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Baseline Biodiversity Survey for the Tenaja Corridor and Southern Santa Ana Mountains

Final Report

Prepared for:

The Nature Conservancy

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

Baseline Biodiversity Survey for the Tenaja Corridor and Southern Santa Ana Mountains

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INTRODUCTION

Habitat fragmentation has been targeted as one of the most serious threats to biological diversity worldwide (Wilcove et al. 1998), and in areas with increasing urbanization and agriculture, the loss and fragmentation of natural habitat is virtually inevitable (Soulé 1991). Indeed, intensive development in southern California over the past century has destroyed much of the native habitat (McCaull 1994), with remaining natural areas often reduced to patches of remnant habitat either completely isolated or connected by tenuous linkages. This massive habitat loss, in conjunction with the high levels of local endemism of native species, has helped create a "hot-spot" of extinction and endangerment in the region (Myers 1990, Dobson et al. 1997).

One of the most practical and effective measures to maintain wildlife in developing areas is the establishment of linkages that permit dispersal across barriers such as roadways and developments (Noss 1983, Soulé 1991, Noss et al. 1996, Soulé and Terborgh 1999). A wildlife corridor must fulfill several functions (Ogden Environmental and Energy Services 1992): 1.) the corridor must link two or more patches of habitat where connectivity is desired, 2.) the corridor must conduct animals through a landscape to areas of suitable habitat without excessive risk of directing them into a "mortality sink" - unsuitable areas with high mortality risks, 3.) the corridor design must allow individuals of the designated target species to use the corridor frequently enough to achieve the desired demographic and genetic exchange between populations. Where functional movement corridors are not retained across the landscape, many wildlife populations will eventually disappear.

STUDY AREA

The Nature Conservancy's Santa Rosa Plateau Ecological Reserve covers 8,200 acres on one of the richest, most diverse natural landscapes remaining in southern California (Figures 1, 2). The reserve is currently connected to larger natural areas through the Tenaja Corridor - a habitat linkage over three miles in length joining the western boundary of the Reserve with the Cleveland National Forest (Figures 1, 3). Although the Tenaja Corridor is a key landscape linkage, proposed development threatens to permanently sever this connection, thereby isolating the Santa Rosa Plateau and imperiling its diverse populations of flora and fauna.

The Santa Rosa Plateau and the Tenaja Corridor are embedded within the southern Santa Ana Mountain range in southern California. The southern Santa Ana Mountains are a high plateau and valley region that lie between United States Forest Service land to the northwest and southeast, I-15 to the east, and Department of Defense land to the west (Figure 1). In addition to the Santa Rosa Plateau (SRP), the southern Santa Ana Mountains also hold another large protected area, San Diego State University's Santa Margarita Ecological Reserve (SMER), encompassing about 4,235 acres. SMER is connected to larger habitat blocks through several potential landscape linkages, primarily the Santa Margarita River, which links to Camp Pendleton to the west, and the Pechanga

Corridor, which links to the Cleveland National Forest and the Palomar Mountains to the east (Figure 1). As with the Tenaja Corridor, however, expanding agriculture and development threaten to sever these linkages.

RESEARCH GOALS

Our research goal was to conduct baseline biodiversity surveys for vertebrates within the Tenaja Corridor and the surrounding southern Santa Ana Mountains study area. From January 1999 through September 2000, we developed and implemented a series of survey techniques to assess the distribution and abundance of a suite of vertebrate populations in the region. Target taxa for our biodiversity surveys included herpetofauna, small mammals, large mammals, birds, and bats. In addition, we conducted surveys to monitor water quality and road mortality throughout the study area.

The focal taxa we selected vary greatly in habitat preferences, mobility, movement patterns, and sensitivities to human disturbance, and therefore can provide valuable information across multiple taxonomic levels, habitats and spatial scales. Such baseline information is essential to identify strategic conservation areas within the region, to identify linkages between core habitat blocks, and to provide guidance for future monitoring and management activities.

BIODIVERSITY SURVEYS

In this section, we first review our survey results for herpetofauna, small mammals, large mammals, birds, bats, water quality, and road transects. For each survey type, we review survey methodology, present maps of the location of survey points, and summarize data tables of distribution and abundance among these locations.

Herpetofauna Species

Herpetofauna (reptiles and amphibians) species were surveyed utilizing the pitfall drift-fence array design widely used by Dr. Robert Fisher and Dr. Ted Case in southern California (Fisher and Case 2000a, b). This trapping technique has successfully captured over 44 species of reptiles and amphibians representing over 20,000 individuals in coastal southern California since 1995. Currently, a total of 350 arrays are being monitored across 26 low-elevation sites in coastal southern California. The pitfall drift-fence technique is effective in determining herpetofaunal diversity and abundance and allows monitoring of these intermediate trophic levels. Regionally, results will be used to identify factors correlated with herpetofaunal diversity and will allow for comparisons among taxonomic groups.

Sixty-four arrays were placed throughout the Santa Ana Mountains project area (Figure 4). Forty arrays were placed within the Tenaja Corridor (Figure 5), 15 arrays were placed within the Santa Margarita Ecological Reserve, and 8 arrays were placed within the

eastern section of Camp Pendleton. Target areas for pitfall sampling locations were chosen by visually surveying for drainage proximity, plant communities, slope, and accessibility. Each array consists of seven 5 gallon buckets as pitfall traps, connected by 15 meter shade cloth drift-fences in the shape of a Y. A hardware cloth funnel trap is placed at each of the three arms for capturing large snakes and lizards.

Sampling was conducted at each study site for 10 consecutive days every 6 weeks, for a total of 50 to 60 days a year, spread evenly across all seasons. Traps were kept closed between sampling periods. During sampling periods, all reptiles and amphibians captured were processed in the field; any other captured animals were released without processing. Processing included individually marking each animal with toe clipping or scale clipping (snakes), weighing, and measuring body length; we stored all tissue samples in ethanol for future molecular systematic work. The protocols developed ensure that the majority of the animals captured remain alive when the traps are open; traps are checked once every morning. Any incidental deaths were preserved as vouchers, and are deposited in the California Academy of Sciences herpetological collection. Additionally, the flora and vegetation was recorded in the vicinity of each array following established protocols of the California Native Plant Society.

We detected 32 species of herpetofauna in 1,916 captures in the Santa Ana Mountains study area. Twenty-six species were detected in the Tenaja Corridor, 27 species in SMER, and 21 species in Camp Pendleton. In 70 sampling days for the 40 pitfall arrays in the Tenaja Corridor (Table 1), we recorded 6 species of amphibians in 291 captures (in decreasing order of relative abundance): Pacific slender salamander (124 total individuals), western toad (92), Pacific treefrog (32), Monterey salamander (20), California newt (20), and the arboreal salamander (3). In 230 and 50 sampling days for pitfall arrays 1-5 and 6-15, respectively, at SMER (Table 2), we recorded 5 species of amphibians in 56 captures: Pacific slender salamander (26), western toad (12), western spadefoot toad (8), Pacific treefrog (8), and California treefrog (2). In 130 sampling days for the 8 pitfall arrays at Camp Pendleton (Table 3), we recorded 5 species of amphibians in 105 captures: Pacific slender salamander (65), arroyo toad (18), Pacific treefrog (15), California newt (6), and arboreal salamander (1).

In the Tenaja Corridor (Table 1), we recorded 8 species of lizards in 732 captures: western fence lizard (360 total individuals), western skink (111), southern alligator lizard (97), western whiptail (60), side-blotched lizard (46), coast horned lizard (32), granite spiny lizard (24), and Gilbert skink (2). At the SMER (Table 2), we recorded 9 species of lizards in 302 captures: western fence lizard (86), orange-throated whiptail (76), western whiptail (52), southern alligator lizard (43), western skink (16), Gilbert's skink (10), side-blotched lizard (9), granite spiny lizard (5), and coast horned lizard (5). At Camp Pendleton (Table 3), we recorded 8 species of lizards in 246 captures: western fence lizard (144), western whiptail (35), orange-throated whiptail (20), southern alligator lizard (19), western skink (12), side-blotched lizard (10), granite spiny lizard (3), and coast horned lizard (3).

In the Tenaja Corridor (Table 1), we recorded 10 species of snakes in 110 captures: yellow-bellied racer (47 total individuals), striped racer (19), two-striped gartersnake (13), California kingsnake (10), western ringneck snake (7), southern Pacific rattlesnake (6), gopher snake (3), red diamond rattlesnake (2), speckled rattlesnake (2), and the western patch-nosed snake (1). At SMER (Table 2), we recorded 12 species of snakes in 44 captures: western ringneck snake (8), striped racer (7), two-striped gartersnake (6), gopher snake (6), red diamond rattlesnake (5), southern Pacific rattlesnake (4), coachwhip (2), California black-headed snake (2), speckled rattlesnake (1), night snake (1), California kingsnake (1), and the western patch-nosed snake (1). At Camp Pendleton (Table 3), we recorded 8 species of snakes in 22 captures: striped racer (11), western ringneck snake (3), western patch-nosed snake (2), night snake (2), gopher snake (1), two-striped garter snake (1), California kingsnake (1), and speckled rattlesnake (1). Finally, we have recorded western pond turtle in both the Tenaja Corridor (1 capture) and SMER (4 captures).

Small Mammals

Herpetofauna sampling arrays also allowed us to survey small mammals throughout the Santa Ana Mountains study Area (Figure 4). In total, we recorded 14 species of small mammals in 1,784 captures. At the Tenaja Corridor (Figure 5, Table 4), we recorded 11 species of small mammals in 1,163 captures through pitfall sampling (in decreasing order of relative abundance): California vole (618 total captures), unidentified deer mouse (138), western harvest mouse (115), California mouse (77), deer mouse (70), Botta's pocket gopher (61), ornate shrew (30), desert shrew (22), brush mouse (21), unidentified pocket mouse (7), desert cottontail (2), California pocket mice (1), and house mouse (1). At SMER (Table 5), we recorded 11 species of small mammals in 361 captures through pitfall sampling: western harvest mouse (85), ornate shrew (78), desert shrew (70), deer mouse (33), California vole (32), California mouse (20), cactus mouse (11), Botta's pocket gopher (13), unidentified deer mouse (4), unidentified pocket mouse (3), unidentified rodent (3), California pocket mice (3), San Diego pocket mouse (3), brush mouse (2), and unidentified rabbit species (1).

At Camp Pendelton (Table 6), we recorded 13 species of small mammals in 261 captures through pitfall sampling: western harvest mouse (53), California vole (52), California mouse (43), deer mouse (36), desert shrew (18), ornate shrew (27), unidentified *Peromyscus* species (7), Botta's pocket gopher (6), cactus mouse (5), California mole (2), house mouse (2), brush mouse (1), California pocket mouse (1), San Diego pocket mouse (1), unidentified shrew (2), unidentified rodent (1), unidentified rabbit (1), and unidentified mammal (1).

