's oriole	1	1	2	7	1	2	1	1		6	2	6	6	8	1	2	3		2	3	5				1			1	1	1		1	2	9	3	6		3	5	2	2		11	5	7	6	3	2	2	2	40	135
White-breasted nuthatch	3	6	2	4	7		3	1	5	4	4					1	1	1	6	5	1		2		2	4		4		1	2	5	4	6		6	5	5	1	7			2	1	4	1		1	3	3	37	123
Western scrub-jay	5	2		4	5	3	1	1	1	1	3	1	3	5		2	2	3	3	2	4	1		6	4		1			9		6	3			3		4	1	2			4	4	2	3	2	3	2	4	38	115
Western kingbird			1	1						2		15	11	11	14			1	2	1	6									1			1	4		5		3			5	3	13	8			1				21	109
Tricolored blackbird														100																																					1	100
Nuttall's woodpecker		2		4	2		3		3	2	4		1	1		4		1		2	3	3	3	3	4	5	4	3	4	5	4	1	1	4	6	1	2		2	3						1		1	2	1	35	95
Bushtit		3			8		3			2	3					3				5		4	7					4	10	7	12		2	1	6	2			1	5									1	5	21	94
House finch			4					3		3		3	4	11			7		9	1	2	6	1	5		3				2	1		2	6			2	3	2			2	4	2				1	5		26	94
American crow		2		5	6			2					2													3		5		1	1		7	5	4	2	4		3	1	10	3	3		1	9	5	3	3	2	25	92
Western meadowlark			10		1		3			3		5	2		2																	3	3	1	4	2		6			9	13	16		1	1	7				19	92
Cliff swallow				8	1				1				5	5						2	22			1		6				1		1	2				1	3	1		1	1	7	1	9	4	5		1		23	89
Brewer's blackbird												15	19	35	3								1											6										2							7	81
Anna's hummingbird	4	3	2	2						1	1					1	2	1	1	2	1	1	5	3	2	1		1	2	11	3	2	3	6	3	2	1	1		1	1	2					3	1	1		34	77
Bewick's wren	6	5	1		1	2	1	3	1	1	2					2	2					2	3	5	6	3			4	4	4	1	2		2			1						1				4	3	4	28	76
Lawrence's goldfinch		2				1			3		2		3	4	1	2		1	7	2		1	5		3	4				1	1					2	1		4	2	2				2	2	4	1	8		27	71
Brown-headed cowbird		2		3	2	2	1			6	2	2	4	5					1			1	1			3	3	3			3		2	1	1	1	8	3	4	3					1	1				1	28	70
Dark-eyed junco				4	2		1			1									1				4					7		1	2		1				9		16	10				2	2	3			4		17	70
Black-chinned sparrow		1				3		6	2	1	1						5	13	2	3	5	4	2	1	1	1				1	1	1	4	1											1	1		1		1	25	63
Steller's jay				2						1	1								1					1						3				1	3	6			1	7			3	9	5	6	1	3	5	4	19	63
Phainopepla	7	1			2	1	1	5	2	1	1	1				2					3	2		1	2	4		4		1	2	4	1					7						1	4						24	60
Black-headed grosbeak	4			1	2				1		2			2		4	1	1	1	1			1	5	4		1		5	1	3	2				1			2							1	1	1	2	4	26	54
Costa's hummingbird	3	3				4	4	1	4	1	1					2		4			1	3	1			1				1		1	1					1													18	37
Purple martin																	26			4					3										2			1						1							6	37
Northern flicker		3			2		2	1	2		2	1			2	1			1			1			1	1		1				2		2	1	1		1	1				3	3	2						23	37
Blue-gray gnatcatcher		2				5	5	2	3		1					1		1	1			1	1	1		2	3			3	1	1	2																		18	36
Common raven					1	1				1	1	3				1		2	1			1			2	3		1	1		3			2		3			2			2	1			1			2		21	35
Red-tailed hawk					1				2	1	4		4	4	3		3		1						1									2				1	1	1	2				1				1	2	18	35
Western tanager				1			1			2				2		3		1	1				1					2	2							2				8						1			3	1	15	31
Wild turkey															1	4	1					1					1	9	1					4	1					3						5					11	31
Pacific-slope flycatcher							1				1		1	1														5	3		2						9			3										1	10	27
Band-tailed pigeon						2															3	1		1												1				4	3				4			5		2	10	26
Mountain chickadee																							1			3							1			1	2	5	1				2		1	2	1	2	2	2	14	26
Unidentified hummingbird[a]	1			1		1	1						1			1	1		3				3	3								1			1				1		1	1			2						16	23
Yellow warbler					1																							9	1								6		3	1							1		1		8	23
Red-winged blackbird													2																														1				2	1	14	1	6	21

Table 6 (continued)

Species	*Point Count Number* 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	*Total # of Points*	*Total # individuals*
Song sparrow				4									2	1													1												1	1					1		2	1	6		11	21
Chipping sparrow		2												1						2																	7				2		3	3					7	20
Warbling vireo				1			2	1	1	7			2	1		1			1										1								1												11	19
California thrasher	2	4			1		1		1		1		1			1	1	1						2		1				1																			13	18
Horned lark																																					2				6	8						1		4	17
Orange-crowned warbler																											4		1						1				1									1		7	14
Hutton's vireo		1			2						1																3		2	1								1		1							1		9	13
Turkey vulture			1			1			2									2		1	1								1	1		1						2										10	13
Wilson's warbler											1		3	2									2				2		1		1																	7	12
California quail	3						1			1								2						1									1	2															7	11
Red-shouldered hawk		2							1																							1	1	1	2											1	2		8	11
American robin			3																																				1	6								0	4	10
Grasshopper sparrow			1										1		1																	1					1						2		1		2		8	10
White-tailed kite			1	1			2																									1		1						3				1			7	10
Yellow-rumped warbler			2	1				1		1			2						1												1														1				8	10
Swainson's thrush	2			1						1			2														1							1															6	8
American kestrel							1											1												1				1	1						1								7	7
Rufous-crowned sparrow		1						2									1			1																					1							2	5	7
Townsend's warbler								1											1										1		2																	1		5	6
Black-throated gray warbler										1																					2					1												4	5
Sage sparrow		1																2			1																													4	5
Black phoebe													1	2																																			1	3	4
Cooper's hawk																			1							0					1																	1	5	4
Killdeer			2		1								1																																			1	3	4
Ruby-crowned kinglet													2	2																																			2	4
Allen's hummingbird																											1				2																			2	3
Barn owl																																			2											1				2	3
Blue grosbeak									1				2																																					2	3
Olive-sided flycatcher																1												1			1																			3	3
Black-chinned hummingbird																							2																											1	2
Black-throated sparrow																					2																													1	2
Common yellowthroat																															2																			1	2
Golden eagle																																																	1	1	2	2
Long-eared owl																	1																		1															2	2
Mallard														2																																					1	2
Caspian tern											1																																								1	1
Hairy woodpecker																																																				1	1
Mountain quail										1																																									1	1
Northern mockingbird															1																																				1	1
Northern rough-winged swallow													1																																					1	1
Rock dove											1																																								1	1
Varied thrush[b]																																																				1	1
Yellow-breasted chat																																																			1	1
Total Individuals	120	133	57	122	120	86	93	94	93	104	133	100	134	261	53	127	112	92	122	116	108	115	97	85	86	114	73	144	96	103	116	115	123	138	89	135	85	104	143	139	88	61	131	151	112	116	87	102	151	113		***5592***
Total Species	23	34	20	29	32	24	33	24	30	37	36	19	39	34	18	32	27	28	35	30	27	28	29	26	25	30	19	33	29	29	34	31	33	32	29	36	27	31	36	34	16	12	28	26	32	36	26	32	42	31		**92**
Individuals detected/10-min count	20.0	22.2	9.5	20.3	20.0	14.3	15.5	15.7	15.5	17.3	22.2	16.7	22.3	43.5	8.8	21.2	18.7	15.3	20.3	19.3	18.0	19.2	16.2	14.2	14.3	19.0	12.2	24.0	16.0	17.2	19.3	19.2	20.5	23.0	14.8	22.5	14.2	17.3	23.8	23.2	14.7	10.2	21.8	25.2	18.7	19.3	14.5	17.0	25.2	18.8		

Grand Total From All Point Count Locations

[a] = this is only added into total species calculations when no other hummingbird species was recorded at a point

[b] = probable, but not confirmed, detection

Table 7. Habitat associations of avifauna species detected at point count stations within the Santa Ysabel Ranch Open Space Preserve listing number of individuals detected in each habitat type, sorted from most common species to least common species. For each bird observation vegetation was qualitatively assigned a habitat type.

	Habitat Type [a]								*Total # of Points*	*Grand*
Species	*CHAP*	*PIN*	*G*	*HUM*	*OAK*	*RIP*	*CSS*	*Flyover*	*Detected*	*Total*
Lazuli bunting	25		18		213	31	36		44	323
Mourning dove	26	4	21	1	152	14	3	70	48	291
Ash-throated flycatcher	28	3	7		207	9	11	3	46	268
Spotted towhee	44	2			186	10	14	1	44	257
Acorn woodpecker	9	28	1		163	12		7	39	220
House wren	10				166	22	9		40	207
Violet-green swallow		2	4	1	24	5	3	160	38	199
Lesser goldfinch	11		3		74	8	14	73	42	183
Oak titmouse	8	3			147	7	3		37	168
Western bluebird		3	77	1	78	5	1	3	28	168
Lark sparrow	6	1	40		70	20	14	4	35	155
Western wood-pewee	6	3			133	13			36	155
European starling		15	22	5	18	29		65	23	154
Wrentit	61	1			72	1	16		35	151
California towhee	35	5	3		79	5	23		36	150
Bullock's oriole	1	4	9		83	25	3	10	40	135
White-breasted nuthatch	2	2			112	5	1	1	37	123
Western scrub-jay	16	6		1	78	10	3	1	38	115
Western kingbird		13	26		35	10		25	21	109
Tricolored blackbird								100	1	100
Nuttall's woodpecker	9				79	5		2	35	95
Bushtit	6				87	1			21	94
House finch			1	2	38	15	2	36	26	94
American crow			4		27	13		48	25	92
Western meadowlark			71		20			1	19	92
Cliff swallow						1		88	23	89
Brewer's blackbird		2	2	15		12		50	7	81
Anna's hummingbird	11		2		45	1	4	14	34	77
Bewick's wren	24	1			42	3	6		28	76
Lawrence's goldfinch	1				34	11		25	27	71
Brown-headed cowbird	1		4	1	34	21		9	28	70
Dark-eyed junco	1	2	1		58	7		1	17	70
Black-chinned sparrow	8				25		30		25	63
Steller's jay	1	15			44	2		1	19	63
Phainopepla	11	1			37	4		7	24	60
Black-headed grosbeak	13				39	2			26	54
Costa's hummingbird	10				17		10		18	37
Purple martin		1		27	2			7	6	37
Northern flicker	2	4			28	2		1	23	37
Blue-gray gnatcatcher	7				27		2		18	36
Common raven			3		4	1		27	21	35
Red-tailed hawk			1	4	10			20	18	35
Western tanager	1		2		24	2		2	15	31
Wild turkey			1		25	4	1		11	31
Pacific-slope flycatcher					19	8			10	27
Band-tailed pigeon					15			11	10	26
Mountain chickadee		2			24				14	26
Unidentified hummingbird*b*	4				8	1		10	16	23
Yellow warbler					6	17			8	23
Red-winged blackbird					1	4		16	6	21

Table 7 (continued)

	Habitat Type [a]								Total # of Points	Grand
Species	*CHAP*	*PIN*	*G*	*HUM*	*OAK*	*RIP*	*CSS*	*Flyover*	*Detected*	*Total*
Song sparrow		1			4	16			11	21
Chipping sparrow	2		3		10	3	2		7	20
Warbling vireo	2				14	3			11	19
California thrasher	13				2	1	2		13	18
Horned lark			13			1		3	4	17
Orange-crowned warbler					11	3			7	14
Hutton's vireo	1				8	4			9	13
Turkey vulture								13	10	13
Wilson's warbler					5	7			7	12
California quail	4		2		3		2		7	11
Red-shouldered hawk					5	1		5	8	11
American robin			3		3	4			4	10
Grasshopper sparrow			10						8	10
White-tailed kite					5			5	7	10
Yellow-rumped warbler	1				5	2		2	8	10
Swainson's thrush	2				4	2			6	8
American kestrel					5			2	7	7
Rufous-crowned sparrow	1						6		5	7
Townsend's warbler	1				5				5	6
Black-throated gray warbler					5				4	5
Sage sparrow			1		1		3		4	5
Black phoebe			1	1		2			3	4
Cooper's hawk		1			2	1			5	4
Killdeer					1			3	3	4
Ruby-crowned kinglet						4			2	4
Allen's hummingbird					3				2	3
Barn owl					3				2	3
Blue grosbeak				2	1				2	3
Olive-sided flycatcher					3				3	3
Black-chinned hummingbird					2				1	2
Black-throated sparrow							2		1	2
Common yellowthroat					2				1	2
Golden eagle		1						1	2	2
Long-eared owl					1		1		2	2
Mallard						2			1	2
Caspian tern								1	1	1
Hairy woodpecker					1				1	1
Mountain quail					1				1	1
Northern mockingbird					1				1	1
Northern rough-winged swallow						1			1	1
Rock dove			1						1	1
Varied thrush*c*		1							1	1
Yellow-breasted chat						1			1	1
Total Individuals	425	127	357	61	3025	436	227	934		5592
% Total Individuals/Habitat	7.6	2.3	6.4	1.1	54.1	7.8	4.1	16.7		100
Total Species	39	28	31	12	75	58	29	42		92[d]
% Total Species/Habitat	42.4	30.4	33.7	13.0	81.5	63.0	31.5	45.7		

[a] *= habitat that species was detected in during point count; habitat types include: chaparral (CHAP), pine woodland (PIN), grassland (G), human-modified (HUM), oak woodland (OAK), riparian (RIP), and coastal sage scrub (CSS) (note: point count locations may be asociated with multiple habitat types).*

[b] *= this is only added into total species calculations when no other hummingbird species was recorded at a point*

[c] *= probable, but not confirmed, detection*

[d] *= 92 is the total number of species detected*

Table 8. Owl species detected during focused California spotted owl surveys on the Santa Ysabel Ranch Open Space Preserve.

		Calling Station Number [a]															
		1	*9*	*10*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*36*
Spotted owl	*Strix occidentalis*				✓	✓	✓	✓	✓		✓						
Barn owl	*Tyto alba*					✓	✓			✓	✓	✓		✓		✓	
Great horned owl	*Bubo virginianus*				✓		✓	✓					✓				
Western screech owl	*Otus kennicottii*	✓		✓			✓	✓			✓						

[a] *= 36 spotted owl calling stations were chosen throughout SYROSR, but only 16 calling stations in the most suitable habitat (high and medium priority) were actually surveyed (see Appendix 4); the gaps in the station numbers reflect the omitted calling stations.*

Table 9. Bat survey locations within the Santa Ysabel Ranch Open Space Preserve including survey site features, dates, and methodologies.