Large Mammals

Large mammals, particularly mammalian carnivores, are inherently difficult to census given large home ranges, small populations, nocturnality, and extreme wariness due to direct persecution by humans. Absolute density estimates for carnivores are therefore elusive. As a result, indirect survey techniques have been developed to evaluate the

relative abundance of carnivore populations (Wilson et al. 1996). We used a combination of track counts and remotely-triggered cameras to survey large mammals in the Santa Ana Mountains study area.

Track Surveys

Track surveys were conducted to evaluate distribution, relative abundance, and movement patterns of large mammals throughout the Santa Ana study area (Figure 6). Survey methodology followed that employed by Dr. Kevin Crooks in regional carnivore surveys in coastal southern California (Crooks 2000, 2001, Crooks and Soulé 1999). Focal areas included the Tenaja Corridor (Figure 7), SMER, Fallbrook Public Utilities District property (FPUD - southwest of SMER), the Interstate 15 (I-15) transportation corridor, and private and public lands east of SMER across Interstate 15. Along each transect, we established a series of track detection stations at 250 m intervals along dirt roads or trails. Each track station consisted of a 1-m diameter circle of freshly sifted gypsum 1 cm deep and scented with carnivore lures. All tracks were identified and measured daily. For each transect, relative abundance is expressed as the total number of visits recorded for each species divided by the total sampling effort (station-nights = number of stations x number of nights sampled). This survey methodology is therefore an index of relative abundance - it should not be expected to provide a census of the absolute number of individuals in each study area. Rather, it provides comparative information on the relative numbers of individuals across space and time (Sargeant et al. 1998).

In all, we detected a total of 12 species of medium- or large-bodied mammals at track stations: deer, coyote, domestic dog, gray fox, mountain lion, bobcat, striped skunk, raccoon, American badger, domestic dog, domestic cat, and Virginia opossum. At the Tenaja Corridor (Table 7), we detected a total of 8 species of medium- or large-bodied mammals on the track stations in 622 station-nights (in decreasing order of abundance): coyote (377 stations visited), domestic dog (277), gray fox (29), bobcat (27), deer (5), striped skunk (5), mountain lion (3), and opossum (1). At Fallbrook Public Utility District property west of SMER (Table 7 - Continued), we detected a total of 5 species on track stations during 114 station-nights: domestic dog (55), coyote (34), opossum (4), raccoon (2), and striped skunk (1). At SMER, we detected a total of 6 species on track stations during 486 station-nights: coyote (237), domestic dog (105), gray fox (21), raccoon (8), mountain lion (6), and bobcat (5). East of SMER across I-15 (Temecula Creek Inn, BLM Property, Rainbow Canyon Road), we detected 7 species on track stations in 231 station-nights: coyote (120), domestic dog (77), raccoon (13), bobcat (7), striped skunk (3), gray fox (1), and opossum (1). At track stations situated along roadways throughout the study area (De Luz Road, Sandia Creek Drive, Rancho California Road, and I-15), we detected 8 species in 777 station-nights: coyote (112), domestic dog (94), domestic cat (8), bobcat (5), gray fox (4), raccoon (2), opossum (2), and badger (1).

Camera Surveys

Remotely-triggered infrared cameras are valuable tools to detect wildlife movement because they can monitor potential movement routes for an extended period of time with minimal supervision (Carthew and Slater 1991). Each camera unit is generally comprised of the camera, a camera cover, a mounting stake, a battery pack, and an infra-red trigger mechanism. Camera systems provide several functions: 1) to positively identify carnivore species present in an area; 2) to provide verification of track identifications at track stations; and 3) to provide pictures of resident carnivore species to resource managers.

Remotely-triggered infra-red cameras were installed at 19 locations throughout the Santa Ana project area (Figure 8), including 16 within the Tenaja Corridor (Figure 9). Where possible, camera locations were restricted to relatively concealed locations where possibility of camera theft was minimal. Camera stations were checked regularly throughout the study. In 2,961 camera-nights (the number of camera stations multiplied by the number of nights they were sampled), camera stations within the Tenaja Corridor recorded corridor usage by 11 medium- to large-bodied mammal species (Table 8): coyote (406 pictures), bobcat (171), gray fox (84), mule deer (54), raccoon (16), striped skunk (20), mountain lion (7), American badger (6), domestic dog (4), opossum (3), and long-tailed weasel (1). In 159 camera-nights, camera stations in SMER, Temecula Creek, and the BLM property recorded coyote (32 pictures), bobcat (192), gray fox (88), mule deer (54), raccoon (48), striped skunk (46), mountain lion (7), American badger (6), domestic dog (4), opossum (3), and long-tailed weasel (1). Representative pictures of animals recorded within the Tenaja Corridor are presented in Appendix 1.

Birds

Point counts

In April and May 1999 we conducted bird point count surveys at 25 stations established along the Tenaja Corridor; stations were associated with the herpetofauna arrays (Figure 5). Three eight-minute point counts were conducted at each station. During point counts, we recorded all individuals detected, method of detection (e.g. call, song, visual, fly-over), distance to the observer, and the habitat in which the bird was observed (following Bolger et al. 1997, Crooks et al. 2001).

We detected a total of 2,148 individuals of 77 bird species during our 1999 point count surveys in the Tenaja Corridor (Table 9). The most common species detected, in decreasing order of abundance, were acorn woodpecker (187 detections), wrentit (163), spotted towhee (140), ash-throated flycatcher (94), house wren (93), scrub jay (89), oak titmouse (84), lesser goldfinch (84), western meadowlark (82), and American crow (74). We conducted these surveys to compile species lists for the Tenaja Corridor, to gather baseline data for future surveys, and to design more extensive point count surveys for the Santa Ana project area.

In spring 2000, we conducted a second series of point count surveys throughout the Santa Ana Mountains project area. The study area encompassed approximately 800 square km in San Diego and Riverside Counties. To designate point count locations, we first used a Geographic Information System (GIS) to generate a 1 square kilometer grid, with potential sampling points located in the middle of each grid cell. This grid of points was then overlaid on our GIS map of the study area. Accessibility determined the exact location at which the actual point count was conducted; terrain and land ownership usually determined accessibility. Ultimately, 379 point counts were conducted using the grid overlays (Figures 10, 11). In addition, we established 39 additional point counts stations approximately every 0.5 miles along several riparian corridors in the study area: De Luz Creek, Santa Margarita River, Sandia Creek, and Cottonwood Creek.

At each station, we conducted one 8-minute, 100-m fixed radius point count between April 17 and June 21, 2000. Point counts were conducted between 5:30 a.m. and 11:00 a.m. in favorable weather conditions. The points were broken down into 0-5 minute and 5-8 minute time frames. Additionally, the radius of detection was broken down into 0-50 m and 51-100 m. We recorded a total of 9,576 detections of 117 species of birds during these point counts (Table 10). The most common species detected throughout the Santa Ana Mountains project area were lesser goldfinch (1,025 detections), house finch (821), wrentit (561), spotted towhee (560), California towhee (527), bushtit (423), mourning dove (391), American crow (326), and Anna's hummingbird (306). These data will be analyzed to evaluate the effect of land-use type (e.g. chaparral, coastal-sage scrub, oak-woodland, grassland, agricultural, urban) on bird community composition.

Rapid Ornithological Inventories (ROI)

The Rapid Ornithological Inventory (ROI) is a method of quickly gaining a measure of bird populations at a single station to compare their abundance, composition, and population structure with other, similar stations. The objectives of ROI surveys are: (1) to quantify the bird population of a site of ~ 2 ha by mist netting and census; (2) to capture and census as many individuals as possible in the site to provide an adequate sample; and (3) to conduct the ROI in relatively homogenous habitat, focusing on riparian habitats We constructed four banding sites in the Santa Ana project area (Figure 12): 1.) East Fork of De Luz Creek in the Santa Rosa Plateau Ecological Reserve, 2.) Santa Margarita River in the Santa Margarita Ecological Reserve, 3.) Los Alamos Creek in Cleveland National Forest Trabuco District, and 4.) an unnamed tributary to Tenaja Creek at the junction of Cleveland Forest Road and Tenaja Road (Figure 13). Each site was sampled twice from May through August 2000. We set up a minimum of six mist-nets at each sampling point. Nets were sampled in the morning and afternoon the first day, and again in the morning on the second day of sampling. All birds caught were banded and released. In addition, a minimum of three search routes were conducted in the area to record the presence of all birds surrounding the mist netting stations. A total of 292 individual birds of 38 species were captured among all four banding sites (Table 11). We banded 29 individuals of 11 species in the Santa Margarita River, 94 individuals of 24 species in East Fork De Luz Creek, 71 individuals of 19 species in Los Alamos Creek, and 98 individuals of 22 species in the unnamed tributary to Tenaja Creek. The most common

species captured in the ROI surveys were wrentit (41 captures), spotted towhee (34), lesser goldfinch (33), California towhee (33), and song sparrow (21).

Bat Surveys

Surveys for foraging and roosting bats were conducted during the spring and summer months of 1999 and 2000. A total of 34 days and/or nights were spent in the field at 22 different sites within the study area (Figure 14); 12 of these sites were located within the Tenaja Corridor (Figure 15). The survey sites typically were chosen based on the presence of habitat components frequented by bat species. These habitat components include open water, geomorphic features such as rocky outcrops and cliffs, vegetative communities such as riparian woodland (i.e. oaks, sycamores, cottonwoods and willows), and man-made structures such as bridges and buildings. Several of the sites were surveyed multiple times, usually due to poor conditions on initial visits. Surveys for foraging bats commenced at or near sunset and concluded within 2.5 to 4 hours. Roost searches were conducted during both day and night.

Due to the behavioral and ecological diversity of bats, no single survey technique is effective for detecting all bat species (Wilson et al. 1998). Therefore, we used three survey methods to detect the maximum number of species possible. Although each of the techniques has its advantages and limitations, in combination they provide a higher probability of detecting a greater diversity of bat species.

1) Acoustic: an Anabat II broadband ultrasonic bat detector was used in combination with a zero crossing analysis system and a laptop computer for detecting, recording, and analyzing bat vocalizations for purposes of species identification. Not all bat species are equally detectable using this technique. Bats that produce low intensity and/or high frequency calls, such as the Townsend's big-eared bat (*Corynorhinus townsendii*) and some *Myotis* species, are more difficult to detect than bats that produce high intensity and/or lower frequency calls, such as the big brown bat (*Eptesicus fuscus*) and the Mexican free-tailed bat (*Tadarida brasiliensis*). Other species, such as the pallid bat (*Antrozous pallidus*), that do not frequently echolocate but simply passively listen for prey would go undetected using a bat detector alone. The use of the unaided ear was also helpful in detecting the Western mastiff bat (*Eumops perotis*), which is usually detectable at a much greater range with the unaided ear than with a bat detector. A spotlight was used in conjunction with the Anabat II bat detector to help visually locate, observe, and identify foraging bats.