Site Number	*Location*	*Feature(s)*	*Survey Dates*	*Survey Methodology*
1	West Santa Ysabel Creek	Creek/Riparian Reach	5/28/2002	Acoustic, mist-net
			7/24/2002	Acoustic, mist-net
			9/10/2002	Acoustic, mist-net
			12/4/2002	Acoustic, mist-net
			1/23/2003	Acoustic, mist-net
			4/9/2003	Acoustic, mist-net
			5/28/2003	Acoustic, mist-net
			7/31/2003	Acoustic, mist-net
2	West Saddle	Upland woodland	7/1/2002	Acoustic, mist-net
3	Corner Store	Roost Structure	8/7/2002	Acoustica
			6/30/2003	Acoustica
4	Cattle Pond[b]	Pond	5/22/2003	Acoustic, mist-net
5	East Santa Ysabel Creek (CA 79)	Creek/Riparian Reach	7/17/2002	Acoustic, mist-net
6	East Santa Ysabel Creek (Tributary)	Creek/Riparian Reach	6/12/2002	Acoustic, mist-net
7	East SY Creek (West Crossing)	Creek/Riparian Reach	5/30/2002	Acoustic, mist-net
			8/29/2002	Acoustic, mist-net
			7/7/2003	Acoustic, mist-net
8	East Santa Ysabel Creek (NE portion)	Creek/Riparian Reach	6/20/2002	Acoustic, mist-net
9	East Santa Ysabel Creek (East Crossing)	Creek/Riparian Reach	6/6/2002	Acoustic, mist-net
			6/24/2003	Acoustic, mist-net

[a] *= indicates survey at roost location; all other surveys at foraging location(s)*

[b] *= Cattle Pond 1 from aquatic survey*

Table 10. Bat species detection methods and occurrence by site within the Santa Ysabel Ranch Open Space Preserve.

Scientific Name	*Common Name*	*Detection Method*	*Detection Sites*	*Number of Detection Nights*
Antrozous pallidus [acd]	Pallid bat	Acoustic	1,3	5
Corynorhinus townsendii [abcd]	Townsend's big-eared bat	Capture	7	1
		Acoustic	1,9	4
Eptesicus fuscus	Big brown bat	Capture	1,6,7	3
		Acoustic	1,2,3,4,5,6,7,8,9	14
Eumops perotis [abd]	Western mastiff bat	Acoustic	1,2,3,5,6,7,8,9	17
Lasiurus blossevillii [a]	Western red bat	Capture	1,7	2
		Acoustic	1,6,7,9	7
Lasiurus cinereus	Hoary bat	Capture	1,4,6,9	5
		Acoustic	1,4,6,7,9	7
Lasiurus xanthinus [a]	Western yellow bat	Acoustic	9	1
Myotis californicus	California myotis	Capture	2,4,7,9	6
		Acoustic	1,2,3,4,6,7,8,9	15
Myotis ciliolabrum [bd]	Western small-footed bat	Capture	7	1
		Acoustic	1,2,4,5,6,7	11
Myotis evotis [bd]	Long-eared myotis	Acoustic	7	1
Myotis yumanensis [bd]	Yuma myotis	Capture	1	1
		Acoustic	1,2,6,7,9	11
Nyctinomops femorosaccus [a]	Pocketed free-tailed bat	Acoustic	1,2,5,7,8,9	11
Nyctinomops macrotis [a]	Big free-tailed bat	Acoustic	7,9	2
Pipistrellus hesperus	Western pipistrelle	Acoustic	1,2,3,4,5,7	7
Tadarida brasiliensis	Mexican free-tailed bat	Acoustic	1,2,3,4,5,6,7,8,9	13

[a] = *CA species of special concern or proposed CA species of special concern*
[b] = *federal species of concern*
[c] = *U.S. Forest Service sensitive species*
d = U.S. Bureau of Land Management sensitive species

Table 11. Total number of small mammals captured during pitfall trap surveys within the Santa Ysabel Ranch Open Space Preserve.

		Array Number																							*Total Captures*	*Total # Arrays*
Species	*Common Name*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
Desert woodrat[a]	*Neotoma lepida*																						1			1	1
Neotoma Nest [b]		1			4		5								3	1		6	3		1			1		25	9
Deer mouse	*Peromyscus* spp.									2			1					4	1		1	1	3	2		15	8
Deer mouse	*Peromyscus maniculatus*				1	2			1	5							1	7	2	1	3	1	4	1		29	12
California mouse	*Peromyscus californicus*								2			1														3	2
Cactus mouse	*Peromyscus eremicus*				1												1				1		1			4	4
Desert shrew	*Notiosorex crawfordi*					1							1						1		1					4	4
Ornate shrew	*Sorex ornatus*	1				11	3					1	1			2			1		3			2	2	27	10
California vole	*Microtus californicus*	5	3			23	18	3	6	4	1	1	2	2	2	1	6	5	2	6	2	2	7	5	20	126	22
Botta's pocket gopher	*Thomomys bottae*	3	5	4	2	3	7	2		4	2	6	1	2	1	2	1	4	1	2	6	9	2	2	1	72	23
Western harvest mouse	*Reithrodontomys megalotis*			1	1											2	1	2		7	4	2	2		5	27	10
Merriam's chipmunk	*Tamias merriami*																						1			1	1
Desert cottontail	*Sylvilagus audubonii*													1												1	1
Unknown rabbit					1									1												2	2
Pocket mouse	*Chaetodipus* spp.															1										1	1
San Diego pocket mouse[a]	*Chaetodipus fallax*		4	1	1																					6	3
Unknown mouse																	1						1			2	2
Unknown rodent																				1						1	1
Total Captures		10	12	6	11	40	33	5	9	15	3	9	6	6	6	9	11	28	11	17	22	15	22	13	28	347	24
Total Species [c]		4	3	3	7	5	4	2	3	3	2	4	5	3	3	6	5	5	6	4	8	4	7	5	4	12	

[a] = *CDFG species of special concern*

[b] = *visual surveys were conducted for Neotoma nests within a 50 meter radius of each pitfall array.*

[c] = *number of confirmed species; Peromyscus spp., Chaetodipus spp., unknown rabbit, unknown mouse, and unknown rodent were not included in species totals*

Table 12. Large mammal species detected at baited scent stations within the Santa Ysabel Ranch Open Space Preserve. [a]

	Transect Number									
Species Detected	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Target Species										
Odocoileus hemionus (Mule deer)	0	0	0	0	0	0	1 (0.009)	2 (0.017)	0	0
Canis latrans (Coyote)	55 (0.470)	42 (0.359)	22 (0.183)	22 (0.190)	9 (0.078)	19 (0.165)	48 (0.429)	7 (0.059)	15 (0.126)	23 (0.333)
Felis rufus (Bobcat)	9 (0.077)	10 (0.085)	9 (0.075)	10 (0.086)	9 (0.078)	8 (0.070)	10 (0.089)	1 (0.008)	1 (0.008)	0
Urocyon cinereoargenteus (Gray fox)	8 (0.068)	12 (0.103)	3 (0.025)	17 (0.147)	6 (0.052)	9 (0.078)	6 (0.054)	0	5 (0.042)	0
Mephitis mephitis (Striped skunk)	5 (0.043)	7 (0.060)	11 (0.092)	5 (0.043)	26 (0.224)	14 (0.122)	23 (0.205)	9 (0.076)	20 (0.168)	1 (0.014)
Spilogale gracilis (Spotted skunk)	0	2 (0.017)	0	1 (0.009)	15 (0.129)	11 (0.096)	4 (0.036)	3 (0.025)	2 (0.017)	0
Human Associated Species										
Canis familiaris (Domestic dog)	5 (0.043)	3 (0.026)	1 (0.008)	4 (0.034)	0	0	3 (0.027)	8 (0.067)	3 (0.025)	4 (0.058)
Didelphis virginiana (Opossum)	0	5 (0.043)	0	1 (0.009)	0	3 (0.026)	1 (0.009)	0	0	1 (0.014)
Homo sapien (Human)	0	1 (0.009)	0	0	0	0	1 (0.009)	0	0	1 (0.014)
Non-Target species										
Mammals										
Sylvilagus species (Rabbit)	0	0	0	4 (0.034)	1 (0.009)	6 (0.052)	0	0	0	0
Squirrel species	0	0	0	0	3 (0.026)	2 (0.017)	1 (0.009)	14 (0.118)	0	0
Rodent species	15 (0.128)	7 (0.060)	12 (0.100)	5 (0.043)	8 (0.069)	7 (0.061)	7 (0.063)	20 (0.168)	6 (0.050)	9 (0.130)
Birds										
Bird species[b]	34 (0.291)	39 (0.333)	27 (0.225)	26 (0.224)	31 (0.267)	54 (0.470)	64 (0.571)	56 (0.471)	31 (0.261)	8 (0.116)
Meleagris gallopavo (Wild turkey)	0	0	0	0	0	0	1 (0.009)	3 (0.025)	2 (0.017)	0
Herpetofauna										
Lizard species	17 (0.145)	10 (0.085)	8 (0.067)	3 (0.026)	20 (0.172)	9 (0.078)	0	12 (0.101)	10 (0.084)	2 (0.029)
Snake species	0	0	0	0	1 (0.009)	2 (0.017)	0	1 (0.008)	0	1 (0.014)

[a] *= values indicate number of visits by named species followed by associated track index within parentheses; track index calculated as* $I=\{v_j/(s_j n_j)\}$*, where I = index of species activity at transect j,* v_j *= number of stations visited by species at transect,* s_j *= number of stations at transect j,* n_j *= number of nights that stations were active in transect j; see Section 3.7.1*

[b] *= bird species encompasses all birds with the exception of wild turkeys, which are listed separately*

Table 13. Large mammal species detected at camera stations[a] within the Santa Ysabel Ranch Open Space Reserve.

	Camera Number								
Species Detected	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
Target Species									
Puma concolor (Mountain lion)	1 (0.004)	0	0	0	8 (0.035)	0	0	2 (0.011)	2 (0.006)
Odocoileus hemionus (Mule deer)	12 (0.048)	64 (0.296)	5 (0.027)	23 (0.113)	4 (0.017)	4 (0.029)	35 (0.257)	13 (0.068)	11 (0.034)
Canis latrans (Coyote)	2 (0.008)	0	4 (0.022)	0	0	1 (0.007)	0	0	1 (0.003)
Felis rufus (Bobcat)	38 (0.152)	1 (0.005)	64 (0.348)	8 (0.039)	21 (0.091)	10 (0.074)	1 (0.007)	55 (0.289)	16 (0.049)
Urocyon cinereoargenteus (Gray fox)	21 (0.084)	0	5 (0.027)	3 (0.015)	4 (0.017)	0	0	0	2 (0.006)
Procyon lotor (Raccoon)	0	0	0	0	0	0	0	6 (0.032)	0
Mephitis mephitis (Striped skunk)	6 (0.024)	0	6 (0.033)	3 (0.015)	21 (0.091)	3 (0.022)	1 (0.007)	0	0
Human Associated Species									
Bos taurus (Domestic cow)	0	39 (0.181)	2 (0.011)	21 (0.103)	1 (0.004)	0	0	14 (0.074)	15 (0.046)
Didelphis virginiana (Opossum)	0	1 (0.005)	0	1 (0.005)	0	0	0	0	0
Equus caballus (Domestic horse)	0	0	0	0	1 (0.004)	0	0	0	2 (0.006)
Homo sapien (Humans)	0	2 (0.009)	1 (0.005)	0	7 (0.030)	0	0	0	0
Non-Target Species									
Mammals									
Sylvilagus species (Rabbit)	0	0	0	0	0	0	0	1 (0.005)	0
Squirrel species	0	0	0	0	0	0	0	1 (0.005)	0
Rodent species[b]	0	0	0	0	0	0	0	0	1 (0.003)
Dipodomys simulans	0	0	0	2 (0.010)	0	0	0	0	0
Dipodomys species (Kangaroo rat)	0	0	6 (0.033)	0	0	0	0	0	0
Birds									
Bird species[c]	8 (0.032)	3 (0.014)	17 (0.092)	0	20 (0.087)	2 (0.015)	6 (0.044)	14 (0.074)	2 (0.006)
Geococcyx californianus (Greater Roadrunner)	0	0	1 (0.005)	0	0	0	0	0	0
Meleagris gallopavo (Wild turkey)	1 (0.004)	5 (0.023)	2 (0.011)	6 (0.029)	39 (0.170)	0	0	0	2 (0.006)
Quail species[d]	0	7 (0.032)	3 (0.016)	0	0	0	2 (0.015)	0	0

[a] *= values indicate number of visits by named species followed by associated camera index within parentheses; camera index is calculated as* $I = \{v_j/n_j\}$, *where I = index of activity at camera j,* v_j *= number of passes by species at camera j,* n_j *= number of nights that camera j was active; see Section 3.7.2*

[b] *= rodent species encompasses all rodents with the exception of kangaroo rats, which are listed separately.*

[c] *= bird species encompasses all birds with the exception of wild turkeys, roadrunners, and quail species, which are listed separately*

[d] *= Quail species encompasses both California Quail (Callipepla californica) and Mountain Quail (Oreortyx pictus)*

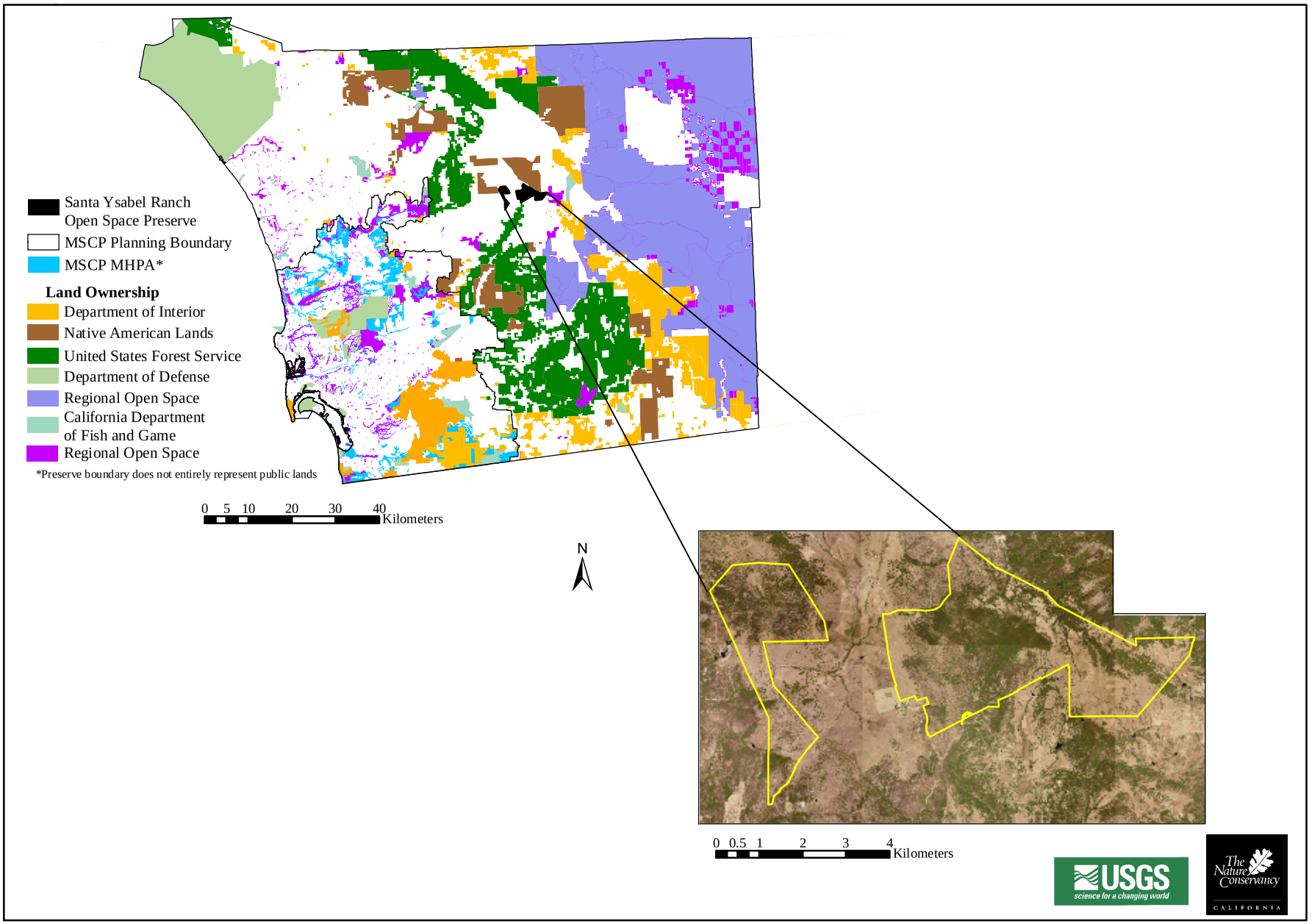

Figure 1. Location of Santa Ysabel Ranch Open Space Preserve.