2) Capture: mist nets were used to identify species and to assess age, reproductive status, and overall condition of captured individuals. Three to four nets of sizes from 7'x18' to 7'x42' were placed in locations most likely to capture foraging bats, such as over small bodies of water or blocking "flyways" among vegetation. Not all species are equally likely to be captured in mist nets. Western mastiff bats and other members of the free-tailed bat family (Molossidae) usually fly much higher than the level at which mist nets are typically placed. Other species, such as the Townsend's big-eared bat, often are

adept at detecting and avoiding mist nets. A primary limitation of mist nets is that they only sample a very small portion of the space being utilized by foraging bats.

3) Roost Surveys: roost surveys are the most effective way to detect colonial, cavity-dwelling species such as the Townsend's big-eared bat. Roost searches in natural features such as rocky cliffs, crevices, snags, and tree foliage can be time and labor intensive; these types of roosts are more easily located by tracking radio-collared bats. Man-made structures such as bridges and buildings, however, can be more easily inspected for roost sites. Roost surveys in this study were limited to a few, selected structures in the vicinity of several survey sites.

A total of 130 detections of 10 bat species were recorded by acoustic means, mist-net capture, and roost searches at 22 sites (Table 12): big brown bat (22 detections), Yuma myotis (21), small-footed myotis (19), Mexican free-tailed bat (16), western mastiff bat (16), western pipistrelle (12), California myotis (11), pocketed free-tailed bat (10), western red bat (2), and pallid bat (1).

When bat diversity at sites within the Tenaja Corridor is aligned from west (Cleveland National Forest) to east (Santa Rosa Plateau), bat diversity is generally highest nearest the core habitats of the Cleveland National Forest and the Santa Rosa Plateau (Table 12). The obvious exception is the high bat diversity associated with a pond near the DOW property within the Tenaja Corridor, suggesting that the presence of open water sites attracts bats. Bat species diversity appears to be positively associated with habitat diversity; those sites with more habitat components (open water, geomorphic features, trees, human structures) generally supported more species. Habitat suitability within the Tenaja Corridor differs among bat species. For example, both the big brown bat and the California myotis appear to be present throughout the Tenaja Corridor, suggesting that suitable habitat exists - across the entire linkage. Conversely, the Western red bat and the pallid bat appear to be found only near core areas, suggesting less suitable habitat within the Tenaja Corridor. Overall, it is likely that creation, restoration, and maintenance of habitat mosaics within the Tenaja Corridor will benefit a diverse bat population.

Water Quality/Hydrology/Riparian Sampling

Water quality/hydrology/riparian sampling was conducted in those stream systems adjacent to and that drain the Santa Rosa Plateau. The initial survey identified 63 field locations in seven drainages (Figure 16); 9 stations were located within the Tenaja Corridor (Figure 17). A suite of water quality variables including pH, conductivity, total dissolved (T.D.) solids, turbidity, temperature, salinity and dissolved oxygen (D.O.) were measured during sampling visits. Instrumentation used to record these variables were a YSI 85 Handheld Dissolved Oxygen, Conductivity, Salinity and Temperature System, an Oakton TDSTestr 10 for total dissolved solids, and an Oakton pHTestr 2 for pH.

Habitat variables recorded at each site included percent cover, vegetative type for streambed and bank, substrate type for streambed and bank, and general descriptions of water flow including stream width, depth and qualitative estimates of flow. In addition to

collection of habitat and environmental variables, aquatic vertebrate and large macro-invertebrate species catalogs were recorded for each site. Voucher specimens of species not considered threatened or sensitive were collected at each site.
A total of four sampling periods were completed from March through August, 2000: 1.) March 10th-27th, 2.) May 2nd-11th, 3.) June 27th-29th, and 4.) August 30th-September 1st (Table 13). Of the 63 original sites, 32 were dry by the fourth sample period ("dry" stations). Dry sites showed a strong seasonal pattern in drying back, transitioning from swiftly flowing streams, to pools connected by shallow channels with slow but visible flow, to small unconnected pools, to a dry stream-bed. Of the 31 remaining sampling sites ("wet" stations), the majority showed no change over the sample period, a few had qualitative increases in flow, and a few showed signs of drying back. Average peak water quality values for wet and dry sites, respectively, were 22.47, 20.46 for water temperature, 0.78, 0.41 for salinity, 104.43, 104.69 for Dissolved Oxygen (D.O.), 1549, 818 for conductivity, and 8.15, 7.6 for pH.

We recorded a total of 33 observations of exotic aquatic vertebrates and large macro-invertebrates during the study period. Eighty two per cent (24) of detections of exotic species occurred at locations that remained wet throughout the study period. Exotic species included bullfrog (*Rana catesbiana*), red swamp crayfish (*Procambrius clarkii*), largemouth bass (*Micropterus salmoides*), black bullhead (*Ameiurus melas*), green sunfish (*Lepomis cyanellus*), and western mosquitofish (*Gambusia affinis*). We recorded a total of 58 observations of native species. In contrast to exotic detections, only 43% (25) of detections of native species occurred at wet locations. Native species included pacific tree frog, arroyo toad, western toad, California newt, two-striped garter snake, and western pond turtle.

Our results highlight two issues of interest in managing amphibian habitat in the Tenaja area: agricultural runoff as a water input source into local drainages and the presence of exotic species. Agricultural input keeps drainages from experiencing the natural cycle of almost complete drying seen in undisturbed drainages. In contrast with the exotic species listed above, most native taxa are well adapted to annual drying. When stream drainages remain wet year round, native amphibians will often take advantage of the available breeding habitat. However, perennial water also allows exotic species to persist in habitats in which they might otherwise not be able to survive.

Water quality values for wet and dry sites differed with sites that remained wet throughout the study on average more mineralized than sites that went dry. This interesting difference in mineralization may represent signatures from two different sources of water. Those dry sites that showed a strong seasonal influence had natural precipitation as a primary source of water and therefore showed lower levels of mineralization. Those drainages that remained wet during the sample period had agricultural input as a primary source of water and showed the increased mineralization levels associated with imported water.

Road Transects

We drove road transects at night on roadways throughout the Santa Ana project area and recorded all animals encountered (Figures 18, 19). We attempted to time these night driving surveys for nights with measurable rainfall (classified as "wet nights" when the roadway was wet during the driving surveys), and if possible also conducted road surveys the night before and the night after the rainfall bout (classified as "dry nights" if the roadway was dry or only slightly moist during driving surveys).

We recorded a total of 1,114 animals during our night driving surveys (Table 14). The most common species found were western toad (617 records) unidentified tree frog species (246), Pacific tree frog (215), California tree frog (11), and western spadefoot toad (7). Road mortality was high for these species; western toad (34%), tree frog species {59%; including unidentified tree frog species (93%), Pacific tree frog (21%), and California tree frog (9%)}, and western spadefoot toad (20%). During night driving surveys in the Tenaja Corridor we also encountered a variety of other species, including coyotes, rabbits, small mammals, and spiders.

Activity differed strikingly between wet and dry nights. Species detected only on dry nights included bullfrog, red diamond rattlesnake, and gopher snake. Species detected only when roads were wet were Pacific slender salamander, arboreal salamander, California newt, western spadefoot toad, California kingsnake, and western diamondback. Species that were more abundant on wet nights included western toad (82% of total detections were on wet nights) and the two tree frog species {97%; including Pacific tree frog (96%), California tree frog (91%), and unidentified tree frog species (99%)}. During 93 road nights with rain, we recorded 465 dead animals and 505 alive animals on roadways, yielding an overall mortality rate of 48%. In contrast, during 161 road nights that were classified as dry, we recorded only 25 dead animals and 105 alive animals, yielding an overall mortality rate of 19%. Clearly, the presence of roads in this region has an impact on the herpetofauna community, particularly on wet nights when these species are active.

In addition to rainfall, road mortality was also influenced by the type of road surveyed. The highest mortality rates (> 50%) occurred on such highly traveled roads as Sandia Creek Drive (68%), Avenida La Cresta (61%), De Luz Road (53%), and Carancho Road (50%). Roads with intermediate levels of traffic showed a lower mortality rate: Via Santa Rosa (41%), Clinton Keith Road (33%), Rancho California Road (29%), and Tenaja Road (27%). Small two-lane roads had the lowest mortality rates: Avenida La Cresta (dirt portion) (16%), Calle Companero/De Lobo (14%), Cleveland Forest Road (4%), Calle de Mucho (0%), and Corona Cala Camino (0%).

We also drove road transects during the day to record road kill information (Figures 20, 21). A total of 175 road kills were recorded (Table 15). The most commonly detected species were Beechey ground squirrel (49 road kills), western toad (23), rabbit (15), coyote (11), opossum (10), domestic dog (9), gopher snake (8), striped racer (7), and striped skunk (7). It should be emphasized that these numbers represent minimum

estimates because 1) roadways were only driven twice a week, thus leaving multiple days for road kill to be removed by humans, driven over, or scavenged upon, 2) some individuals may have been too small to detect, and 3) some individuals crossing the road may have been struck by a vehicle and moved off of the roadway before dying. Continued compilation and mapping of road kill information will help identify unsuccessful animal crossing locations, and monitoring such records over time will result in more accurate analysis of impacts associated with urban development, road construction, and increased traffic (Swift et al. 1993).

CONCLUSIONS

The original design of the Tenaja Corridor consisted of four major "nodes" of habitat along the length of the Tenaja Corridor (Figure 22) that were intended to be the focus of conservation and acquisition efforts for The Nature Conservancy. In the concluding sections, we first provide a brief description of each node and review the major impediments to animal movement within and between nodes. Then, we provide a summary review of the species we detected within the Tenaja Corridor and within each node. Finally, we provide some recommendations for future conservation action in the Tenaja Corridor.

Description of Tenaja Nodes

1.) Node 1

Node 1 is located on the western boundary of the Santa Rosa Plateau Ecological Reserve. It is bordered to the east by Tenaja Road and Via Volcano and extends from the Sylvan Meadows Area (Santa Rosa Plateau Ecological Reserve) to Avocado Mesa Road (Figure 22). The land is dominated by grassland and oak woodland and is bisected by Cole Creek. Three roadways represent potential impediments to movement between the SRP and node 1. Tenaja Road, located in the upper portion of node 1 and the most heavily traveled of the three roads, is an impediment to movement along the north-south axis of node 1. Species attempting to travel between Sylvan Meadows and the headwaters of Cole Creek must cross this road. Via Volcano, which borders node 1 to the east, bisects two principal movement routes. The first route (A - Figure 22) is along Cole Creek, however the presence of two large drainage culverts under the road makes this crossing less formidable. The second movement route (B - Figure 22) is to the south in the vicinity of the vernal pools within SRP. This route parallels Avocado Mesa Road to the north and connects the reserve with a drainage to De Luz Creek (see node 2 description). Fortunately, traffic volume on this stretch of Via Volcano is relatively low. Rancho California Road/Calle de Mucho (referred to as a single road since there is continuos pavement) bisect the middle of node 1. This road serves several houses and therefore has low traffic volume. However, it does bisect the Cole Creek and De Luz Creek headwaters. Recently, a culvert was installed under Rancho California Road so that it is more permeable to smaller vertebrates such as reptiles and amphibians.

Aside from the several developed properties along Calle de Mucho, this node remains largely undeveloped. There is additional private property on the northwest side of node 1, which is surrounded by barbed wire and contains a house, young apple orchard, and a human-made pond. The western boundary of node 1 is becoming increasingly developed and grazed.

2.) Node 2

Node 2 is located on the east and west slopes of De Luz Creek between Tenaja Road and Avocado Mesa Road (Figure 22). The land is dominated by chaparral and is bisected by a riparian area running north and south along De Luz Creek. Several side canyons drain into De Luz Creek from the east (which connect to node 1) and west (which connect to node 3). These drainages and their surrounding slopes serve as excellent physical connections to surrounding nodes, primarily due to the undisturbed state of the riparian areas. The eastern drainage is only infringed upon by several developed properties along Calle de Mucho (see node 1 description). The western drainage (Route C - Figure 22) is protected by a conservation easement between nodes 2 and 3. Certainly, this node represents an important area for conservation, not only because it provides links to protected areas to the east (node 1, Santa Rosa Plateau Ecological Reserve) and west (node 3, node 4, Cleveland National Forest), but also to the south. This southern link is represented by De Luz Creek (Route D - Figure 22), and serves as a critical movement route between the Santa Rosa Plateau and the Santa Margarita River. It also connects to larger areas of protected properties, including FPUD and Camp Pendleton.

Tenaja Road is located just north of node 2. While movement north of this road via De Luz Creek is possible, the habitat quickly reverts to developed and grazed properties. Development has encroached on this node from the north (between node 2 and Tenaja Road) and northwest (just west of Calle Viento). The adjacent property to the north has recently been cleared and slated for development. The developed land to the northwest contains several houses and large human-made ponds. To the south and west, the habitat remains relatively undisturbed. Avocado Mesa Road, the southern boundary of node 2, is a washed out dirt road that is impassable to motor vehicles.

3.) Node 3

The habitat within node 3 contains a mixture of chaparral, coastal sage scrub, grassland, oak woodland, and riparian. While movement from the east (Route C via De Luz Creek - Figure 22) is relatively uninhibited, the remaining three sides of this node are bordered by roads, all of which potentially threaten movement to surrounding areas. These roads include Corona Cala Camino (to the west), Avocado Mesa Road (to the south), and Tenaja Road (to the north) (Figure 22). Tenaja Road represents the greatest potential impediment to movement between node 3 and points north. The primary movement route in this direction is likely to occur along an unnamed tributary to Los Alamos Creek, which drains north into Cleveland National Forest (route E - Figure 22).

Corona Cala Camino and Avocado Mesa Road are small dirt roads that serve several developed properties on the south and southeast border of node 3. However, these roads are slated to be paved, thus posing a potential threat to movement if traffic increases, particularly for smaller vertebrates. The area around the intersection of Corona Cala Camino and Avocado Mesa Road is critical in that it serves as the principal movement route between nodes 3 and 4. These routes include 1) crossing Corona Cala Camino to the west and then Tenaja Road to the north to an unnamed tributary of Tenaja Creek (route F - Figure 22), and 2) crossing Corona Cala Camino/Avocado Mesa Road to the west, following the edge of the plateau past the Caesar Property to a natural saddle which drops into Cleveland National Forest (Route G - Figure 22). Additionally, this intersection contains the headwaters of an unnamed tributary that drains into De Luz Creek.

The increase in development along the western and southern boundaries of this node could jeopardize movement along the corridor, and with the paving of Corona Cala Camino and Avocado Mesa Road, future development seems inevitable. Currently, several properties along the western side of Corona Cala Camino and along Avocado Mesa Road are slated for development.

4.) Node 4

Node 4 is located directly east and adjacent to Cleveland National Forest (Figure 22). It extends east along an unnamed tributary to Tenaja Creek to a point just east of Cleveland Forest Road. The habitat is a mixture of chaparral, coastal sage scrub, grassland, oak woodland, and riparian. Steep slopes with large boulders dominate the northern portion of node 4. The western portion of the node is private property dominated by grazed grassland; a substantial portion of this section, however, has recently been purchased by The Nature Conservancy (Hines property). Two roads serve as potential impediments to movement: Cleveland Forest Road and Tenaja Road. Cleveland Forest Road is a small paved road, but it receives periodic peaks in traffic volume because it is the primary access road into this portion of Cleveland National Forest. Movement of animals across this road (primarily smaller vertebrates such as amphibians) is concentrated along the section of road that crosses an unnamed tributary to Tenaja Creek (route H - Figure 22). To the east, this drainage extends along Tenaja Road and is one of the primary links between nodes 3 and 4. Tenaja Road borders the eastern edge of node 4. While there are several developed properties along this road (particularly south of Cleveland Forest Road), some stretches bisect large portions of habitat. The primary movement route between node 3 and the southeastern section of node 4 would involve crossing this section of Tenaja Road and continuing up a drainage to a natural saddle along the edge of the plateau (Route G - see node 3 for description).

The recent acquisition of the Hines property secures the southern portion of node 4. Development along the north side of Cleveland Forest Road, however, forces movement along the Tenaja Corridor into two likely paths. First, animals could move to the south of these properties along the unnamed tributary to Tenaja Creek, just north of the intersection between Tenaja Road and Cleveland Forest Road (route H - Figure 22). The

second option would be to travel around the north side of the properties, along the foothills of the rocky slopes of Squaw Mountain (route I - Figure 22). Whereas the first route seems the more direct and likely option, future conservation efforts should restrict any encroachment on route H as well. Additionally, increased development along Tenaja Road would disrupt movement between node 4 and points east (to node 3 via route F) and southeast (via Cottonwood Creek, a large drainage of De Luz Creek).

Tenaja Corridor Biodiversity Summary

Our baseline biodiversity surveys indicate that the Tenaja Corridor is being utilized by a wide variety of species. We detected over 130 species within the Tenaja Corridor, including over 26 species of herpetofauna, 11 species of small mammals, 11 species of large mammals, 77 species of birds, and 10 species of bats. A variety of native species considered particularly sensitive to fragmentation and other anthropogenic disturbances were detected within the Tenaja Corridor, including California newt, coast horned lizard, western whiptail, western pond turtle, red-diamond rattlesnake, striped racer, greater roadrunner, California gnatcatcher, western mastiff bat, bobcat, badger, and mountain lion.

To assess species diversity per node within the Tenaja Corridor, we selected clusters of sampling points that best approximated species occurrences within each node. For example, we selected the following pitfall arrays to derive species occurrences per node for herpetofauna, small mammals, and birds (bird point counts were conducted at pitfall arrays): Node 1: arrays 1-8; Node 2: arrays 9-15; Node 3: arrays 18-24; and Node 4: arrays 30-35 (see Figure 5 - note that sampling points did not necessarily fall within the exact boundaries of each node as depicted in Figure 22). In the same manner, we also selected bat sampling stations and carnivore track and camera stations that were representative of each node.

Overall species richness of terrestrial vertebrates (Table 16) was highest in node 4 (94 vertebrate species detected), lowest in node 2 (78 species), and moderate in nodes 1 and 3 (83 species each). For herpetofauna, the number of species slightly increased from node 1 (14 species) to nodes 3 and 4 (17 species each), even though the number of pitfall arrays decreased from node 1 (8 arrays) to node 4 (6 arrays). Eleven herpetofauna species were detected in all nodes: Pacific slender salamander, Pacific treefrog, western toad, southern alligator lizard, western skink, western whiptail, western fence lizard, side-blotched lizard, yellow-bellied racer, ringneck snake, and two-striped garter snake. These species therefore appear to be distributed along the length of the Tenaja Corridor, suggesting that the Tenaja Corridor may provide some connectivity function. In contrast, 8 species were detected only in 1 node (arboreal salamander, California newt, Gilbert's skink, granite spiny lizard, coast horned lizard, gopher snake, speckled rattlesnake, and red diamond rattlesnake), potentially suggesting a more limited distribution.

Like herpetofauna, bird species richness also was highest in node 4 (57 species) and was lower in nodes 1 (45 species), 2 (42 species), and 3 (41 species); the number of point count stations was highest in nodes 1 and 2 (5 stations each) and lowest in node 3 (3

stations). Twenty of the 77 bird species were detected in all nodes, suggesting a broader distribution across the Tenaja Corridor, whereas 18 species were detected in only one node, suggesting a more limited distribution.

For small mammals, the number of species detected was consistent among all four nodes (9-11 species per node); the number of pitfall arrays decreased from node 1 (8 arrays) to node 4 (6 arrays). Ten small mammal species were detected in 3 to 4 nodes, whereas only 3 species (desert cottontail, California pocket mouse, and house mouse) were detected in only 1 node. Thus, small mammal communities appear fairly uniform across the Tenaja Corridor.

For bats, the number of species detected was highest in nodes 1 (8 species) and 3 (7 species), and lowest in nodes 2 (3 species) and 4 (4 species); the number of bat sampling stations decreased from node 1 (4 sites) to node 4 (1 site). Five of the 10 bat species were detected in 3 or 4 nodes, whereas 2 bats (western mastiff and western red bat) were detected in only 1 node, suggesting a more limited distribution.

Finally, the number of large mammal species detected was highest in nodes 2 (9 species) and 3 (8 species), and lower in nodes 1 (5 species) and 4 (6 species). Sampling effort paralleled species richness per node, with highest track and camera nights in nodes 2 (899 sampling nights) and 3 (841 nights) and lower sampling effort in nodes 1 (625 nights) and 4 (525nights). Coyote, domestic dog, gray fox, bobcat and mule deer were detected in 3 or 4 nodes, whereas long-tailed weasel, badger, and opossum were detected in only one node.

We would like to again emphasize that the actual number of species per node is partially a function of which sampling sites we decided to include in Table 16. The exact numbers and identities of species in each node would change with even slight modifications as to which sampling stations (and therefore how much sampling effort) we designated for each node as well as the exact boundaries of each node. The summary tables for each taxa, along with the associated figures, provide the complete data on the distribution of species across the Tenaja Corridor and should be referred to for detailed information about species occurrences.