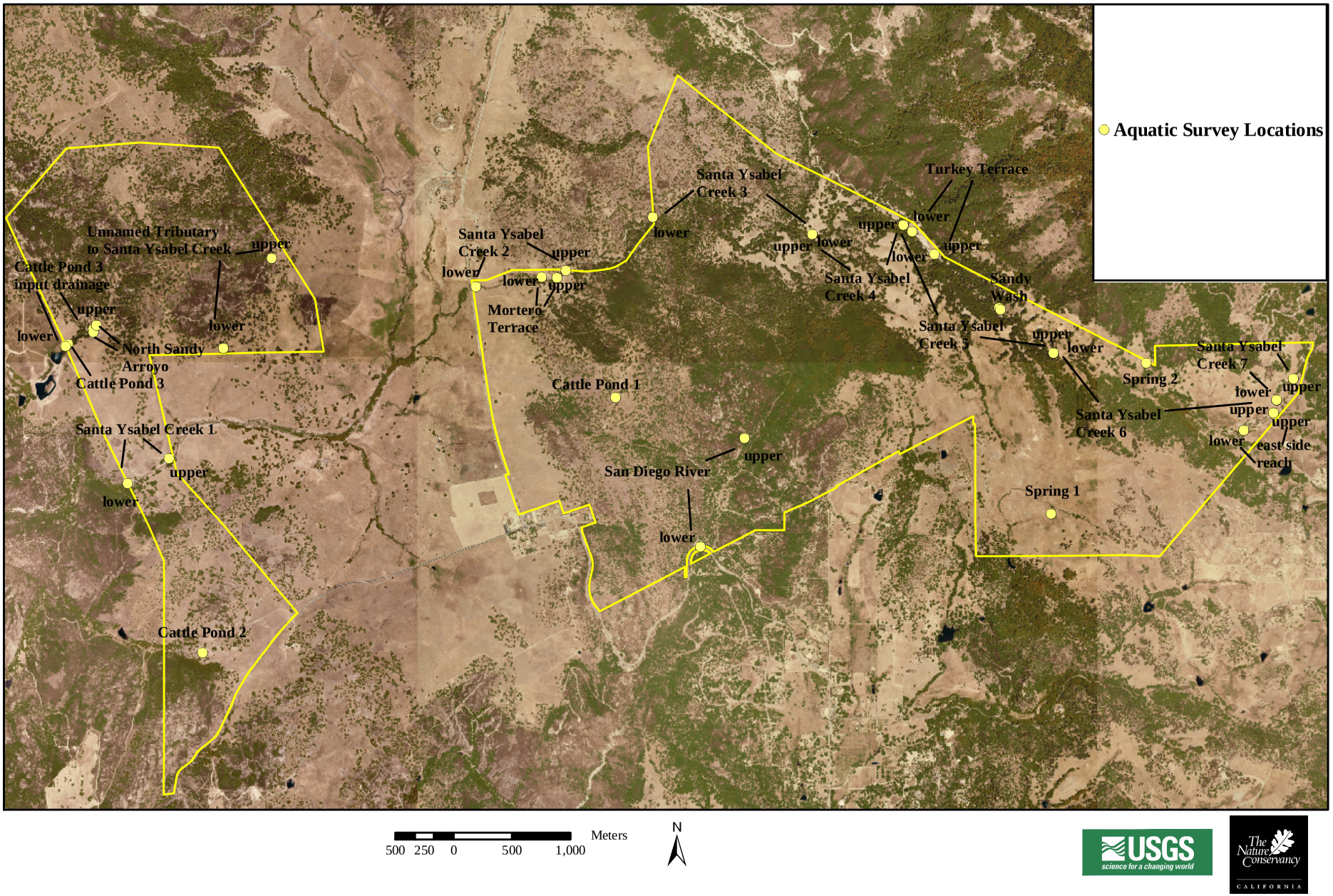

Figure 2. Aquatic survey locations at Santa Ysabel Ranch Open Space Preserve.

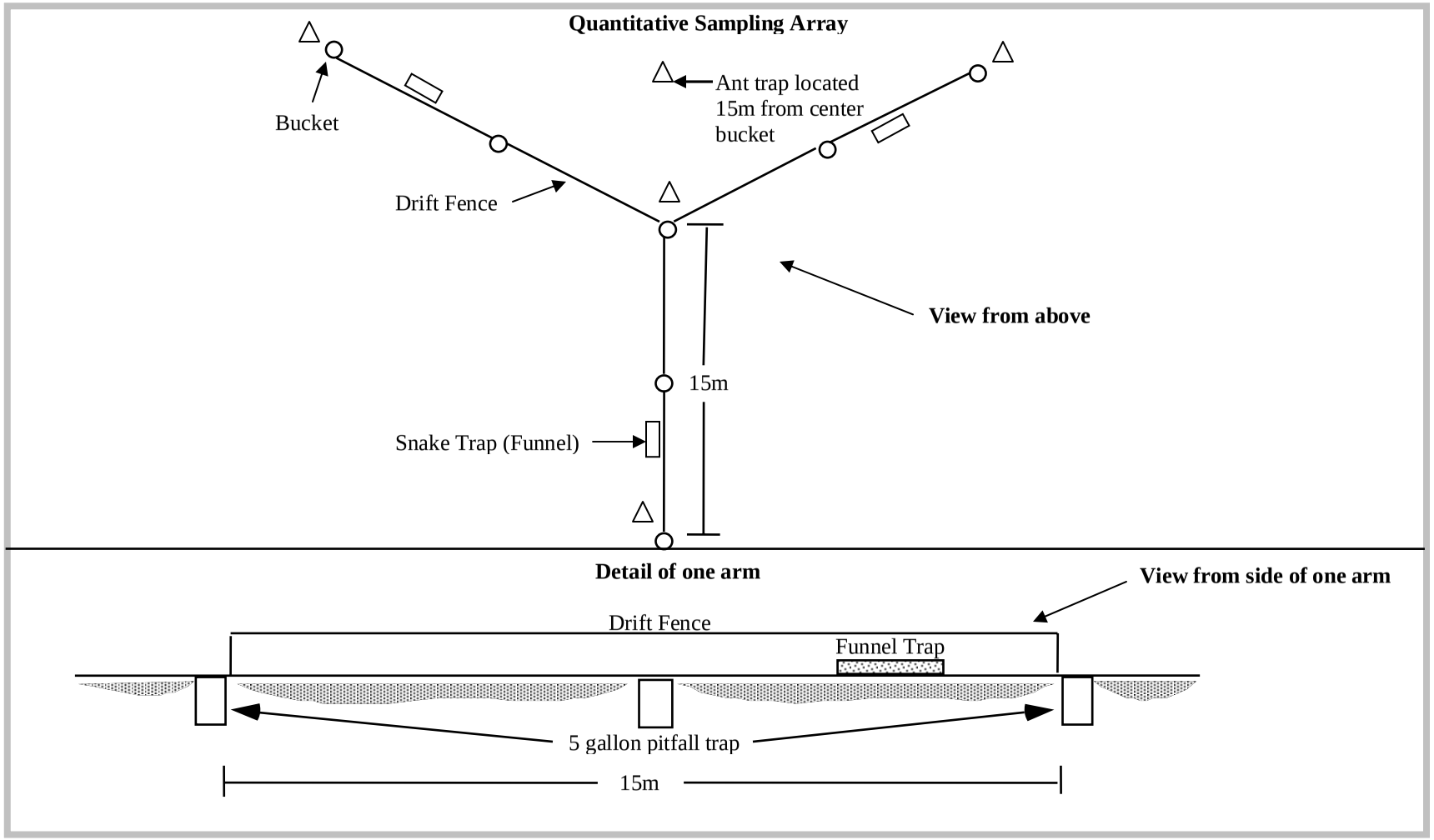

Figure 3. Terrestrial survey protocol and designs for arrangement of pitfall and funnel traps with drift fences for herpetofauna surveys and pitfall traps for ant surveys. Each pitfall bucket is represented by a circle and snake traps are represented by squares. Ant traps are represented by triangles. Figure not drawn to scale.

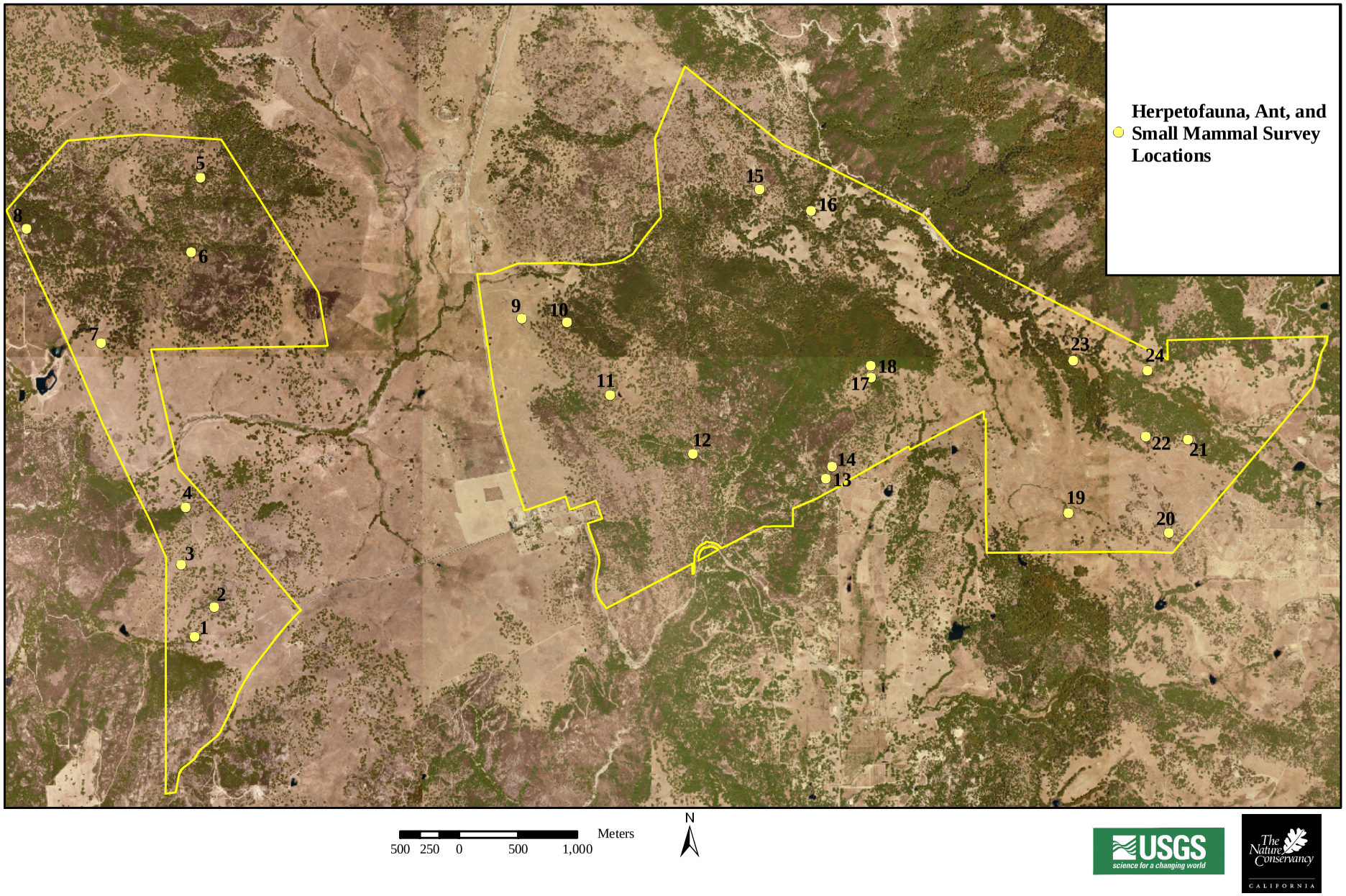

Figure 4. Herpetofauna, ant, and small mammal survey locations at Santa Ysabel Open Space Preserve.

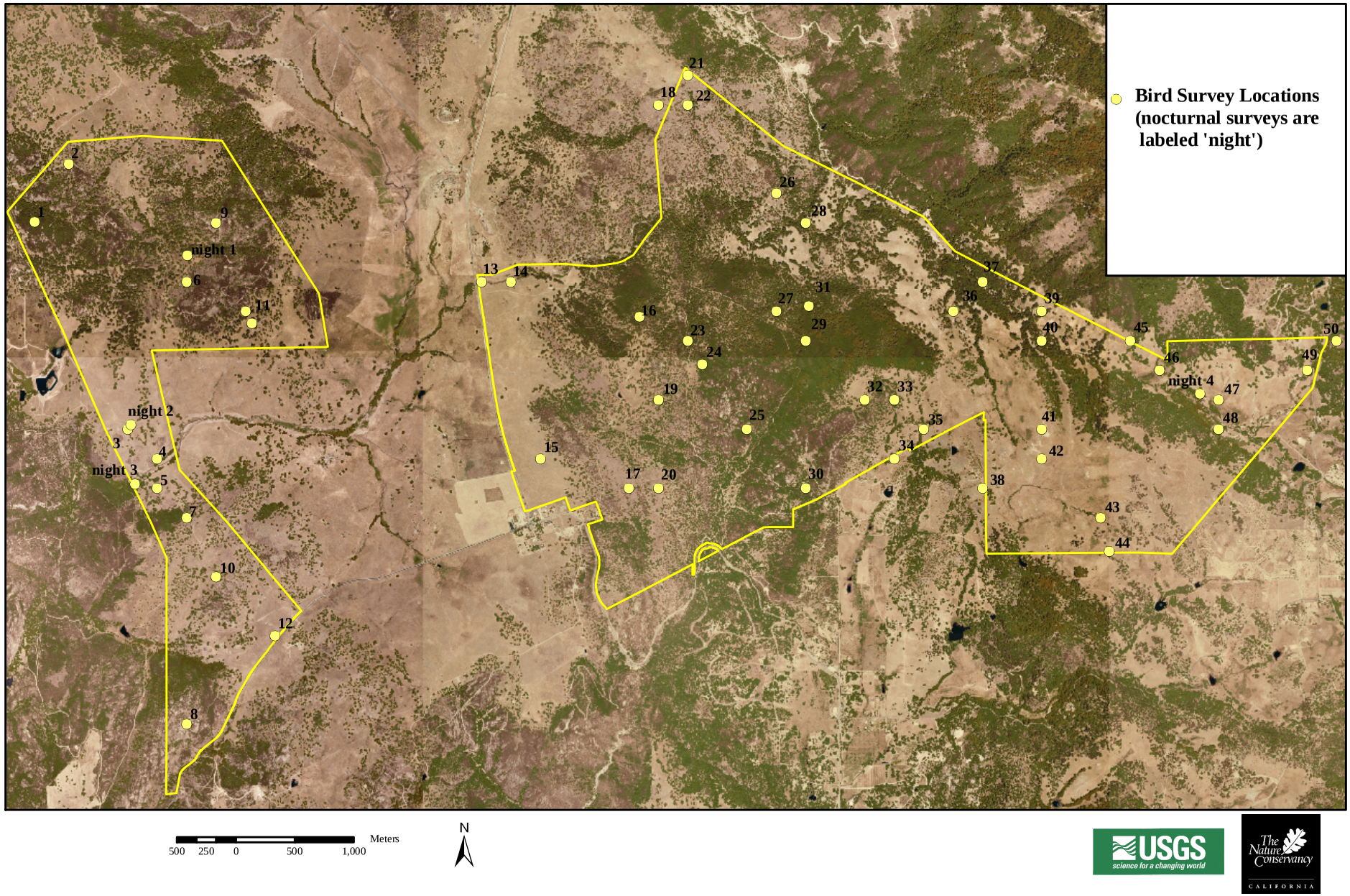

Figure 5. Bird survey locations (diurnal and nocturnal) at Santa Ysabel Ranch Open Space Preserve.