It should also be emphasized that the data presented here provide information on the distribution and abundance of populations in sites across the Tenaja Corridor, but do not necessarily provide information on movement of individuals between sites. Populations of a species might be present in all four nodes, but that does not necessarily imply that those populations are functionally connected, particularly if major impediments to movement exist between nodes. Currently, significant impediments to movement along the Tenaja Corridor are relatively limited. Future development, roadway construction, and incompatible land use practices, however, could constrain movement pathways. Analyses of individual movement, demography, and genetic variation are necessary to more fully assess connectivity along the entire length of the Tenaja Corridor.

Recommendations

While the purpose of the four Tenaja nodes is to protect relatively large blocks of undisturbed habitat along Tenaja Corridor, protecting key properties between these patches will help provide a continuous link of relatively undisturbed habitat between the Santa Rosa Plateau and the Cleveland National Forest. In addition to protecting as much property as possible within each node, continued focus should be directed to connect these nodes with the widest linkages possible. Through conservation easements and reserve land, linkages between nodes 1 and 2 and between nodes 2 and 3 are nearly continuous.

If possible, nodes should be connected by multiple linkages rather than relying on a single link. For example, we have provided at least two examples where movement between nodes is likely divided between two principal routes of travel: 1) between nodes 1 and 2, which include a northern route along Cole Creek (route A - Figure 22) and a southern route along Avocado Mesa Road (route B), and 2) between nodes 3 and 4, which include a northern route along the north side of Tenaja Road (route F) and a southern route over the saddle (route G). Such design redundancy will provide multiple avenues of animal travel across the Tenaja Corridor. In addition, these alternative routes could prove valuable if a disturbance such as a fire disrupts a particular part of the Tenaja Corridor.

Aside from maintaining multiple connections within the Tenaja Corridor, other connections between the corridor and larger areas of habitat should also be considered. Such regional, landscape linkages will promote the long-term viability of the Tenaja Corridor, SRP, and Cleveland National Forest by allowing exchange of individuals from other large core areas across the landscape. Several potential regional connections exist, including connections to the north (to Cleveland National Forest via an unnamed tributary to Los Alamos Creek) and to the south (to the Santa Margarita River, FPUD property, and Camp Pendleton via De Luz Creek and associated tributaries). Two additional connections between the SRP and larger core areas should be considered, including 1) the eastern foothills of the Santa Rosa Plateau, which offer the best link to connect the southeastern portion of the reserve with SMER, and 2) Sandia Creek, which drains the southern portion of SRP and links to the Santa Margarita River, FPUD, and BLM properties. The establishment of a network of corridors and core reserves across the regional landscape will increase the likelihood of persistence of local populations within both the Tenaja Corridor and the SRP.

Further management strategies can help ensure the long-term success of the Tenaja Corridor. As development progresses within and around the Tenaja Corridor, natural habitats and the wildlife they support will increasingly face a suite of environmental impacts. Such edge effects will include non-native predators and competitors (e.g. domestic dogs and cats), grazing and habitat disturbance by domestic livestock, invasive plant species, fencing, light pollution, noise pollution, and urban runoff (Murcia 1995). In addition, as human populations grow in the vicinity, more people will use the Tenaja

Corridor for recreation, further degrading the natural environment. Such recreational uses should be monitored, and if necessary, limited.

Our research has also found an adverse effect of roads on animal mortality, particularly with amphibians. How to address these issues should be carefully considered before future expansion of roadways throughout the area. Repaving events, as foreseen on Corona Cala Camino, may not seem to contribute to additional impacts on road mortality. However, repaving dirt roads results in vehicles traveling at faster speeds, thereby increasing the likelihood of road kill. Further, paving typically leads to greater traffic volumes since the road becomes more accessible to the general public, thus further increasing road kill. Several management strategies can reduce animal mortality on roads (Haas 2000). For large mammals, underpasses can be successful tools in forcing animals under a roadway; proper fencing installed along the road will funnel animals through the underpass and prevent them from surface crossing. Smaller culverts can be successful in reducing road mortality of smaller vertebrates, such as reptiles and amphibians. Again, proper fencing will ensure that these animals cannot gain access to the road surface. In places where underpasses may not be feasible, warning lights, signs, or speed bumps can be placed to warn motorists in areas of high animal crossing rates. These methods could be particularly useful during rainfall events, when amphibians are more likely to be out on the road.

Given the projected development in this area, the placement of future homesites within and around the Tenaja Corridor will be critical. Homesite development that is still compatible with connectivity will likely entail detailed, and perhaps complicated, planning models that would analyze the best configuration of homesites for all developed parcels within the Tenaja Corridor. In general, homesites should be situated as far from the center of the Tenaja Corridor as possible, avoiding likely movement routes, sensitive areas, and core habitat blocks. Often, this will require homesites to be positioned along existing roads, rather than extending the homesite disturbance into the interior portions of habitat. Clustering houses along roads will generally lessen the impact of the residence on the corridor by minimizing constrictions to the Tenaja Corridor.

Finally, we recommend future monitoring of the Tenaja Corridor and surrounding areas. We view the information presented in this report as baseline data on the distribution and relative abundance of vertebrate species in the region. Clearly, other taxa, such as plants and terrestrial and aquatic invertebrates, would need to be surveyed for a more complete representation of biodiversity. Only with additional research and monitoring can the effects of future landscape alterations and other environmental impacts be evaluated. We hope that the data presented herein can serve as a foundation for such research. In addition, analysis and interpretation of our survey data is ongoing. We plan to write-up the results of select surveys (e.g. bird, bat, water quality, and road kill data) for submission for publication as separate papers in scientific journals. In addition, we plan to write a summary paper where we combine all data collected to synthesize, review, and interpret overall diversity patterns in the Tenaja Corridor and southern Santa Ana Mountains project area. We will submit final copies of these manuscripts as they are completed.

Summary of Recommendations

- provide a continuous link of relatively undisturbed habitat between the Santa Rosa Plateau and the Cleveland National Forest with the widest linkages possible
- nodes should be connected by multiple linkages
- regional landscape linkages will promote the long-term viability
- monitor for and if necessary (and where possible) limit edge effects including non-native predators and competitors, grazing and habitat disturbance by domestic livestock, invasive plant species, fencing, light pollution, noise pollution, and urban runoff , and human recreation activities
- consider adverse effect of roads and where possible use underpasses and culverts with fences
- homesites should be situated as far from the center of the Tenaja Corridor as possible
- develop future biodiversity monitoring of the Tenaja Corridor and surrounding areas

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Table 1. Number of herpetofauna captured in the Tenaja Corridor through pitfall sampling, January 15, 1999 through September 20, 2000 (70 total sample days).

		Pitfall Array Number																																							
Common name	**Scientific 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	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	**Total**
Pacific slender salamander	*Batrachoseps pacificus*	0	1	0	0	0	0	0	0	0	0	1	0	1	2	1	0	0	3	0	2	3	4	11	0	15	5	0	1	12	4	2	23	5	6	0	0	2	0	12	8	124
Arboreal salamander	*Aneides lugubris*	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3
Monterey salamander	*Ensatina escholtzi*	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	3	0	8	0	0	1	0	1	0	1	0	1	1	0	0	0	1	0	20
California Newt	*Taricha torosa*	0	0	0	0	0	0	0	0	0	0	1	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	7	12	20
Pacific treefrog	*Hyla regilla*	1	0	0	0	0	0	0	1	1	3	0	4	2	3	3	0	0	0	0	0	0	0	1	0	4	0	0	0	1	2	1	0	1	0	0	0	0	1	1	2	32
Western toad	*Bufo boreas*	6	8	1	0	2	1	0	1	1	0	0	1	0	0	3	3	1	2	0	0	0	0	1	1	23	3	4	0	4	2	1	8	2	1	2	0	0	1	4	5	92
Western pond turtle	*Clemmys marmorata*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Southern alligator lizard	*Elgaria multicarinatus*	1	0	1	8	4	4	2	4	0	0	0	0	0	1	0	13	9	4	1	1	1	1	0	9	1	1	0	1	4	1	0	0	1	4	12	0	0	0	5	3	97
Gilbert skink	*Eumeces gilberti*	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	1	0	0	0	0	1	0	0	0	0	0	0	2
Western skink	*Eumeces skiltonianus*	2	9	1	2	3	11	11	1	0	1	0	3	0	0	3	1	0	1	6	3	0	1	1	0	0	0	0	0	1	4	6	14	0	2	4	9	5	0	4	2	111
Western whiptail	*Cnemidophorus tigris*	0	0	0	0	2	2	0	0	0	3	0	0	0	3	0	0	0	1	0	0	1	0	0	0	6	3	2	5	7	1	3	0	4	9	0	1	0	7	0	0	60
Western fence lizard	*Sceloporus occidentalis*	7	19	0	3	0	4	16	5	4	12	8	8	3	13	13	7	4	26	1	6	6	5	5	20	5	2	10	15	11	5	6	3	12	6	35	3	9	21	8	14	360
Granite spiny lizard	*Sceloporus orcutti*	0	0	0	0	0	0	0	0	0	0	6	0	0	6	3	0	0	0	0	0	0	0	0	0	0	0	1	7	0	0	0	0	0	0	0	0	0	0	0	1	24
Side blotched lizard	*Uta stansburiana*	0	0	0	0	6	3	1	0	0	0	0	1	0	2	1	0	0	0	10	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	1	3	12	3	0	0	46
Coast horned lizard	*Phrynosoma coronatum*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	12	1	1	0	0	0	0	0	1	0	0	14	0	0	32
Yellow-bellied racer	*Coluber constrictor*	3	0	2	6	4	1	2	1	0	0	0	0	0	0	0	13	10	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	47
Western ringneck snake	*Diadophis punctatus*	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	1	0	0	0	7
Western patch-nosed snake	*Salvadora hexalepis*	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	1	0	0	1
Night snake	*Hypsiglena torquata*	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	1	1
California kingsnake	*Lampropeltis getulus*	0	3	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	10
Striped racer	*Masticophis lateralis*	0	0	0	0	0	1	3	1	0	0	0	0	1	0	2	0	0	2	0	3	0	0	0	0	2	0	0	0	1	0	0	1	0	1	0	0	0	1	0	0	19
Gopher snake	*Pituophis melanoleucas*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Two-striped garter snake	*Thamnophis hammondii*	0	1	0	0	0	0	0	1	2	0	0	2	3	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	13
Speckled rattlesnake	*Crotalus mitchellii*	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2
Red diamond rattlesnake	*Crotalus ruber*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Southern pacific rattlesnake	*Crotalus viridis*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	6
Total # of captures		20	41	5	22	21	27	36	17	8	20	17	19	10	31	29	39	25	41	21	20	13	11	24	32	67	15	31	32	46	20	19	50	27	33	59	18	30	49	42	48	1135
Total # of species		6	6	4	6	6	8	7	10	4	5	5	6	5	8	8	7	5	9	6	9	5	4	8	5	10	6	6	8	13	8	6	6	8	11	9	6	6	7	8	9	26

Table 2. Number of herpetofauna captured in the Santa Margarita Reserve by pitfall sampling, April 1, 1996 through September 1, 2000 (pitfall arrays 1-5: 230 sampling days; pitfall arrays 6-15: 50 sampling days).

		Pitfall Array Number					total	Pitfall Array Number										total	Total
Common name	**Scientific name**	1	2	3	4	5	(1-5)	6	7	8	9	10	11	12	13	14	15	(6-15)	(1-15)
Pacific slender salamander	*Batrachoseps pacificus*	1		1	1	2	5							1	19	1		21	26
California treefrog	*Hyla cadaverina*				2		2											0	2
Pacific treefrog	*Hyla regilla*	1	1			2	4						2	2				4	8
Western toad	*Bufo boreas*	2	1	1			4		5			2				1		8	12
Western spadefoot	*Scaphiopus hammondii*	1	6		1		8											0	8
Western pond turtle	*Clemmys marmorata*				4		4											0	4
Southern alligator lizard	*Elgaria multicarinatus*	12	11	8	1	6	38	1				2			2			5	43
Gilbert skink	*Eumeces gilberti*	7	1		2		10											0	10
Western skink	*Eumeces skiltonianus*	8	4	1			13		1	2								3	16
Orange throated whiptail	*Cnemidophorus hyperythrus*	12	19	14	19	9	73								2		1	3	76
Western whiptail	*Cnemidophorus tigris*	7	17	4	2	3	33	1	2	1	1	12	2					19	52
Western fence lizard	*Sceloporus occidentalis*	6	14	13	11	9	53	4	3	2	4	4	2	4	1	2	7	33	86
Granite spiny lizard	*Sceloporus orcutti*	1			2	1	4						1					1	5
Side blotched lizard	*Uta stansburiana*		2				2					1					6	7	9
Coast horned lizard	*Phrynosoma coronatum*	1					1				3		1					4	5
Western Ringneck snake	*Diadophis punctatus*		2	4	1	1	8											0	8
Night snake	*Hypsiglena torquata*				1		1											0	1
California kingsnake	*Lampropeltis getulus*						0					1						1	1
Coachwip	*Masticophis flagellum*		1	1			2											0	2
Striped racer	*Masticophis lateralis*	1	3	2			6				1							1	7
Gopher snake	*Pituophis melanoleucas*			3		3	6											0	6
Western patch-nosed snake	*Salvadora hexalepis*			1			1											0	1
California black-headed snake	*Tantilla planiceps*				1		1			1								1	2
Two-striped garter snake	*Thamnophis hammondii*				6		6											0	6
Speckled rattlesnake	*Crotalus mitchellii*		1				1											0	1
Red diamond rattlesnake	*Crotalus ruber*	2					2						3					3	5
Southern Pacific rattlesnake	*Crotalus viridis*	2		1		1	4											0	4
	Total # of captures	64	83	54	54	37	292	6	11	6	9	22	11	7	33	4	14	123	415
	Total # of species	15	14	13	14	10	26	3	4	4	4	6	6	3	4	3	3	15	27

Table 3. Number of herpetofauna captured in Camp Pendleton through pitfall trapping, December 13, 1996 through September 2, 2000 (130 total sampling days).

		Pitfall Array Number								
Common Name	**Scientific Name**	21	22	23	24	27	28	29	30	**Total**
Pacific slender salamander	*Batrachoseps pacificus*	2	1	7	10	9	1	2	30	65
Arboreal Salamander	*Aneides lugubris*								1	1
California newt	*Taricha torosa*			3	3					6
Pacific treefrog	*Hyla regilla*	3	2			3	3			15
Arroyo Toad	*Bufo microscaphus*					5	13			18
Southern alligator lizard	*Elgaria multicarinatus*	1	1	2	3	1	2		9	19
Western skink	*Eumeces skiltonianus*					4	4	4		12
Orange-throated whiptail	*Cnemidophorus hyperythrus*		1			14	4	1		20
Western whiptail	*Cnemidophorus tigris*	4	6	3	7	3	8	4		35
Western fence lizard	*Sceloporus occidentalis*	15	21	16	14	16	11	36	15	144
Granite spiny lizard	*Sceloporus orcutti*		1	2						3
Side-blotched lizard	*Uta stansburiana*	3	4		1			2		10
Coast horned lizard	*Phrynosoma coronatum*	3								3
Western ringneck snake	*Diadophis punctatus*			1				2		3
Night snake	*Hypsiglena torquata*					1			1	2
California kingsnake	*Lampropeltis getulus*				1					1
Striped racer	*Masticophis lateralis*			1	1	1	2	4	2	11
Gopher snake	*Pituophis melanoleucas*		1							1
Western patch-nosed snake	*Salvadora hexalepis*		1		1					2
Two-striped garter snake	*Thamnophis hammondii*			1						1
Speckled rattlesnake	*Crotalus mitchellii*								1	1
	Total # of captures	31	39	36	41	57	48	55	59	366
	Total # of species	7	10	9	9	10	9	8	7	21

Table 4. Number of small mammals captured in the Tenaja Corridor through pitfall sampling, January 15, 1999 through September 20, 2000 (70 total sample d

Pitfall Array Number (arrays 1–20)

Common Name	Scientific Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Deer mouse (species unknown)	*Peromyscus species*		2	4			2	6	3	6	2	7	3	2	1	6	4	4	12	2	9
Deer mouse	*Peromyscus maniculatus*	8	12				2	1										6	1	11	7
California mouse	*Peromyscus californicus*	3		4				6		1		2	1	6			1	5	4	2	5
Brush mouse	*Peromyscus boylei*	1								1	3	1			3	7					
California vole	*Microtus californicus*	3	4	10	10	24	15	16	1	10	16	9	8	4	14	13	53	41	24	30	22
Western harvest mouse	*Reithrodontomys megalotis*	4	1	5	11			3							2	1	4	21		3	4
Desert shrew	*Notiosorex crawfordi*				2				1	1	2	1			1	4				1	
Ornate shrew	*Sorex ornatus*												1		1	1	1			1	2
Botta's pocket gopher	*Thomomys bottae*	4	7	3	3	3	5	1		1		2	1	1		2	1	2	2		
Pocket mouse (species unknown)	*Chaetodipus species*	1	1																1		
California pocket mouse	*Chaetodipus californicus*		1																		
Desert cottontail	*Sylvilagus audubonii*										1	1									
House mouse	*Mus musculus*			1																	
	Total # of captures	24	28	27	26	27	24	33	5	20	24	23	14	13	22	34	64	79	44	50	49
	Total # of species	6	5	5	4	2	3	5	2	5	4	6	4	3	5	6	5	5	4	6	5

Pitfall Array Number (arrays 21–40)

Common Name	Scientific Name	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	Total
Deer mouse (species unknown)	*Peromyscus species*	9	10		1	1	10			1	1	1	10	9	7	1				2		138
Deer mouse	*Peromyscus maniculatus*			1	6		1					1	1	2	5	5						70
California mouse	*Peromyscus californicus*		2	1	6	7	5				1			8	5		2					77
Brush mouse	*Peromyscus boylei*	1	1									2	1									21
California vole	*Microtus californicus*	26	23	23	104	15	17	11	4	17	6	3	5	10	15	6	3		3			618
Western harvest mouse	*Reithrodontomys megalotis*		1	1	5	1	4			2				19	14	6	2	1				115
Desert shrew	*Notiosorex crawfordi*				1	2		2	1	1					1		1					22
Ornate shrew	*Sorex ornatus*	7	4	1		2	2		2		2	1	1	1								30
Botta's pocket gopher	*Thomomys bottae*		2	1	2	1	1			1		3	4	3		3	1	1				61
Pocket mouse (species unknown)	*Chaetodipus species*												1		1		1	1				7
California pocket mouse	*Chaetodipus californicus*																					1
Desert cottontail	*Sylvilagus audubonii*																					2
House mouse	*Mus musculus*																					1
	Total # of captures	43	43	28	125	29	40	13	7	22	10	11	23	52	48	21	10	3	3	2	0	1163
	Total # of species	3	6	6	6	6	6	2	3	4	3	5	5	6	5	4	5	2	1	0	0	11

Table 5. Number of small mammals captured in Santa Margarita Reserve through pitfall sampling, April 1, 1996 through September 1, 2000 (pitfall arrays 1-5: 230 sampling days; pitfall arrays 6-15: 50 sampling days

		Pitfall Array Number					Total	Pitfall Array Number										Total	Total
Common Name	**Scientific Name**	1	2	3	4	5	(1-5)	6	7	8	9	10	11	12	13	14	15	(6-15)	(1-15)
Deer mouse (species unknown)	*Peromyscus species*	1		2			3			1								1	4
Deer mouse	*Peromyscus maniculatus*	5	7	11	1	1	25								5	3		8	33
California mouse	*Peromyscus californicus*	2	6	5		2	15	1					1			1	2	5	20
Cactus mouse	*Peromyscus eremicus*	4	4	1	1		10			1								1	11
Brush mouse	*Peromyscus boylei*					2	2											0	2
Western harvest mouse	*Reithrodontomys megalotis*	25	30	24		4	83		1								1	2	85
California vole	*Microtus californicus*	6	5	16	3	1	31									1		1	32
Desert shrew	*Notiosorex crawfordi*	24	22	4	5	8	63		2		1	1	3					7	70
Ornate shrew	*Sorex ornatus*	16	25	13	9	12	75						3					3	78
Botta's pocket gopher	*Thomomys bottae*	4		4	2		10								1	2		3	13
Pocket mouse (species unknown)	*Chaetodipus species*	1	1		1		3											0	3
California pocket mouse	*Chaetodipus californicus*	1	1	1			3											0	3
San Diego pocket mouse	*Chaetodipus fallax*		2	1			3											0	3
Unknown rabbit			1				1											0	1
Unknown rodent					1	2	3											0	3
	Total # of captures	89	104	82	23	32	330	1	3	2	1	1	7	0	6	7	3	31	361
	Total # of species	9	9	10	6	7	11	1	2	1	1	1	3	0	2	4	2	11	11

Table 6. Number of small mammals captured at Camp Pendleton by pitfall sampling, December 13, 1996 through September 2, 2000 (130 total sampling days).