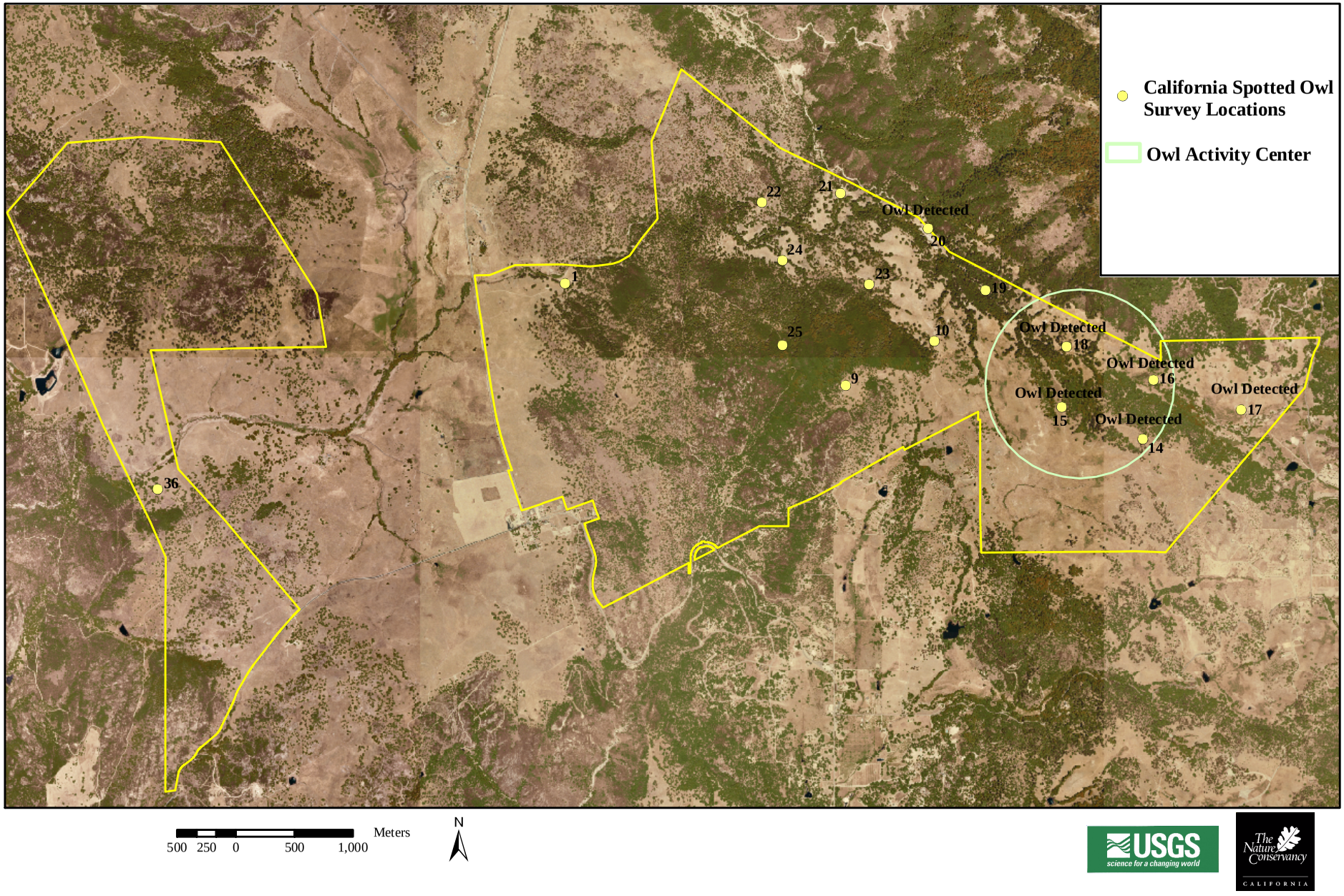

Figure 6. California spotted owl survey locations at Santa Ysabel Ranch Open Space Preserve.

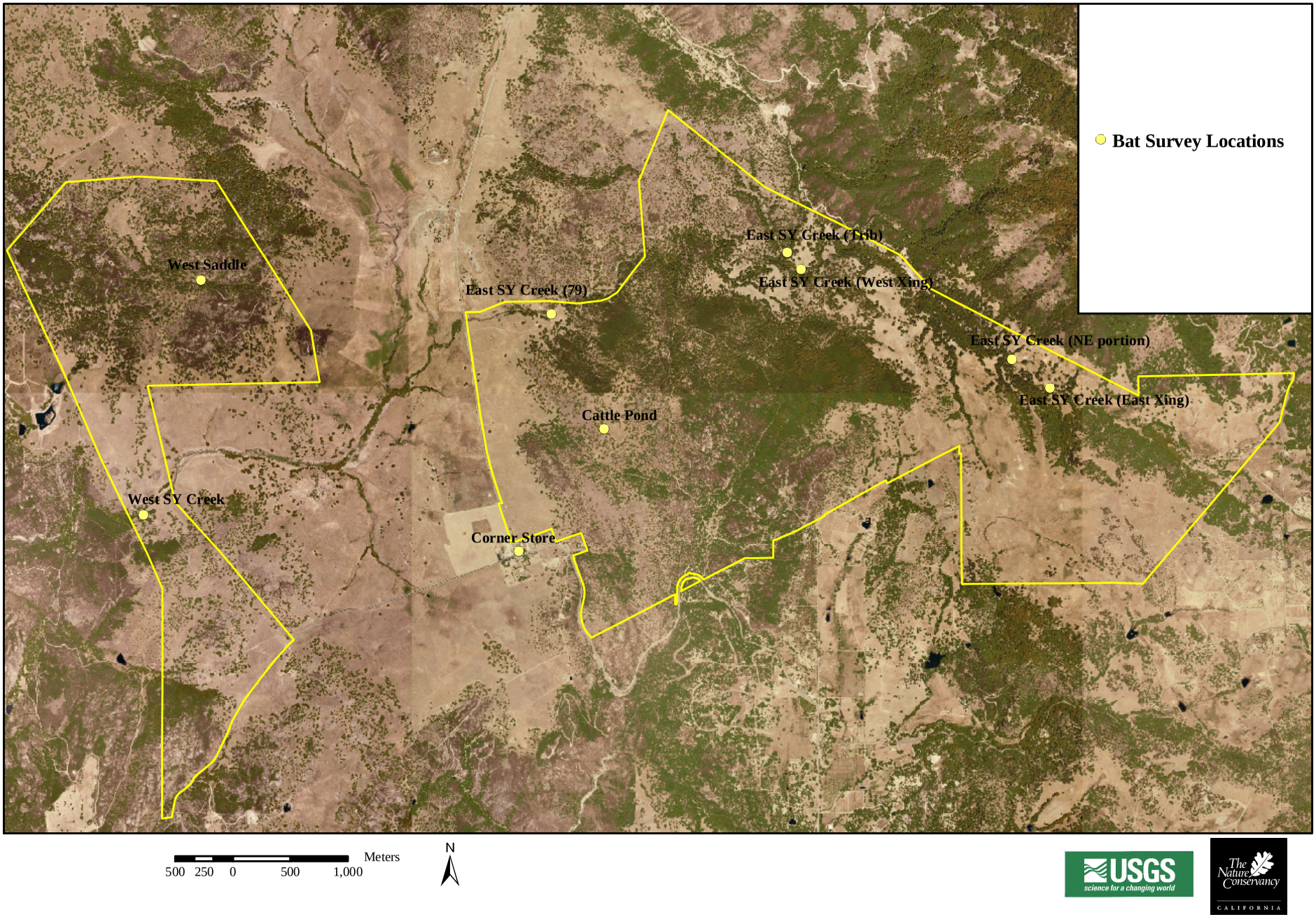

Figure 7. Bat survey locations at Santa Ysabel Ranch Open Space Preserve.

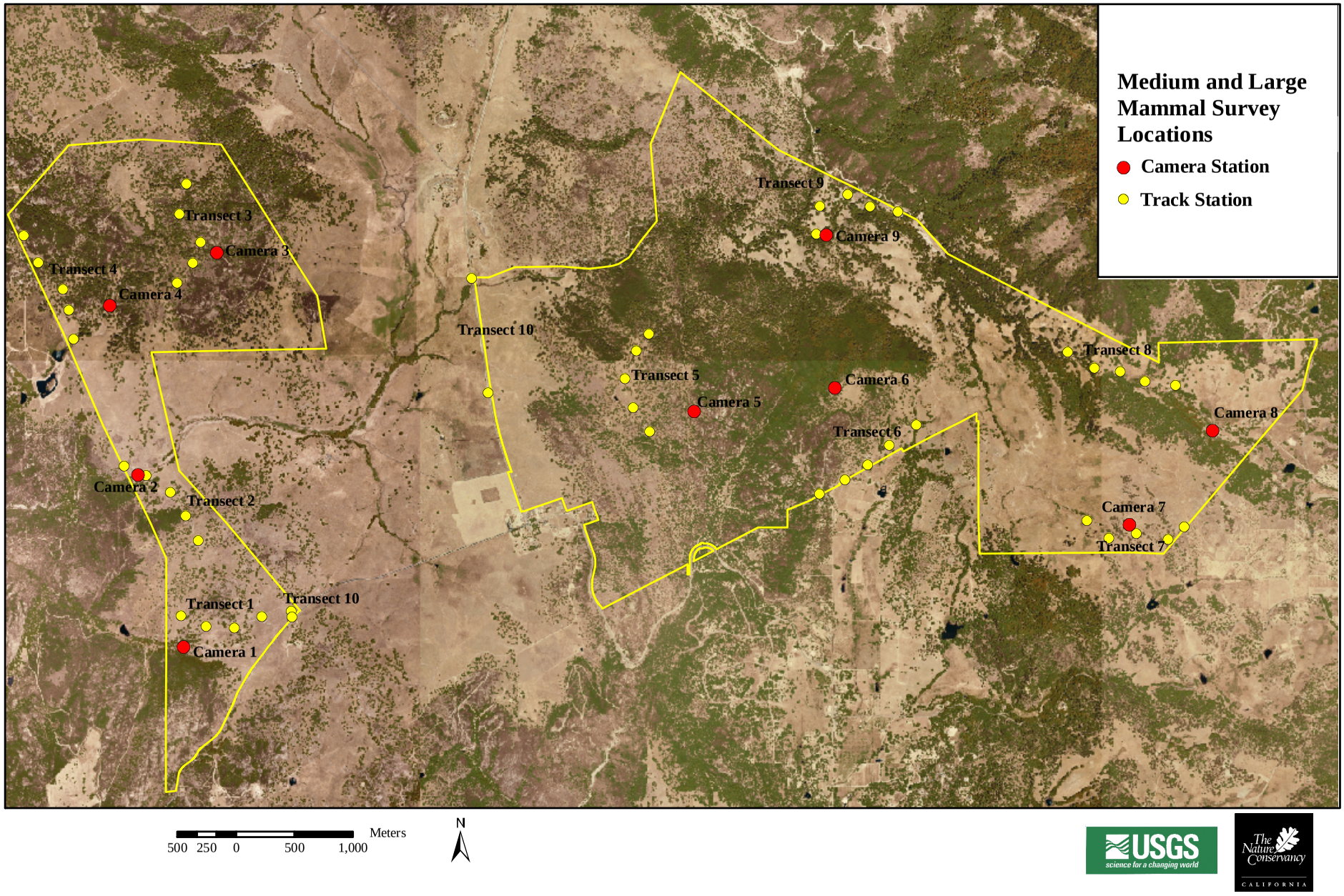

Figure 8. Medium and large mammal survey locations at Santa Ysabel Ranch Open Space Preserve.

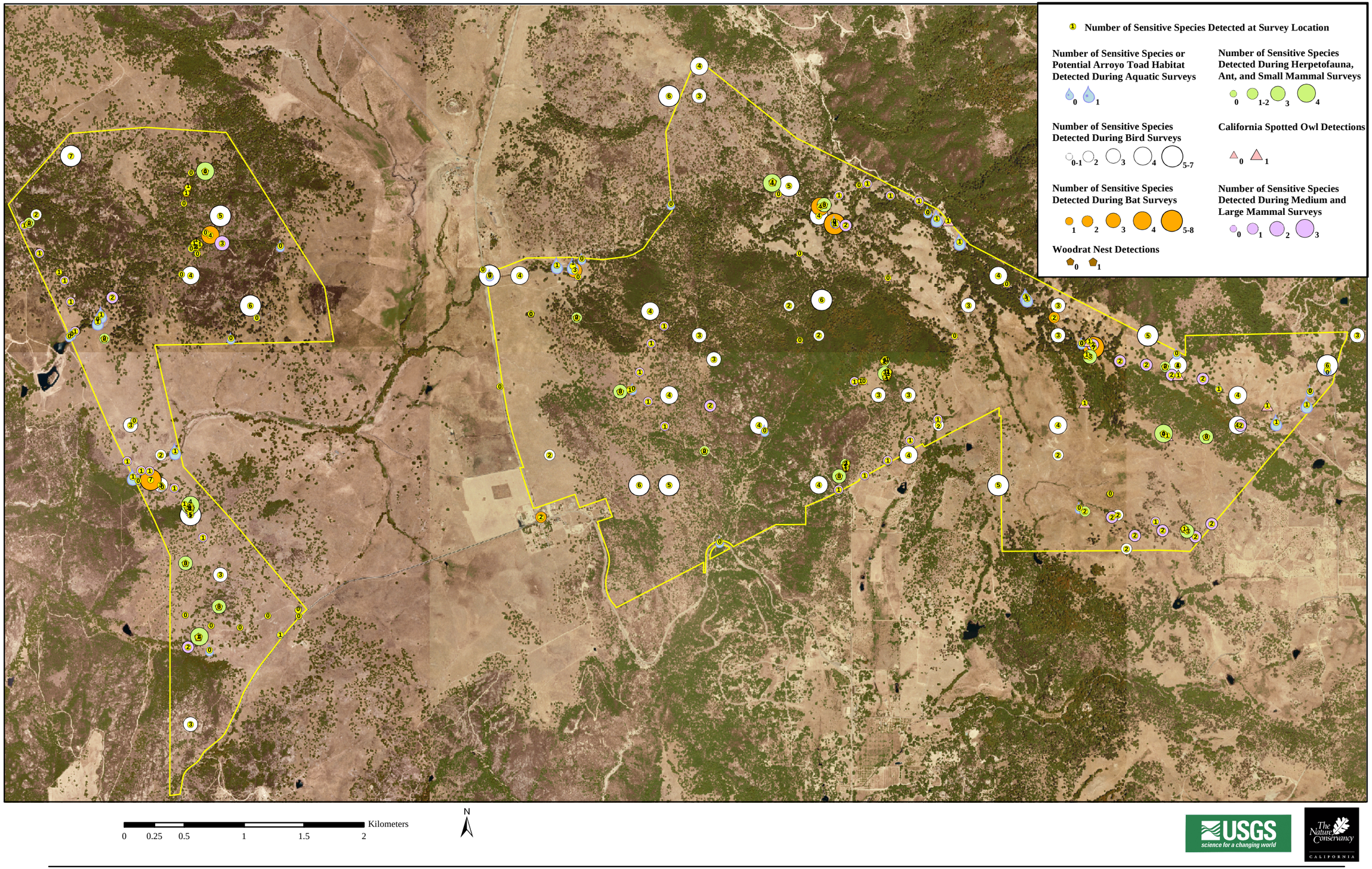

Figure 9. Locations of sensitive resources detected on Santa Ysabel Ranch Open Space Preserve.

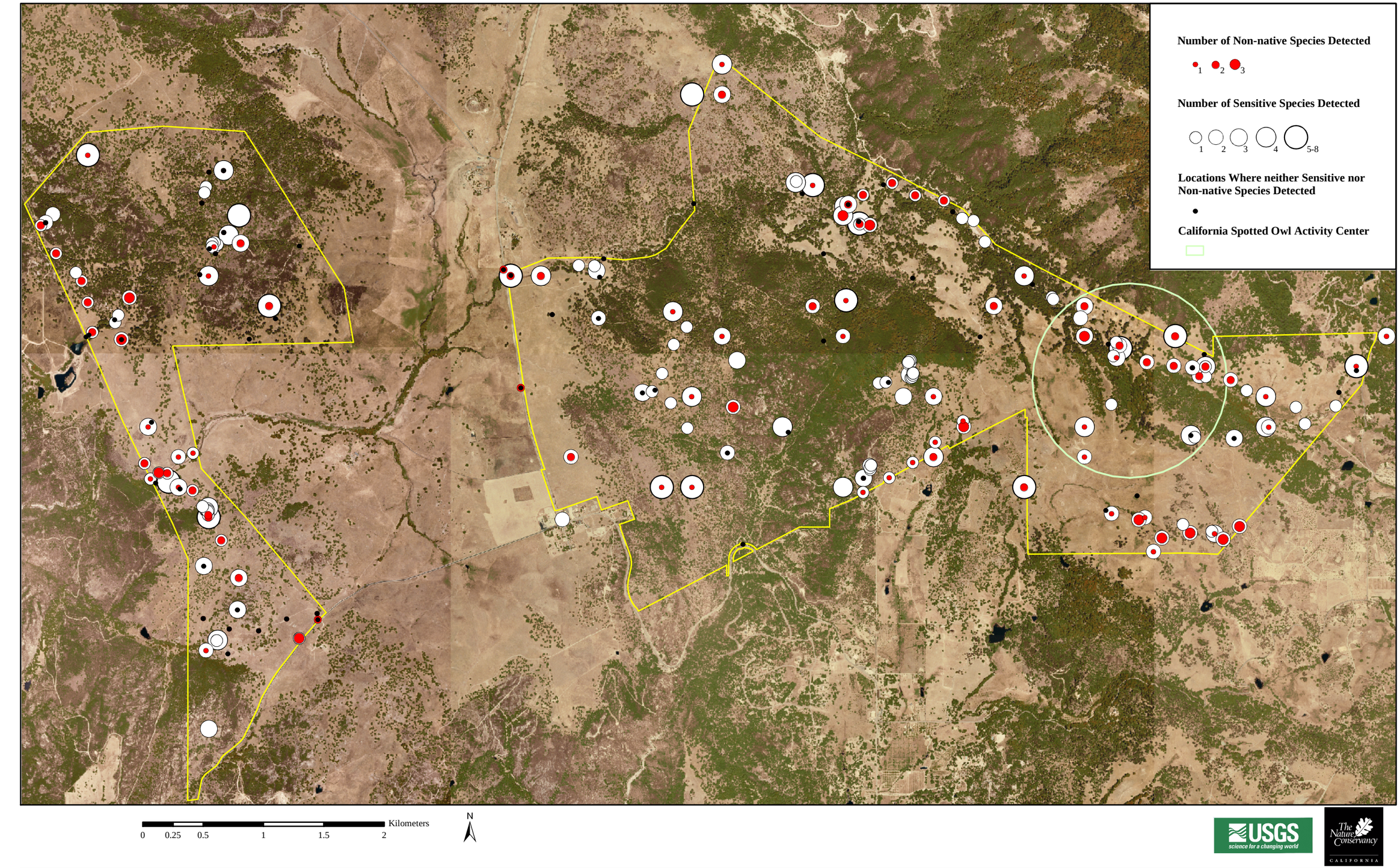

Figure 10. Locations of non-native species detected relative to survey locations on Santa Ysabel Ranch Open Space Preserve.

Appendix 1. Site names and coordinates of aquatic survey sites within the Santa Ysabel Ranch Open Space Preserve.

	Lower end		Upper end	
Survey Site	*Degrees N* [a]	*Degrees W*	*Degrees N*	*Degrees W*
West Property				
Santa Ysabel Creek 1 [b]	33.11271	116.7104	33.11463	116.70661
Cattle Pond 2	33.09963	116.70358		
Cattle Pond 3 (east side)	33.12348	116.71583		
input drainage to Cattle Pond 3	33.12333	116.71607	33.1246	116.71353
North sandy arroyo [c]	33.12440	116.71350	33.12494	116.71321
unnamed tributary to Santa Ysabel Creek	33.12314	116.70159	33.13008	116.69713
East Property				
Santa Ysabel Creek 2	33.12783	116.67838	33.12905	116.67013
Mortero terrace [c]	33.12856	116.67235	33.12851	116.67095
Santa Ysabel Creek 3	33.13315	116.66213	33.13179	116.64749
Santa Ysabel Creek 4	33.13179	116.64749	33.13247	116.63913
Santa Ysabel Creek 5	33.13247	116.63913	33.12255	116.62538
Turkey terrace [c]	33.13198	116.63832	33.13022	116.63629
Sandy wash [c]	33.12607	116.63037	33.12592	116.63025
Santa Ysabel Creek 6	33.12255	116.62538	33.11888	116.60494
East side reach [c]	33.11654	116.60796	33.11786	116.60523
Santa Ysabel Creek 7	33.11888	116.60494	33.12051	116.60337
San Diego River	33.10769	116.65785	33.11605	116.65379
Cattle Pond 1	33.11923	116.66561		
Spring 1	33.11014	116.62565		
Spring 2	33.12176	116.61687		

[a] *= locations obtained in datum WGS84 (decimal.degrees)*

[b] *= occupied arroyo toad habitat patch*

[c] *= potential arroyo toad habitat patch (sub-reach of a survey site)*

Appendix 2. Pitfall array sampling schedule for the Santa Ysabel Ranch Open Space Preserve.

Sample Period #	*Opening Day of Sample Period*	*# of Days in Sample Period*
1	4/15/2002	4
2	6/3/2002	4
3	7/29/2002	3[a]
4	9/9/2002	4
5	10/28/2002	4
6	12/8/2002	4
7	1/6/2003	4
8	3/26/2003	4
9	4/29/2003	3[b]
10	5/19/2003	4
11	6/9/2003	4
12	7/7/2003	4
Total # of Sample Days		46

[a] *= closed early due to Pines fire*

[b] *= closed early due to expected rains*

Appendix 3. Coordinates of herpetofauna, ant, and small mammal survey stations within the Santa Ysabel Ranch Open Space Preserve.

Array Number	*Degrees Na*	*Degrees W*	*Elevation (m)**
1	33.10065	116.70449	909
2	33.10291	116.70272	934
3	33.10618	116.70570	957
4	33.11055	116.70527	940
5	33.13572	116.70384	1061
6	33.13003	116.70470	1037
7	33.12312	116.71293	897
8	33.13186	116.71965	954
9	33.12490	116.67471	926
10	33.12461	116.67061	1000
11	33.11903	116.66672	1069
12	33.11452	116.65921	1117
13	33.11260	116.64715	1172
14	33.11352	116.64657	1180
15	33.13470	116.65308	1045
16	33.13305	116.64841	1018
17	33.12031	116.64302	1251
18	33.12120	116.64305	1246
19	33.10988	116.62514	1239
20	33.10836	116.61601	1277
21	33.11547	116.61425	1261
22	33.11571	116.61808	1291
23	33.12153	116.62465	1141
24	33.12076	116.61792	1150

[a] *= locations obtained in datum WGS84 (decimal.degrees)*

**derived using Topo! Version 2.5*

Appendix 4. Coordinates of avifauna point count stations within the Santa Ysabel Ranch Open Space Preserve.

Point Count Number	*Degrees N* [a]	*Degrees W*	*Point Count Number*	*Degrees N*	*Degrees W*
1	33.13248	116.71900	26	33.13448	116.65156
2	33.13690	116.71588	27	33.12546	116.65160
3	33.11659	116.71059	28	33.13222	116.64889
4	33.11433	116.70792	29	33.12320	116.64893
5	33.11208	116.70792	30	33.11193	116.64897
6	33.12786	116.70519	31	33.12587	116.64865
7	33.10982	116.70525	32	33.11868	116.64359
8	33.09403	116.70530	33	33.11867	116.64091
9	33.13236	116.70250	34	33.11416	116.64093
10	33.10530	116.70259	35	33.11641	116.63824
11	33.12559	116.69984	36	33.12542	116.63552
12	33.10078	116.69724	37	33.12766	116.63283
13	33.12779	116.67839	38	33.11188	116.63290
14	33.12778	116.67571	39	33.12539	116.62748
15	33.11425	116.67308	40	33.12314	116.62749
16	33.12507	116.66402	41	33.11637	116.62752
17	33.11197	116.66505	42	33.11412	116.62753
18	33.14128	116.66226	43	33.10959	116.62219
19	33.11873	116.66235	44	33.10703	116.62143
20	33.11196	116.66237	45	33.12311	116.61945
21	33.14353	116.65957	46	33.12085	116.61678
22	33.14127	116.65958	47	33.11858	116.61143
23	33.12323	116.65965	48	33.11632	116.61144
24	33.12142	116.65833	49	33.12081	116.60338
25	33.11645	116.65432	50	33.12306	116.60069

[a] *= locations obtained in datum WGS84 (decimal.degrees)*

Appendix 5. Coordinates of California spotted owl calling stations within the Santa Ysabel Ranch Open Space Preserve. Stations surveyed are indicated in bold.

Calling Station Number	*Degrees N* [a]	*Degrees W*	*Priority* [b]
1	33.12768	116.67049	**High**
2	33.12120	116.66695	Low
3	33.11546	116.66129	Medium
4	33.12009	116.65956	Medium
5	33.11092	116.65615	Medium
6	33.11426	116.65404	Medium
7	33.11151	116.64718	Medium
8	33.11587	116.63994	Medium
9	33.11976	116.64488	**High**
10	33.12314	116.63675	**High**
11	33.11701	116.63139	Low
12	33.11097	116.62661	Low
13	33.10844	116.61819	Medium
14	33.11556	116.61774	**High**
15	33.11805	116.62513	**High**
16	33.12009	116.61675	**High**
17	33.11778	116.60876	**High**
18	33.12268	116.62469	**High**
19	33.12704	116.63208	**High**
20	33.13180	116.63730	**High**
21	33.13452	116.64528	**High**
22	33.13387	116.65249	**High**
23	33.12753	116.64271	**High**
24	33.12939	116.65062	**High**
25	33.12287	116.65063	**High**
26	33.12722	116.65881	Medium
27	33.13850	116.70552	Low
28	33.13087	116.70391	Low
29	33.12454	116.70823	Low
30	33.11738	116.71135	Medium
31	33.12743	116.71644	Low
32	33.13331	116.72152	Low
33	33.13496	116.70846	Low
34	33.10175	116.69963	Low
35	33.10571	116.70676	Low
36	33.11196	116.70779	**Medium**

[a] *= locations obtained in datum WGS84 (decimal.degrees)*

[b] *= priority (high, medium, or low) was assigned to each of the calling points based on habitat quality for spotted owls; all the high priority stations were surveyed and one medium priority station was surveyed (calling station 36)*

Appendix 6. Coordinates of bat survey stations within the Santa Ysabel Ranch Open Space Preserve.

Site Number	*Location*	*Degrees N* [a]	*Degrees W*
1	West Santa Ysabel Creek	33.11248	116.70882
2	West Saddle	33.13090	116.70342
3	Corner Store	33.10957	116.67387
4	Cattle Pond	33.11913	116.66587
5	East Santa Ysabel Creek (CA 79)	33.12815	116.67077
6	East Santa Ysabel Creek (Tributary)	33.13292	116.64877
7	East Santa Ysabel Creek (West Crossing)	33.13159	116.64748
8	East Santa Ysabel Creek (NE portion)	33.12448	116.62783
9	East Santa Ysabel Creek (East Crossing)	33.12223	116.62430

[a] *= locations obtained in datum WGS84 (decimal.degrees)*

Appendix 7. Coordinates of baited scent and camera stations for mammal sampling within the Santa Ysabel Ranch Open Space Preserve.