		Pitfall Array Number								
Common Name	Scientific Name	21	22	23	24	27	28	29	30	**Total**
Deer mouse (species unknown)	*Peromyscus species*		2			2	2	2	1	9
Deer mouse	*Peromyscus maniculatus*	3	3	5		4	6	9	6	36
California mouse	*Peromyscus californicus*	3		2	2	7	5	4	20	43
Cactus mouse	*Peromyscus eremicus*	3					1	1		5
Brush mouse	*Peromyscus boylei*								1	1
California vole	*Microtus californicus*	3	2	4		5		38		52
Western harvest mouse	*Reithrodontomys megalotis*	2	1	1	5	7	5	25	7	53
Desert shrew	*Notiosorex crawfordi*		3	2	4	2	3	4		18
Ornate shrew	*Sorex ornatus*	3	5	7	5	1	1	4	1	27
Unknown shrew			1					1		2
California mole	*Scapanus latimanus*							2		2
Botta's pocket gopher	*Thomomys bottae*			2	1		2		1	6
Pocket mouse	*Chaetodipus species*									0
California pocket mouse	*Chaetodipus californicus*							1		1
San Diego pocket mouse	*Chaetodipus fallax*						1			1
House mouse	*Mus musculus*					2				2
Unknown rabbit			1							1
Unknown rodent						1				1
Unknown mammal								1		1
	Total # of captures	17	18	23	17	31	26	92	37	261
	Total # of species	6	5	7	5	7	8	9	6	13

Table 7. Mammalian carnivore species detected through baited track station surveys.

Survey Site	Transect	Dates Surveyed	Track Stations	Station Nights	Species Detected	# Detections	Track Index
Tenaja	Calle de Mucho	May 25 - 29, 1999	4	96	*Canis latrans* (Coyote)	66	0.688
		Aug 20 - 29, 1999			*Canis familiaris* (Domestic dog)	65	0.677
		Oct 20 - 23, 1999			*Odocoileus hemionus* (Mule deer)	3	0.031
		Jun 13 - 17, 2000			*Felis rufus* (Bobcat)	1	0.010
Tenaja	Calle Viento	July 1 - 5, 1999	12	173	*Canis latrans* (Coyote)	98	0.566
		Oct 20 - 23, 1999			*Canis familiaris* (Domestic dog)	89	0.514
		Jun 13 - 1, 2000			*Urocyon cinereoargenteus* (Gray fox)	13	0.075
					Felis rufus (Bobcat)	7	0.040
					Didelphis virginiana (Virginia opossum)	1	0.006
Tenaja	Corte Colinga	July 1 - 5, 1999	6	90	*Canis latrans* (Coyote)	48	0.533
		Oct 20 - 23, 1999			*Canis familiaris* (Domestic dog)	27	0.300
		Jun 21 - 25, 2000			*Felis rufus* (Bobcat)	8	0.089
					Urocyon cinereoargenteus (Gray fox)	5	0.056
					Mephitis mephitis (Striped skunk)	1	0.011
					Odocoileus hemionus (Mule deer)	1	0.011
Tenaja	DOW	May 25 - 29, 1999	5	119	*Canis latrans* (Coyote)	76	0.639
		Aug 20 - 29, 1999			*Canis familiaris* (Domestic dog)	55	0.462
		Oct 20 - 23, 1999			*Urocyon cinereoargenteus* (Gray fox)	8	0.067
		Jun 21 - 25, 2000			*Puma concolor (* Cougar)	3	0.025
					Felis rufus (Bobcat)	1	0.008
					Odocoileus hemionus (Mule deer)	1	0.008
					Mephitis mephitis (Striped skunk)	1	0.008
Tenaja	Viejo Road	May 25 - 29, 1999	4	99	*Canis latrans* (Coyote)	55	0.556
		Aug 20 - 29, 1999			*Canis familiaris* (Domestic dog)	28	0.283
		Oct 20 - 23, 1999			*Felis rufus* (Bobcat)	8	0.081
		Jun 21 - 25, 2000			*Mephitis mephitis* (Striped skunk)	3	0.030
					Urocyon cinereoargenteus (Gray fox)	1	0.010
Tenaja	Caeser Property	July 1 - 5 1999	5	45	*Canis latrans* (Coyote)	34	0.756
	(not mapped - discontinued)	Oct 20 - 23, 1999			*Canis familiaris* (Domestic dog)	13	0.289
					Felis rufus (Bobcat)	2	0.044
					Urocyon cinereoargenteus (Gray fox)	2	0.044

Table 7 (Continued - 2) Mammalian carnivore species detected through baited track station surveys.

Survey Site	Transect	Dates Surveyed	Track Stations	Station Nights	Species Detected	# Detections	Track Index
FPUD	River Trail	Sep 11 - 17, 1999	3	20	*Canis familiaris* (Domestic dog)	12	0.600
					Canis latrans (Coyote)	4	0.200
					Memphitis memphitis (Striped skunk)	1	0.050
					Procyon lotor (Raccoon)	1	0.050
FPUD	Rock Mountain Road	Sep 11 - 17, 1999	2	14	*Canis familiaris* (Domestic dog)	7	0.500
					Canis latrans (Coyote)	5	0.357
FPUD	Sandia Creek Road/FPUD	Sep 11 - 17, 1999	6	40	*Canis familiaris* (Domestic dog)	11	0.275
					Canis latrans (Coyote)	6	0.150
					Didelphis virginiana (Virginia opossum)	2	0.050
FPUD	Santa Margarita River Dam	Sep 11 - 17, 1999	2	13	*Canis familiaris* (Domestic dog)	8	0.615
					Didelphis virginiana (Virginia opossum)	1	0.077
FPUD	Stagecoach Road	Sep 11 - 17, 1999	4	27	*Canis latrans* (Coyote)	19	0.704
					Canis familiaris (Domestic dog)	17	0.630
					Didelphis virginiana (Virginia opossum)	1	0.037
					Procyon lotor (Raccoon)	1	0.037
SMER	Camino Estribo Road	Oct 5 - 12, 1999	5	38	*Canis latrans* (Coyote)	14	0.368
					Canis familiaris (Domestic dog)	11	0.289
					Urocyon cinereoargenteus (Gray fox)	3	0.079
					Procyon lotor (Raccoon)	1	0.026
SMER	Gorge (not mapped - discontinued)	Aug 18 - 27, 1999	5	50	*Canis latrans* (Coyote)	16	0.320
					Urocyon cinereoargenteus (Gray fox)	3	0.060
					Felis rufus (Bobcat)	1	0.020
SMER	North Gorge	Aug 18 - 27, 1999 Aug 2 - 8, 2000	5	85	*Canis latrans* (Coyote)	50	0.588
					Canis familiaris (Domestic dog)	11	0.129
					Puma concolor (Cougar)	4	0.047
					Urocyon cinereoargenteus (Gray fox)	3	0.035
					Procyon lotor (Raccoon)	2	0.024
SMER	South Gorge	Aug 18 - 27, 1999 Aug 2 - 8, 2000	5	84	*Canis latrans* (Coyote)	36	0.429
					Canis familiaris (Domestic dog)	11	0.131
					Procyon lotor (Raccoon)	2	0.024
					Urocyon cinereoargenteus (Gray fox)	1	0.012
					Felis rufus (Bobcat)	1	0.012
SMER	MWD Road	Sep 11- 17, 1999 Aug 2 - 8, 2000	5	67	*Canis latrans* (Coyote)	30	0.448
					Canis familiaris (Domestic dog)	19	0.284
					Urocyon cinereoargenteus (Gray fox)	3	0.045
					Puma concolor (Cougar)	2	0.030
SMER	Rainbow Glen Road	Aug 18 - 27, 1999 Aug 2 - 8, 2000	5	81	*Canis latrans* (Coyote)	55	0.679
					Canis familiaris (Domestic dog)	36	0.444
					Urocyon cinereoargenteus (Gray fox)	4	0.049
					Felis rufus (Bobcat)	2	0.025
					Procyon lotor (Raccoon)	1	0.012
SMER	Stone Creek	Aug 18 - 27, 1999 Aug 2 - 8, 2000	5	81	*Canis latrans* (Coyote)	36	0.444
					Canis familiaris (Domestic dog)	17	0.210
					Urocyon cinereoargenteus (Gray fox)	4	0.049
					Procyon lotor (Raccoon)	2	0.025
					Felis rufus (Bobcat)	1	0.012

Table 7 (Continued - 3) Mammalian carnivore species detected through baited track station surveys.

Survey Site	Transect	Dates Surveyed	Track Stations	Station Nights	Species Detected	# Detections	Track Index
Temecula Creek Inn	Northeast	Oct 5 - 12, 1999	5	29	*Canis familiaris* (Domestic dog)	18	0.621
					Canis latrans (Coyote)	6	0.207
Temecula Creek Inn	Northwest	Oct 5 - 12, 1999	3	47	*Canis latrans* (Coyote)	28	0.596
		Jul 8 - 16, 2000			*Canis familiaris* (Domestic dog)	16	0.340
					Procyon lotor (Raccoon)	3	0.064
					Felis rufus (Bobcat)	1	0.021
Temecula Creek Inn	West	Oct 5 - 12, 1999	4	67	*Canis latrans* (Coyote)	44	0.657
		Jul 8 - 16, 2000			*Canis familiaris* (Domestic dog)	10	0.149
					Procyon lotor (Raccoon)	10	0.149
					Felis rufus (Bobcat)	5	0.075
					Memphitis memphitis (Striped skunk)	3	0.045
					Urocyon cinereoargenteus (Gray fox)	1	0.015
					Didelphis virginiana (Virginia opossum)	1	0.006
Temecula Creek Inn	Rainbow Canyon Road	Jul 8 - 16, 2000	5	44	*Canis latrans* (Coyote)	15	0.341
					Canis familiaris (Domestic dog)	12	0.273
					Felis rufus (Bobcat)	1	0.023
BLM Property	BLM	Jul 8 - 16, 2000	5	44	*Canis latrans* (Coyote)	27	0.614
					Canis familiaris (Domestic dog)	21	0.477
Interstate 15	Interstate 15 Northbound	Jul 7 - 16, 2000	27	269	*Canis latrans* (Coyote)	18	0.067
					Felis catus (Domestic cat)	6	0.022
					Canis familiaris (Domestic dog)	5	0.019
					Didelphis Virginiana (Virginia Opossum)	2	0.007
Interstate 15	Interstate 15 Southbound	Jul 7 - 16, 2000	24	239	*Canis familiaris* (Domestic dog)	8	0.033
					Canis latrans (Coyote)	8	0.033
					Urocyon cinereoargenteus (Gray fox)	2	0.008
					Felis rufus (Bobcat)	1	0.004
Roads	De Luz Road	Aug 24 - 30, 2000	22	131	*Canis familiaris* (Domestic dog)	52	0.397
					Canis latrans (Coyote)	50	0.382
					Felis rufus (Bobcat)	3	0.023
					Felis catus (Domestic cat)	2	0.015
					Urocyon cinereoargenteus (Gray fox)	2	0.015
					Procyon lotor (Raccoon)	1	0.008
Roads	Rancho California Road	Aug 24 - 30, 2000	4	37	*Canis familiaris* (Domestic dog)	8	0.216
					Canis latrans (Coyote)	8	0.216
Roads	Sandia Creek Road	Aug 24 - 30, 2000	13	101	*Canis latrans* (Coyote)	28	0.277
					Canis familiaris (Domestic dog)	21	0.208
					Felis rufus (Bobcat)	1	0.010
					Procyon lotor (Raccoon)	1	0.010
					Taxidea taxus (American badger)	1	0.010

Table 8. Mammalian carnivore species detected at camera stations in the Tenaja and Pechanga corridors.