Survey Location	*Degrees N* [a]	*Degrees W*	*Survey Location*	*Degrees N*	*Degrees W*
Transect 1			Transect 7		
1-1	33.10263	116.69563	7-1	33.10942	116.62272
1-2	33.10222	116.69834	7-2	33.10804	116.62069
1-3	33.10134	116.70084	7-3	33.10841	116.61818
1-4	33.10148	116.70344	7-4	33.10793	116.61525
1-5	33.10228	116.70574	7-5	33.10890	116.61378
Transect 2			Transect 8		
2-1	33.10810	116.70414	8-1	33.12243	116.62439
2-2	33.11000	116.70528	8-2	33.12119	116.62195
2-3	33.11183	116.70667	8-3	33.12090	116.61959
2-4	33.11313	116.70891	8-4	33.12013	116.61733
2-5	33.11386	116.71092	8-5	33.11983	116.61454
Transect 3			Transect 9		
3-1	33.13561	116.70512	9-1	33.13331	116.63991
3-2	33.13330	116.70577	9-2	33.13371	116.64246
3-3	33.13110	116.70384	9-3	33.13463	116.64452
3-4	33.12951	116.70457	9-4	33.13375	116.64709
3-5	33.12796	116.70599	9-5	33.13158	116.64740
Transect 4			Transect 10 (potential crossing locations)		
4-1	33.12367	116.71553	10-1	33.12826	116.67901
4-2	33.12591	116.71592	10-2	33.11944	116.67752
4-3	33.12750	116.71646	10-3	33.10217	116.69558
4-4	33.12956	116.71871			
4-5	33.13166	116.72006			
Transect 5			Cameras		
5-1	33.12393	116.66278	CAM1	33.09987	116.70552
5-2	33.12263	116.66394	CAM2	33.11316	116.70965
5-3	33.12047	116.66498	CAM3	33.13027	116.70235
5-4	33.11825	116.66423	CAM4	33.12623	116.71221
5-5	33.11638	116.66275	CAM5	33.11793	116.65867
			CAM6	33.11971	116.64575
Transect 6			CAM7	33.10907	116.61882
6-1	33.11155	116.64718	CAM8	33.11630	116.61117
6-2	33.11263	116.64486	CAM9	33.13150	116.64649
6-3	33.11376	116.64278			
6-4	33.11526	116.64077			
6-5	33.11684	116.63828			

[a] *= locations obtained in datum WGS84 (decimal.degrees)*

Appendix 8. Total sampling effort for baited scent and camera stations within the Santa Ysabel Ranch Open Space Preserve.

Transect Number	*Sampling Effort (SE)* [a,b,c]	*Camera Number*	*Sampling Effort (SE)* [d]
1	117	1	250
2	117	2	216
3	120	3	184
4	116	4	204
5	116	5	230
6	115	6	136
7	112	7	136
8	119	8	190
9	119	9	326
10	69		

[a] *= SE = ($s_j n_j$)-o_j, where, s_j = number of stations in transect j, n_j = number of nights that station was active in transect j, oj = number of station nights omitted in transect j due to complications; see Section 3.7.1*

[b] *= baited scent stations conducted June 4-8, 2002, Sept 17-21, 2002, Dec 4-7, 2002, Mar 11-15, 2003, and June 10-14, 2003*

[c] *= sj for transects 1-9 = 5 stations; sj for transect 10 = 3 stations*

[d] *= camera stations operated April 2002 to June 2003; SE = number of days camera was active*

Appendix 9. Representative photos of aquatic survey sites and species detected at Santa Ysabel Ranch Open Space Preserve.

Santa Ysabel Creek 1

Arroyo toad detected at Santa Ysabel Creek 1 site

Fingernail clam detected at Santa Ysabel Creek 1 site

Appendix 9 (continued).

Input drainage to Cattle Pond 3, north sandy arroyo habitat patch

Santa Ysabel Creek 2, Mortero terrace habitat patch

Santa Ysabel Creek 5, turkey terrace habitat patch

Appendix 9 (continued).

Santa Ysabel Creek 5, sandy wash habitat patch

Santa Ysabel Creek 6, east side reach habitat patch

Appendix 10. Rare and sensitive vertebrate species potentially occurring on the Santa Ysabel Ranch Open Space Preserve.

	Common Name	*Scientific Name*
CLASS: AMPHIBIA (Amphibians)		
ANURA SALIENTIA (Frogs and Toads)		
RANIDAE (True Frogs)		
	California red-legged frog	*Rana aurora draytonii* [ab]
CAUDATA (Salamanders)		
SALAMANDRIDAE (Newts)		
	California newt	*Taricha torosa* [b]
PLETHODONTIDAE (Lungless Salamanders)		
	Garden slender salamander	*Batrachoseps major*
CLASS: REPTILIA (Reptiles)		
TESTUDINES (Turtles)		
EMYDIDAE (Box and Water Turtles)		
	Western pond turtle	*Emys* (*Clemmys*) *marmorata* [b]
SQUAMATA (Lizards and Snakes)		
EUBLEPHARIDAE (Eyelid Geckos)		
	San Diego banded gecko	*Coleonyx variegatus*
PHRYNOSOMATIDAE (Spiny lizards and relatives)		
	Southern sagebrush lizard	*Sceloporus graciosus*
XANTUSIIDAE (Night Lizards)		
	Granite night lizard	*Xantusia henshawi*
ANNIELLIDAE (California Legless Lizards)		
	California legless lizard	*Anniella pulchra* [b]
BOIDAE (Boas)		
	Rosy boa	*Charina (Lichanura) trivirgata* [cd]
COLUBRIDAE (Colubrids)		
	Coachwhip	*Masticophis flagellum*
	Glossy snake	*Arizona elegans* [d]
	California mountain kingsnake	*Lampropeltis zonata* [b]
	Long-nosed snake	*Rhinocheilus lecontei*
	California black-headed snake	*Tantilla planiceps*
	California lyresnake	*Trimorphodon biscutatus*
	Red-sided gartersnake	*Thamnophis sirtalis*
VIPERIDAE (Vipers)		
	Red diamond rattlesnake	*Crotalus ruber* [b]
CLASS: AVES (Birds)		
FALCONIFORMES (Vultures, Hawks, and Falcons)		
ACCIPITRIDAE (Hawks, Old World Vultures, and Harriers)		
	Osprey	*Pandion haliaetus* [bd]
	Sharp-shinned hawk	*Accipiter striatus* [b]
	Swainson's hawk	*Buteo swainsoni* [ce]
FALCONIDAE (Caracaras and Falcons)		
	Merlin	*Falco columbarius* [b]
	Peregrine falcon	*Falco peregrinus* [f]
	Prairie falcon	*Falco mexicanus* [b]

Appendix 10 (continued).

	Common Name	*Scientific Name*
CLASS: AVES (Birds) (Continued)		
STRIGIFORMES (Owls)		
STRIGIDAE (Typical Owls)		
	Burrowing owl	*Athene cunicularia* [bc]
PASSERIFORMES (Perching Birds)		
LANIIDAE (Shrikes)		
	Loggerhead shrike	*Lanius ludovicianus* [bc]
VIREONIDAE (Typical Vireos)		
	Gray vireo	*Vireo vicinior* [b]
CLASS: MAMMALIA (Mammals)		
CHIROPTERA (Bats)		
VESPERTILIONIDAE (Evening Bats)		
	Fringed myotis	*Myotis thysanodes* [c]
	Long-legged myotis	*Myotis volans*
	Spotted bat	*Euderma maculatum* [bc]
	Silver-haired bat	*Lasionycteris noctivagans*
LAGOMORPHA (Rabbits, Hares, and Pikas)		
LEPORIDAE (Rabbits and Hares)		
	Black-tailed jackrabbit	*Lepus californicus* [b]
RODENTIA (Squirrels, Rats, Mice, and relatives)		
HETEROMYIDAE (Pocket Mice and Kangaroo Rats)		
	Dulzura pocket mouse	*Chaetodipus californicus* [b]
	Stephens' kangaroo rat	*Dipodomys stephensi* [ade]
MURIDAE		
	Southern grasshopper mouse	*Onychomys torridus* [bc]
CARNIVORA (Carnivores)		
CANIDAE (Foxes, wolves, and coyotes)		
	Kit fox	*Vulpes macrotis*
PROCYONIDAE (Raccoons and relatives)		
	Ringtail cat	*Bassariscus astutus* [d]
MUSTELIDAE (Weasels and relatives)		
	American badger	*Taxidea taxus* [d]

[a] *= federally threatened species*

[b] *= CDFG species of special concern*

[c] *= federal species of special concern*

[d] *= species for which additional surveys are recommended*

[e] *= CDFG threatened species*

[f] *= CDFG endangered species*

Appendix 11. Representative photos of species from herpetofauna pitfall trap arrays.

Coast Horned Lizard (*Phrynosoma coronatum*)

Western Skink (*Eumeces skiltonianus*)

Southern Alligator Lizard *(Elgaria multicarinatus)*

Large-blotched Ensatina *(Ensatina klauberi)*

Ring-necked Snake *(Diadophis punctatus)*

Granite Spiny Lizard *(Sceloporus orcutti)*

Appendix 11 (continued).

Common Kingsnake *(Lampropeltis getulus*) (striped)

Gilbert's Skink *(Eumeces gilberti)*

Common Kingsnake *(Lampropeltis getulus)* (banded)

Racer *(Coluber constrictor*) (juvenile)

Racer *(Coluber constrictor)* (adult)

Two-Striped Gartersnake *(Thamnophis hammondii)*

Appendix 11 (continued).

Merriam's Chipmunk (*Tamias merriami*)

Appendix 12. Vegetation transect summary data for pitfall arrays within the Santa Ysabel Ranch Open Space Preserve.

		Array Number																						
		1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*
Canopy Height (cm)	Average	520.4	57.5	213.8	224.8	273.8	409.6	9.6	120.9	8.5	300.8	290.6	85.4	179.2	41.5	81.9	469.8	82.0	209.8	15.4	476.1	23.7	643.2	1221.5	30.6
	Median	650.0	62.0	139.5	125.0	30.5	600.0	7.5	102.5	5.5	52.5	59.5	94.0	92.0	25.5	36.5	31.0	12.0	192.0	13.0	44.0	20.5	500.0	1800.0	31.0
	Minimum	17.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.0	0.0
	Maximum	800.0	240.0	680.0	700.0	1000.0	800.0	39.0	391.0	43.0	900.0	800.0	222.0	800.0	155.0	550.0	1600.0	400.0	500.0	52.0	2000.0	91.0	2300.0	1800.0	114.0
	StDev	229.0	49.2	225.0	239.8	392.0	382.7	10.3	115.2	11.1	353.7	327.0	60.1	237.6	46.5	141.8	612.3	126.8	173.4	10.5	680.1	17.8	639.7	705.8	15.4
Leaf Litter Depth (cm)	Average	6.7	0.9	2.6	2.7	2.2	4.6	1.5	2.1	1.0	1.7	3.2	0.8	1.7	0.8	2.6	2.7	1.5	3.1	2.6	1.6	2.8	3.6	5.6	6.3
	Median	7.0	0.5	2.0	2.0	2.0	4.0	1.0	1.0	0.5	2.0	3.0	0.5	0.5	0.0	2.0	2.0	1.0	2.0	2.0	1.0	3.0	3.0	3.0	6.0
	Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Maximum	18.0	6.0	6.0	14.0	9.0	17.0	11.0	14.0	5.0	6.0	15.0	5.0	14.0	8.0	25.0	12.0	11.0	30.0	8.0	11.0	9.0	18.0	24.0	14.0
	StDev	3.4	1.1	1.5	2.5	1.8	3.7	1.7	2.6	0.9	1.3	2.7	0.9	2.6	1.6	3.4	2.4	1.7	3.8	1.8	2.0	2.0	3.6	5.4	3.6
Substrate Type (# points along transect)	Sandy Soil		18					2	8				33	3	6	1		8	1		2				
	Leaf Litter	96	72	99	92	95	93	97	91	94	89	94	60	67	36	73	89	87	85	99	82	98	93	92	98
	Organic Soil	4	1	1		5	3	1	1	4	5	4	2	19	12	2	9	5	14	1	16	2	7	7	2
	Cryptogamic		3		2		2				3	1	3	7	8	12	1								
	Bare Rock		3		6					2	3	1	2	4	16	11	1							1	
	Moss		3				2									1									
	Cobblestone														22										
Number of Points Along Transect (n)		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Vegetation Layer Structure	% Trees	38.2%		21.5%	23.1%	28.2%	35.4%		13.4%		30.9%	22.1%		12.1%		7.3%	47.6%	8.5%	24.4%		22.5%		47.4%	62.7%	
	% Shrubs	10.8%	52.2%	12.9%	36.6%	9.4%	4.9%		63.4%		9.6%	13.3%	80.4%	60.0%	53.5%	30.9%	2.9%	15.5%	30.5%	0.7%	11.9%	5.8%	6.8%	8.2%	1.8%
	% Herbs	50.9%	47.8%	65.6%	40.3%	62.4%	59.7%	100.0%	23.2%	100.0%	59.6%	64.6%	19.6%	27.9%	46.5%	61.8%	49.5%	76.1%	45.1%	99.3%	65.6%	94.2%	45.9%	29.1%	98.2%
	Total Hits	212	113	163	134	117	144	66	112	76	136	181	102	140	71	123	105	142	164	153	151	137	133	134	166
Proportion of Habitat Type[a]	Chaparral	0.5%	51.3%		4.5%		0.7%		60.7%		12.5%		81.4%	63.3%	74.6%	4.9%			35.4%						
	Coastal Sage Scrub		15.0%		10.4%		0.7%		15.2%	6.6%		26.0%	3.9%	7.2%		38.2%		2.1%	2.4%						
	Non-Native Grassland	51.4%	18.6%	49.7%	11.9%	57.3%	59.0%	97.0%	5.4%	73.7%	42.6%	46.4%	1.0%	5.0%	1.4%	39.8%	48.6%	52.8%	34.8%	42.5%	66.2%	92.6%	28.0%	17.2%	62.1%
	Native Grassland	2.4%	8.8%	18.4%	4.5%			1.5%	3.6%	3.9%	5.1%		2.0%	9.4%	16.9%			10.6%		2.6%			1.5%		
	Riparian																			39.9%				2.2%	11.8%
	Oak Woodland	43.9%		31.9%	54.5%	33.3%	35.4%		8.9%		25.7%	23.8%		12.2%		7.3%	50.5%	23.9%	19.5%				1.5%	62.7%	
	Pine Woodland																				22.5%		47.0%		
	Un-Classified	1.9%	6.2%		14.2%	9.4%	4.2%	1.5%	6.3%	15.8%	14.0%	3.9%	11.8%	2.9%	7.0%	9.8%	1.0%	10.6%	7.9%	15.0%	11.3%	7.4%	22.0%	17.9%	26.1%
	Total %	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

[a] = *habitat types with the relative percentage for select dominant species at each pitfall array; see text for the dominant species used for each habitat type*

Appendix 13. The habitat type at each pitfall array and the top three plant species recorded along vegetation transects within the Santa Ysabel Ranch Open Space Preserve. The number of arrays represented by each habitat class is found in parenthesis.

Array Number	*Habitat Type* [a]						*Dominant Plant Species* [b]		
	OAK (8)	*RIP (2)*	*PIN (2)*	*NNG (4)*	*CHAP (6)*	*CSS (2)*	*1*	*2*	*3*
1	X						QUAG	BRSP	AVSP
2					X		ADFA	BRSP	SAAP
3	X						BRSP	QUEN	NAPU
4	X						QUCH	QUEN	BRSP
5	X						BRSP	QUAG	DW
6	X						BRSP	QUAG	QUEN
7				X			BRSP	ERSP	NAPU
8					X		ADFA	ARGL	QUCH
9				X			BRSP	ERSP	ERWR
10	X						BRSP	QUEN	ARGL
11						X	BRSP	QUEN	ERFA
12					X		ADFA	ARGL	RHIL
13					X		ADFA	QUEN	LOIN
14					X		ADFA	NAPU	ARGL
15						X	SAAP	BRSP	AVSP
16	X						BRSP	QUAG	QUKE
17				X			BRSP	ERSP	NAPU
18					X		BRSP	ARGL	QUCH
19		X					BRSP	CXSP	AMPS
20			X				BRSP	AVSP	PICO
21				X			BRSP	ERSP	AMPS
22			X				PICO	BRSP	DW
23	X						QUAG	BRSP	GASP
24		X					BRSP	AMPS	CXSP

[a] *= habitat types include: oak woodland (OAK), riparian (RIP), pine woodland (PIN), non-native grassland (NNG), chaparral (CHAP), and coastal sage scrub (CSS)*

[b] *= plant species codes can be found in Appendix 14*

Appendix 14. Plant species codes used in the description of plant communities associated with pitfall arrays and bird point count stations within the Santa Ysabel Ranch Open Space Preserve.

Code	*Species*	*Common Name*	*Family*
ADFA	*Adenostoma fasciculatum*	Chamise	Rosaceae
AIAL	*Ailanthus altissima*	Tree of heaven	Simaroubaceae*a*
ALRH	*Alnus rhombifolia*	White alder	Betulaceae
AMPS	*Ambrosia psilostachya*	Ragweed	Asteraceae
ANCA	*Anemopsis californica*	Yerba mansa	Saururaceae
ARGL	*Arctostaphylos glauca*	Manzanita	Ericaceae
AVSP	*Avena* spp.	Wild oats	Poaceaea
BASA	*Baccharis salicifolia*	Mulefat	Asteraceae
BRSP	*Bromus* spp.	Brome grass	Poaceaea
CELE	*Ceanothus leucodermis*	Chaparral whitethorn	Rhamnaceae
CXSP	*Carex* spp.	Sedge spp.	Cyperaceae
DW	N/A	Dead wood	N/A
ERFA	*Eriogonum fasciculatum*	California buckwheat	Polygonaceae
ERSP	*Erodium* spp.	Unknown filaree	Geraniaceaea
ERWR	*Eriogonum wrightii*	Foothill buckwheat	Polygonaceae
GASP	*Galium* spp.	Unknown bedstraw	Rubiaceae
GUCA	*Gutierrezia californica*	California matchweed	Asteraceae
JUSP	*Juncus* spp.	Rush spp.	Juncaceae
LEFI	*Lessingia filaginifolia*	California aster	Asteraceae
LOIN	*Lonicera interrupta*	Chaparral honeysuckle	Caprifoliaceae
NAPU	*Nassella pulchra*	Purple needlegrass	Poaceae
PICO	*Pinus coulteri*	Coulter pine	Pinaceae
PLRA	*Platanus racemosa*	Sycamore	Platanaceae
POSP	*Poa* spp.	Bluegrass spp.	Poaceae
PRIL	*Prunus ilicifolia*	Holly-leaved cherry	Rosaceae
QUAG	*Quercus agrifolia*	Coast live oak	Fagaceae
QUCH	*Quercus chrysolepis*	Canyon live oak	Fagaceae
QUEN	*Quercus engelmannii*	Engelman oak	Fagaceae
QUKE	*Quercus kelloggii*	California black oak	Fagaceae
RHIL	*Rhamnus ilicifolia*	Holly-leaved redberry	Rhamnaceae
SAAP	*Salvia apiana*	White sage	Lamiaceae
SASP	*Salix* spp.	Unknown willow	Salicaceae
SYMO	*Symphoricarpos mollis*	Creeping snowberry, Trip vine	Caprifoliaceae
TODI	*Toxicodendron diversilobum*	Poison oak	Anacardiaceae

[a] *= non-native species*

Appendix 15. Photos of herpetofauna pitfall trap arrays within Santa Ysabel Ranch Open Space Preserve.

Array 1

Array 2

Array 3

Array 4

Array 5

Appendix 15 (continued).

Array 6

Array 9

Array 7

Array 11

Array 8

Array 12

Appendix 15 (continued).

Array 13

Array 14

Array 15

Array 16

Array 17

Array 18

Appendix 15 (continued).

Array 19

Array 22

Array 20

Array 23

Array 21

Array 24

Appendix 16. Representative photos of ant species detected within Santa Ysabel Ranch Open Space Reserve.

Subfamily Dolichoderinae
(*Dorymyrmex bicolor*)

Subfamily Formicinae
(*Formica francoueri*)

Subfamily Formicinae
(*Camponotus dumetorum*)

Subfamily Formicinae
(*Camponotus semitestaceus*)

Subfamily Myrmicinae
(*Crematogaster californica*)

Subfamily Myrmicinae
(*Crematogaster mutans*)

Appendix 16 (continued).

Subfamily Myrmicinae
(*Messor andrei*)

Subfamily Myrmicinae
(*Pheidole vistana*)

Subfamily Myrmicinae
(*Pheidole hyatti*)

Appendix 17. The qualitative percentage of each habitat type and the top three plant species present within a 100 meter radius of each bird point count station within the Santa Ysabel Ranch Open Space Preserve.

	Habitat Type [a]							Dominant Plant Species [b]		
Number	*CHAP*	*PIN*	*G*	*HUM*	*OAK*	*RIP*	*CSS*	*1*	*2*	*3*
1	100							ADFA	ARGL	QUCH
2	90				10			ADFA	QUAG	QUEN
3			95		5			AVSP	NAPU	QUEN
4					15	15	70	ERFA	QUAG	ANCA
5			50		50			BRSP	QUEN	QUAG
6	30				30		40	SAAP	ADFA	QUAG
7	10				75		15	QUEN	QUCH	SAAP
8	25				50		25	QUEN	PRIL	SAAP
9	50				50			ADFA	CELE	QUEN
10	10		30		60			QUEN	QUCH	BRSP
11	35				65			QUAG	QUEN	ADFA
12			99		1			AVSP	BRSP	QUAG
13			60			40		AVSP	SASP	BASA
14			50		25	25		AVSP	QUAG	SASP
15			98		2			BRSP	AVSP	QUEN
16	40				60			QUKE	QUAG	RHIL
17							100	SAAP	ERFA	QUEN
18							100	SAAP	TODI	QUAG
19					100			QUEN	AVSP	BRSP
20					25		75	SAAP	GUCA	QUAG
21			65		5		30	AVSP	QUKE	SAAP
22					60		40	QUAG	QUEN	SAAP
23					100			QUAG	QUKE	BRSP
24	100							ARGL	QUCH	RHIL
25	50				50			RHIL	QUEN	QUCH
26					100			QUEN	QUAG	SAAP
27					100			QUKE	QUCH	QUAG
28					75	25		QUKE	QUAG	PLRA
29					100			QUKE	QUAG	QUCH
30	50				50			ARGL	QUCH	QUAG
31					100			QUAG	QUCH	TODI
32			70		30			BRSP	LEFI	QUEN
33					100			QUEN	QUAG	QUKE
34			50		50			QUAG	QUEN	AVSP
35			25		75			QUAG	SYMO	BRSP
36			80		20			BRSP	AMPS	QUKE
37					50	50		QUAG	ALRH	TODI
38			70	10	20			AVSP	BRSP	QUKE
39			50		50			QUAG	BRSP	PLRA
40					75	25		QUAG	SYMO	PLRA
41			100					AVSP	BRSP	ERSP
42			100					AVSP	BRSP	ERSP
43		25	50			25		AVSP	QUAG	JUSP
44		100						PICO	QUKE	BRSP
45			45		55			QUAG	QUEN	AVSP
46			50		50			SASP	JUSP	QUAG

Appendix 17 (continued).

	Habitat Type [a]							Dominant Plant Species [b]		
Number	*CHAP*	*PIN*	*G*	*HUM*	*OAK*	*RIP*	*CSS*	*1*	*2*	*3*
47			75			25		POSP	BRSP	QUAG
48		50				50		QUAG	AIAL	QUKE
49						100		QUAG	PLRA	SASP
50					40		60	ERFA	SAAP	QUAG
% Total [c]	11.8	3.5	26.2	0.2	39.6	7.6	11.1			

[a] *= habitat types include: chaparral (CHAP), pine woodland (PIN), grassland (G), human-modified (HUM), oak woodland (OAK), riparian (RIP), and coastal sage scrub (CSS)*

[b] *= plant species codes can be found in Appendix 14*

[c] *= percentage calculated by taking sum of each column and dividing by 5000% (50 points* x *100% area sampled per point)*

Appendix 18. California spotted owl detected within the Santa Ysabel Ranch Open Space Preserve during day follow-up survey.

Appendix 19. Representative photos of bat species captured within the Santa Ysabel Ranch Open Space Preserve.

Hoary bat (*Lasiurus cinereus*)

Western red bat (*Lasiurus blossevillii*)

Appendix 20. Representative photos of mammal and bird species taken at camera stations within the Santa Ysabel Ranch Open Space Preserve.

Camera 1: Bobcat
(*Felis rufus*)

Camera 1: Coyote
(*Canis latrans*)

Camera 2: Mule deer
(*Odocoileus hemionus*)

Camera 2: Opossum
(*Didelphis virginiana*)

Camera 3: Striped skunk
(*Mephitis mephitis*)

Camera 3: Roadrunner
(*Geococcyx californianus*)

Camera 4: Dulzura kangaroo rat
(*Dipodomys simulans*)

Camera 4: Gray fox
(*Urocyon cinereoargenteus*)

Appendix 20 (continued)

Camera 5: Mountain lion
(*Puma concolor*)

Camera 5: Striped skunk
(*Mephitis mephitis*)

Camera 5: Mountain lion
(*Puma concolor*)

Camera 5: Wild turkeys
(*Meleagris gallopavo*)

Camera 7: Mule deer
(*Odocoileus hemionus*)

Camera 8: Bobcat (*Felis rufus*)
(*Felis rufus*)

Camera 8: Raccoon
(*Procyon lotor*)

Camera 8: Western scrub-jay with acorn
(*Aphelocoma californica*)

Appendix 21. Santa Ysabel Ranch Open Space Preserve vertebrate species list for the 2002/2003 USGS - BRD wildlife surveys.

	Common Name	*Scientific Name*	*Detection Method* [a]
CLASS: OSTEICHTHYES (Bony Fish)			
SALMONIFORMES			
SALMONIDAE (Trout and Salmon)			
	Rainbow trout	*Oncorhynchus mykiss* [b]	IN
ATHERINIFORMES			
POECILIDAE (Livebearers)			
	Mosquitofish	*Gambusia affinis* [b]	AS
CLASS: AMPHIBIA (Amphibians)			
CAUDATA (Salamanders)			
PLETHODONTIDAE (Lungless Salamanders)			
	Large-blotched ensatina	*Ensatina klauberi* [cd]	PF
ANURA SALIENTIA (Frogs and Toads)			
PELOBATIDAE (Spadefoot Toads)			
	Western spadefoot	*Spea hammondii* [cd]	PF
BUFONIDAE (True Toads)			
	Western toad	*Bufo boreas*	AS, PF
	Arroyo toad	*Bufo californicus* [ce]	IN
HYLIDAE (Treefrogs and relatives)			
	Pacific treefrog	*Hyla regilla*	AS, PF
	California treefrog	*Hyla cadaverina*	AS
	Bullfrog	*Rana catesbeiana* [b]	PF
CLASS: REPTILIA (Reptiles)			
SQUAMATA (Lizards and Snakes)			
PHRYNOSOMATIDAE (Spiny Lizards and relatives)			
	Granite spiny lizard	*Sceloporus orcutti*	PF
	Western fence lizard	*Sceloporus occidentalis*	PF
	Side-blotched lizard	*Uta stansburiana*	PF
	Coast horned lizard	*Phrynosoma coronatum* [c]	PF
SCINCIDAE (Skinks)			
	Western skink	*Eumeces skiltonianus* [c]	PF
	Gilbert's skink	*Eumeces gilberti*	PF
TEIIDAE (Whiptails and relatives)			
	Western whiptail	*Aspidoscelis* (*Cnemidophorus) tigris* [f]	PF
ANGUIDAE (Alligator Lizards and relatives)			
	Southern alligator lizard	*Elgaria multicarinata*	PF
LEPTOTYPHLOPIDAE (Slender Blind Snakes)			
	Western blind snake	*Leptotyphlops humilis*	PF
COLUBRIDAE (Colubrids)			
	Ring-necked snake	*Diadophis punctatus* [f]	PF
	Racer	*Coluber constrictor*	PF
	Striped racer (California whipsnake)	*Masticophis lateralis*	PF
	Western patch-nosed snake	*Salvadora hexalepis* [c]	PF
	Gopher snake	*Pituophis melanoleucus*	PF
	Common kingsnake	*Lampropeltis getula*	PF

Appendix 21 (continued)

	Common Name	*Scientific Name*	*Detection Method* [a]
CLASS: REPTILIA (Reptiles) (continued)			
SQUAMATA (Lizards and Snakes) (continued)			
COLUBRIDAE (Colubrids) (continued)			
	Two-striped gartersnake	*Thamnophis hammondii* [c]	PF
	Night snake	*Hypsiglena torquata*	PF
VIPERIDAE (Vipers)			
	Speckled rattlesnake	*Crotalus mitchellii*	PF
	Western rattlesnake	*Crotalus viridis*	PF
CLASS: AVES (Birds)			
CICONIIFORMES (Herons, Storks, Ibises, and relatives)			
ARDEIDAE (Herons and Bitterns)			
	Cattle egret	*Bubulcus ibis*	IN
CATHARTIDAE (New World Vultures)			
	Turkey vulture	*Cathartes aura*	BP
ANSERIFORMES (Screamers, Ducks, and relatives)			
ANATIDAE (Swans, Geese, and Ducks)			
	Mallard	*Anas platyrhynchos*	BP
FALCONIFORMES (Vultures, Hawks, and Falcons)			
ACCIPITRIDAE (Hawks, Old World Vultures, and Harriers)			
	White-tailed kite	*Elanus leucurus* [dg]	BP
	Northern harrier	*Circus cyaneus* [cg]	IN
	Cooper's hawk	*Accipiter cooperii* [cg]	BP
	Red-shouldered hawk	*Buteo lineatus* [f]	BP
	Red-tailed hawk	*Buteo jamaicensis*	BP
	Ferruginous hawk	*Buteo regalis* [cd]	IN
	Golden eagle	*Aquila chrysaetos* [cgh]	BP
FALCONIDAE (Caracaras and Falcons)			
	American kestrel	*Falco sparverius*	BP
GALLIFORMES (Megapodes, Curassows, Pheasants, and relatives)			
PHASIANIDAE (Quails, Pheasants, and relatives)			
	Wild turkey	*Meleagris gallopavo* [b]	BP, CS, IN, SS
ODONTOPHORIDAE (New World Quail)			
	Mountain quail	*Oreortyx pictus*	BP
	California quail	*Callipepla californica*	BP, CS
CHARADRIIFORMES (Shorebirds, Gulls, and relatives)			
CHARADRIIDAE (Plovers and relatives)			
	Killdeer	*Charadrius vociferus*	BP
LARIDAE (Jaegers, Gulls, and Terns)			
	Caspian tern	*Sterna caspia*	BP
COLUMBIFORMES (Pigeons and Doves)			
COLUMBIDAE (Pigeons and Doves)			
	Rock dove	*Columba livia* [b]	BP
	Band-tailed pigeon	*Columba fasciata*	BP
	Mourning dove	*Zenaida macroura*	BP
CUCULIFORMES (Cuckoos and relatives)			
CUCULIDAE (Typical Cuckoos)			
	Greater roadrunner	*Geococcyx californianus* [e]	CS, IN

Appendix 21 (continued)

	Common Name	Scientific Name	Detection Method [a]
CLASS: AVES (Birds) (continued)			
STRIGIFORMES (Owls)			
TYTONIDAE (Barn Owls)			
	Barn owl	*Tyto alba*	BP, NT
STRIGIDAE (Typical Owls)			
	Great horned owl	*Bubo virginianus*	NT
	Spotted owl	*Strix occidentalis* [cd]	NT
	Western screech owl	*Otus kennicottii*	NT
	Long-eared owl	*Asio otus* [c]	BP
	Short-eared owl	*Asio flammeus* [c]	NT
CAPRIMULGIFORMES (Goatsuckers and relatives)			
CAPRIMULGIDAE (Goatsuckers)			
	Lesser nighthawk	*Chordeiles acutipennis*	NT
APODIFORMES (Swifts and Hummingbirds)			
APODIDAE (Swifts)			
	White-throated swift	*Aeronautes saxatalis*	IN
TROCHILIDAE (Hummingbirds)			
	Black-chinned hummingbird	*Archilochus alexandri*	BP
	Anna's hummingbird	*Calypte anna*	BP
	Costa's hummingbird	*Calypte costae* [d]	BP
	Allen's hummingbird	*Selasphorus sasin* [d]	BP
PICIFORMES (Woodpeckers and relatives)			
PICIDAE (Woodpeckers and Wrynecks)			
	Lewis's woodpecker	*Melanerpes lewis* [d]	IN
	Acorn woodpecker	*Melanerpes formicivorus*	BP
	Nuttall's woodpecker	*Picoides nuttallii*	BP
	Hairy Woodpecker	*Picoides villosus*	BP
	Northern flicker	*Colaptes auratus*	BP
PASSERIFORMES (Perching Birds)			
TYRANNIDAE (Tyrant Flycatchers)			
	Olive-sided flycatcher	*Contopus cooperi* [d]	BP
	Western wood-pewee	*Contopus sordidulus*	BP
	Pacific-slope flycatcher	*Empidonax difficilis* [d]	BP
	Black phoebe	*Sayornis nigricans*	BP
	Ash-throated flycatcher	*Myiarchus cinerascens*	BP
	Western kingbird	*Tyrannus verticalis*	BP
VIREONIDAE (Typical Vireos)			
	Cassin's vireo	*Vireo cassinii*	IN
	Hutton's vireo	*Vireo huttoni*	BP
	Warbling vireo	*Vireo gilvus*	BP
CORVIDAE (Jays, Magpies, and Crows)			
	Steller's jay	*Cyanocitta stelleri*	BP
	Western scrub-jay	*Aphelocoma californica*	BP
	American crow	*Corvus brachyrhynchos*	BP
	Common raven	*Corvus corax*	BP
ALAUDIDAE (Larks)			
	Horned lark	*Eremophila alpestris* [c]	BP

Appendix 21 (continued)

Common Name	Scientific Name	Detection Method [a]
CLASS: AVES (Birds) (continued)		
PASSERIFORMES (Perching Birds) (continued)		
HIRUNDINIDAE (Swallows) (continued)		
Purple martin	*Progne subis* [cg]	BP
Violet-green swallow	*Tachycineta thalassina*	BP
Northern rough-winged swallow	*Stelgidopteryx serripennis*	BP
Cliff swallow	*Petrochelidon pyrrhonota*	BP
PARIDAE (Titmice and relatives)		
Mountain chickadee	*Poecile gambeli*	BP
Oak titmouse	*Baeolophus inornatus*	BP
AEGITHALIDAE (Bushtit)		
Bushtit	*Psaltriparus minimus*	BP
SITTIDAE (Nuthatches)		
White-breasted nuthatch	*Sitta carolinensis*	BP
Pygmy nuthatch	*Sitta pygmaea*	IN
TROGLODYTIDAE (Wrens)		
Bewick's wren	*Thryomanes bewickii*	BP
House wren	*Troglodytes aedon*	BP
REGULIDAE (Kinglets)		
Ruby-crowned kinglet	*Regulus calendula*	BP
SYLVIIDAE		
Blue-gray gnatcatcher	*Polioptila caerulea*	BP
TURDIDAE		
Western bluebird	*Sialia mexicana*	BP
Swainson's thrush	*Catharus ustulatus*	BP
American robin	*Turdus migratorius*	BP
Varied thrush	*Ixoreus naevius*	BP
TIMALIIDAE (Babblers)		
Wrentit	*Chamaea fasciata*	BP
MIMIDAE (Mockingbirds and Thrashers)		
Northern mockingbird	*Mimus polyglottos*	BP
California thrasher	*Toxostoma redivivum* [d]	BP
STURNIDAE (Starlings & Allies)		
European starling	*Sturnus vulgaris* [b]	BP
PTILOGONATIDAE (Silky Flycatchers)		
Phainopepla	*Phainopepla nitens*	BP
PARULIDAE (Wood Warblers and relatives)		
Orange-crowned warbler	*Vermivora celata*	BP
Yellow warbler	*Dendroica petechia* [cg]	BP
Yellow-rumped warbler	*Dendroica coronata*	BP
Black-throated gray warbler	*Dendroica nigrescens*	BP
Townsend's warbler	*Dendroica townsendi*	BP
Hermit warbler	*Dendroica occidentalis*	IN
Palm warbler	*Dendroica palmarum*	IN
MacGillivray's warbler	*Oporornis tolmiei*	IN
Common yellowthroat	*Geothlypis trichas*	BP
Wilson's warbler	*Wilsonia pusilla*	BP
Yellow-breasted chat	*Icteria virens* [cg]	BP

Appendix 21 (continued)

	Common Name	*Scientific Name*	*Detection Method* [a]
CLASS: AVES (Birds) (continued)			
PASSERIFORMES (Perching Birds) (continued)			
THRAUPIDAE (Tanagers)			
	Western tanager	*Piranga ludoviciana*	BP
EMBERIZIDAE (Emberizines)			
	Spotted towhee	*Pipilo maculatus*	BP
	California towhee	*Pipilo crissalis*	BP
	Rufous-crowned sparrow	*Aimophila ruficeps* [c]	BP
	Chipping sparrow	*Spizella passerina*	BP
	Black-chinned sparrow	*Spizella atrogularis* [f]	BP
	Lark sparrow	*Chondestes grammacus* [dg]	BP
	Black-throated sparrow	*Amphispiza bilineata*	BP
	Sage sparrow	*Amphispiza belli* [cd]	BP
	Grasshopper sparrow	*Ammodramus savannarum* [f]	BP
	Song sparrow	*Melospiza melodia*	BP
	Dark-eyed junco	*Junco hyemalis*	BP
CARDINALIDAE (Cardinals, Grosbeaks & Allies)			
	Black-headed grosbeak	*Pheucticus melanocephalus*	BP
	Blue grosbeak	*Guiraca caerulea*	BP
	Lazuli bunting	*Passerina amoena*	BP
ICTERIDAE (Blackbirds, Orioles & Allies)			
	Red-winged blackbird	*Agelaius phoeniceus*	BP
	Tricolored blackbird	*Agelaius tricolor* [cdg]	BP
	Western meadowlark	*Sturnella neglecta*	BP
	Brewer's blackbird	*Euphagus cyanocephalus*	BP
	Brown-headed cowbird	*Molothrus ater*	BP
	Bullock's oriole	*Icterus bullockii*	BP
FRINGILLIDAE (Finches)			
	House finch	*Carpodacus mexicanus*	BP
	Lesser goldfinch	*Carduelis psaltria*	BP
	Lawrence's goldfinch	*Carduelis lawrencei* [dg]	BP
CLASS: MAMMALIA (Mammals)			
DIDELPHIMORPHIA (Marsupials)			
DIDELPHIDAE (Opossums)			
	Virginia opossum	*Didelphis virginiana* [b]	CS, SS
INSECTIVORA (Insectivores)			
SORICIDAE (Shrews)			
	Ornate shrew	*Sorex ornatus*	PF
	Desert shrew	*Notiosorex crawfordi*	PF
CHIROPTERA (Bats)			
VESPERTILIONIDAE (Evening Bats)			
	Yuma myotis	*Myotis yumanensis* [d]	BS
	California myotis	*Myotis californicus*	BS
	Long-eared myotis	*Myotis evotis* [d]	BS
	Western Small-footed myotis	*Myotis ciliolabrum* [d]	BS
	Western pipistrelle	*Pipistrellus hesperus*	BS
	Big brown bat	*Eptesicus fuscus*	BS
	Hoary bat	*Lasiurus cinereus*	BS

Appendix 21 (continued)

	Common Name	Scientific Name	Detection Method [a]
CLASS: MAMMALIA (Mammals) (continued)			
CHIROPTERA (Bats) (continued)			
VESPERTILIONIDAE (Evening Bats) (continued)			
	Townsend's big-eared bat	*Corynorhinus townsendii* [cd]	BS
	Pallid bat	*Antrozous pallidus* [c]	BS
	Southwestern yellow bat	*Lasiurus xanthinus* [f]	BS
	Western red bat	*Lasiurus blossevillii* [f]	BS
MOLOSSIDAE (Free-tailed Bats)			
	Mexican free-tailed bat	*Tadarida brasiliensis*	BS
	Pocketed free-tailed bat	*Nyctinomops femorosacca* [c]	BS
	Big free-tailed bat	*Nyctinomops macrotis* [c]	BS
	Western mastiff bat	*Eumops perotis* [cd]	BS
LAGOMORPHA (Rabbits, Hares, and Pikas)			
LEPORIDAE (Rabbits and Hares)			
	Desert cottontail	*Sylvilagus audubonii*	PF
	Rabbit species	*Sylvilagus* spp.	CS, SS
RODENTIA (Squirrels, Rats, Mice, and relatives)			
SCIURIDAE (Squirrels, Chipmunks, and Marmots)			
	California ground squirrel	*Spermophilus beecheyi*	CS, SS
	Merriam's chipmunk	*Tamias merriami*	PF
GEOMYIDAE (Pocket Gophers)			
	Botta's pocket gopher	*Thomomys bottae*	PF
HETEROMYIDAE (Pocket Mice and Kangaroo Rats)			
	San Diego pocket mouse	*Chaetodipus fallax* [c]	PF
	Dulzura kangaroo rat	*Dipodomys simulans* [f]	CS
MURIDAE			
	Western harvest mouse	*Reithrodontomys megalotis*	PF
	Cactus mouse	*Peromyscus eremicus*	PF
	California mouse	*Peromyscus californicus*	PF
	Deer mouse	*Peromyscus maniculatus*	PF
	Desert woodrat	*Neotoma lepida* [c]	PF
	California vole	*Microtus californicus*	PF
CANIDAE (Foxes, Wolves, and relatives)			
	Domestic dog	*Canis familiaris* [b]	SS
	Coyote	*Canis latrans*	CS, IN, SS
	Gray fox	*Urocyon cinereoargenteus*	CS, IN, SS
PROCYONIDAE (Raccoons and relatives)			
	Raccoon	*Procyon lotor*	CS, IN
MUSTELIDAE (Weasels and relatives)			
	Long-tailed weasel	*Mustela frenata* [f]	IN
MEPHITIDAE (Skunks)			
	Western spotted skunk	*Spilogale gracilis* [f]	SS
	Striped skunk	*Mephitis mephitis*	CS, IN, SS
FELIDAE (Cats)			
	Mountain lion	*Puma concolor* [f]	CS
	Bobcat	*Felis rufus*	CS, IN, SS

Appendix 21 (continued)

Common Name	*Scientific Name*	*Detection Method* [a]
CLASS: MAMMALIA (Mammals) (continued)		
PERISSODACTYLA (Odd-toed Ungulates)		
EQUIDAE (Horses, Burros, and relatives)		
Domestic horse	*Equus caballus* [b]	CS
ARTIODACTYLA (Even-toed Ungulates)		
CERVIDAE (Deer, Elk, and relatives)		
Mule deer	*Odocoileus hemionus* [f]	CS, IN, SS
BOVIDAE (Cattle, Sheep, and relatives)		
Domestic cow	*Bos taurus* [b]	CS, IN

[a] *= detection methods include: aquatic survey (AS), bird point count survey (BP), bat survey (BS), camera survey (CS), incidental observation (IO), night time bird survey (NT), pitfall survey PF), and scent station survey (SS)*

[b] *= non-native species*

[c] *= CDFG species of special concern*

[d] *= federal species of concern*

[e] *= federally endangered species*

[f] *= species identified by expert knowledge within the San Diego Field Station as being a sensitive resource*

[g] *= listing applicable to nesting birds*

[h] *= listing applicable to wintering birds*

Appendix 22. Sensitive and non-native species detected on Santa Ysabel Ranch Open Space Preserve.

Sensitive Species	*Listing Categorya*	*Non-Native Species*
Arroyo toad	FE, CSC	Rainbow trout
Large-blotched ensatina	FSC, CSC	Mosquito fish
Western spadefoot	FSC, CSC	Bullfrog
Western skink	CSC	Wild turkey
Western whiptail	Expert Knowledge	Rock dove
Coast horned lizard	CSC	European starling
Ring-necked snake	Expert Knowledge	Virginia opossum
Western patch-nosed snake	CSC	Domestic dog
Two-striped gartersnake	CSC	Domestic horse
White-tailed kite	FSC	Domestic cow
Northern harrier	CSC	
Cooper's hawk	CSC	
Red-shouldered hawk	Expert Knowledge	
Ferruginous hawk	FSC, CSC	
Golden eagle	CSC	
Greater roadrunner	Expert Knowledge	
Spotted owl	FSC, CSC	
Long-eared owl	CSC	
Short-eared owl	CSC	
Costa's hummingbird	FSC	
Allen's hummingbird	FSC	
Lewis's woodpecker	FSC	
Olive-sided flycatcher	FSC	
Pacific-Slope flycatcher	FSC	
Horned lark	CSC	
Purple martin	CSC	
California thrasher	FSC	
Yellow warbler	CSC	
Yellow-breasted chat	CSC	
Rufous-crowned sparrow	CSC	
Black-chinned sparrow	Expert Knowledge	
Sage sparrow	FSC, CSC	
Lark sparrow	FSC	
Grasshopper sparrow	Expert Knowledge	
Tricolored blackbird	FSC, CSC	
Lawrence's goldfinch	FSC	
Pallid bat	CSC	
Townsend's big-eared bat	FSC, CSC	
Western mastiff bat	FSC, CSC	
Western red bat	Expert Knowledge	
Western yellow bat	Expert Knowledge	
Western small-footed bat	Expert Knowledge	
Long-eared myotis	FSC	
Western small-footed bat	FSC	
Yuma myotis	FSC	
Pocketed free-tailed bat	CSC	
Big free-tailed bat	CSC	
Desert wood rat	CSC	

Appendix 22 (continued).

Sensitive Species	*Listing Categorya*	*Non-Native Species*
Wood rat nest	CSC	
Dulzura kangaroo rat	Expert Knowledge	
San Diego pocket mouse	CSC	
Long-tailed weasel	Expert Knowledge	
Western spotted skunk	Expert Knowledge	
Mountain lion	Expert Knowledge	
Mule deer	Expert Knowledge	

[a] *= listing categories include federally endangered species (FE), federal species of concern (FSC), CA DFG species of special concern (CSC), and sensitive species determined by specific knowledge of USGS San Diego Field Station*