Survey Site	Camera Name	Camera-Nights	Species Detected	Number of Detections	Camera Index
Cleveland Nat'l Forest	Forest	16	*Procyon lotor* (Raccoon)	4	0.250
			Canis latrans (Coyote)	2	0.125
			Canis familiaris (Domestic dog)	1	0.063
			Mephitis mephitis (Striped skunk)	1	0.063
			Urocyon cinereoargenteus (Gray fox)	1	0.063
Tenaja	Viejo (2 cameras)	426	*Canis latrans* (Coyote)	27	0.063
			Felis rufus (Bobcat)	23	0.054
			Mephitis mephitis (Striped skunk)	7	0.016
			Urocyon cinereoargenteus (Gray fox)	4	0.009
			Odocoileus hemionus (Mule deer)	1	0.002
Tenaja	Corte Colinga	542	*Urocyon cinereoargenteus* (Gray fox)	49	0.090
			Felis rufus (Bobcat)	11	0.020
			Mephitis mephitis (Striped skunk)	8	0.015
			Canis latrans (Coyote)	6	0.011
			Procyon lotor (Raccoon)	2	0.004
			Taxidea taxus (American badger)	1	0.002
Tenaja	DOW (6 cameras)	390	*Canis latrans* (Coyote)	38	0.097
			Felis rufus (Bobcat)	4	0.010
			Felis concolor (Mountain lion)	3	0.008
			Odocoileus hemionus (Mule deer)	1	0.003
			Urocyon cinereoargenteus (Gray fox)	1	0.003
Tenaja	Corriente	332	*Odocoileus hemionus* (Mule deer)	18	0.054
			Canis latrans (Coyote)	8	0.024
			Procyon lotor (Raccoon)	6	0.018
			Mephitis mephitis (Striped skunk)	4	0.012
			Canis familiaris (Domestic dog)	1	0.003
Tenaja	Calle Viento	520	*Canis latrans* (Coyote)	66	0.127
			Felis rufus (Bobcat)	29	0.056
			Urocyon cinereoargenteus (Gray fox)	25	0.048
			Odocoileus hemionus (Mule deer)	10	0.019
			Procyon lotor (Raccoon)	4	0.008
			Canis familiaris (Domestic dog)	1	0.002
			Didelphis virginiana (Virginia opossum)	1	0.002
			Mustela frenata (Long-tailed weasel)	1	0.002

Table 8 (Continued -2). Mammalian carnivore species detected at camera stations in the Tenaja and Pechanga corridors.

Survey Site	Camera Name	Camera-Nights	Species Detected	Number of Detections	Camera Index
Tenaja	De Luz	31	*Canis latrans* (Coyote)	22	0.710
			Odocoileus hemionus (Mule deer)	4	0.129
			Felis rufus (Bobcat)	3	0.097
Tenaja	Via Volcano/Cole Creek Culvert	84	*Canis latrans* (Coyote)	7	0.083
Tenaja	Avocado Mesa	stolen			
Tenaja	Old Avocado Mesa	175	*Felis rufus* (Bobcat)	20	0.114
			Canis latrans (Coyote)	5	0.029
			Felis concolor (Mountain lion)	4	0.023
			Urocyon cinereoargenteus (Gray fox)	4	0.023
			Didelphis virginiana (Virginia opossum)	2	0.011
Tenaja	Calle de Mucho	529	*Canis latrans* (Coyote)	232	0.439
			Felis rufus (Bobcat)	81	0.153
			Odocoileus hemionus (Mule deer)	20	0.038
			Taxidea taxus (American badger)	5	0.009
			Canis familiaris (Domestic dog)	1	0.002
SMER	North Gorge	65	*Felis rufus* (Bobcat)	10	0.154
			Canis latrans (Coyote)	4	0.062
Temecula Creek Inn	Golf Course	115	*Procyon lotor* (Raccoon)	31	0.270
			Mephitis mephitis (Striped skunk)	26	0.226
			Canis latrans (Coyote)	15	0.130
			Felis rufus (Bobcat)	10	0.087
			Urocyon cinereoargenteus (Gray fox)	3	0.026
BLM Property	BLM	44	*Canis latrans* (Coyote)	13	0.295
			Felis rufus (Bobcat)	1	0.023
			Procyon lotor (Raccoon)	1	0.023
			Urocyon cinereoargenteus (Gray fox)	1	0.023

Table 9. Number of birds detected in the Tenaja corridor in Spring 1999 through point count surveys

	Pitfall Sampling Array																										TOTAL # OF DETECTIONS
SPECIES	2	3	5	7	8	9	10	12	13	14	16	18	20	22	25	26	27	29	31	32	33	35	36	39	40	
Acorn Woodpecker	5	3	3	1	4		4	3		7	8	9	3	4	5			3	7	11	14	8	56	10	19	187
American Crow	1	5		2		7	2	8	7	4	2	3	8	5	1				2	1	2	2	4	2	6	74
American Kestrel			1																							1
American Pipit																						1				1
American Robin												1										1			1	3
Anna's Hummingbird		2	1	2	2	6	5	3	4	4		1		1	3	2	4	2			13	1	1	4	2	63
Ash-throated Flycatcher	5	3	3	5	3	1		5	3	1	20	3	3	1	4	3	4	2	2	5	6	2	2	2	6	94
Band-tailed Pigeon						1															1				5	7
Barn Swallow	2																					1				3
Bewick's Wren			1	2	4	5	3	10	2	6					4	2	3		4		6		1		1	54
Black Phoebe								1																1		2
Black-chinned Hummingbird						1															1					2
Black-chinned Sparrow						6	5	1	4	1			2					2			1	1	1			24
Black-headed Grosbeak					4						1		1	4	3	1		2	3	1		1	1	2	6	30
Black-throated Gray Warbler															1				2	1	1		1		1	7
Blue Grosbeak											4											1				5
Blue-gray Gnatcatcher						1																				1
Brown-headed Cowbird																				1	2	1	1	1	2	8
Bullock's Oriole		1	1	1							1											1				5
Bushtit				8	6	2	1	1	2			4	2	2	2		5	8	5	3	1		1		5	58
California Gnatcatcher					1	1											1	2								5
California Quail	2	2	3	2	1		4	4	1		1	3	3	3		4		1	3	4	8		3	5	10	67
California Thrasher			2	2	2	1	4	5	4			1	7	4	3	2	3	3	3		6	1	7		3	63
California Towhee					5							1			2	3		2	2		5	2	1	1	7	31
Canyon Wren				2																						2
California Kingbird																						5				5
Cliff Swallow		13	2	1				1																		17
Common Raven	2		2	2	6	1	1	1	12	1	3	10	4			1	2	1		2	8	2	3		1	65
Common Yellowthroat	2	3			1				1	1	3				1					3	4	2	3			24
Costa's Hummingbird		1	1	1	1			4	2						1	1					1	1	1			15
Downy Woodpecker		1																								1
European Starling	1	1	3								3				10	1			4	1	15	11	2	4	4	60
Golden-crowned sparrow																									1	1
Great Horned owl					4																					4
Greater Roadrunner														1												1
Hermit Thrush															2				1							3
House Finch	1	1			1		3				3					2		1			3	2	2	11	1	31
House Wren	3	2	4	6	5		1	1		2		2	6	1	5			2	5	10	10	1	3	9	15	93
Hutton's Vireo	1								1				1	2					2	2				2		11
Killdeer											1															1
Lark Sparrow	1		1			1		1	3		3	1				1						2	2	2		18
Lazuli Bunting		4	1	2							1												1			9
Lesser Goldfinch	5	8	7	4	5	2	1				7	3			1				7	2	18	5	2	4	1	82
Lincoln's Sparrow		1										1				1					1	1				5
Mallard								1			3	1						2	1		1			1		10
Mountain Quail							1				1	1		1	1		2		4		10	3	2			26
Mourning Dove	6	5	3	1	1	1	1	2	3	3	3	2		1	3	3			2	3	7	4	7	5	5	71
Northern Flicker			3	1			1					1	4		1	1	1		2	1	1				1	18
Northern Harrier																									1	1
Nuthatch																					1					1
Nuttall's Woodpecker			1								2		5			1		2	1		3	1			1	17
Oak Titmouse	7	3	5	4	3	1		1	2	2		7	2	5	1		2	1	7	6	4	4	2	5	10	84
Orange-crowned Warbler						1	1	1	2		1			3			1				1		1		2	14
Phainopepla		2	1	2		2			1		1								1		3	1	1		1	16
Red-shouldered Hawk		1				2			1						2		1	1			3	1				12
Red-tailed Hawk	1		2		3		1				2				1			1						1		12
Red-winged Blackbird	1																									1
Rufous-crowned Sparrow	1	2		2								1	3													9
Sage Sparrow							2	1	1												1					5
Say's Phoebe													1													1
Scrub Jay		2	2	6	8		1	1	1	4			6	2	4	11	3	4	1	7	4	6	5	2	9	89
Song Sparrow	5	3			2				1		10	1			1					1	5	1		1	1	32
Spotted Towhee			7	5	5	3	6	4	6	5	2	2	3	7	5	6	6	8	9	2	21	12	6	4	6	140
Townsend's Warbler				2								4							4						3	13
Turkey Vulture										1	1						5		1		1					9
Warbling Vireo																									1	1
Western Bluebird				1								2				4				3			2		1	13
Western Kingbird															2											2
Western Meadowlark	4	4	6	4	1	3	2	6	2	4	8	5	1	2	1		3			2	8	7	5	2	2	82
Western Wood-pewee														1		1						1				3
White-breasted Nuthatch	2	2						2				2		1	1				1	1	1			2	2	17
White-crowned Sparrow		1			1								1			1			1							5
White-tailed Kite	2	1			1	1		7	6	2	1										2					23
Wilson's Warbler												1		1		1		2	2	1		1			3	12
Wrentit			4	6	4	9	14	12	10	11		2	8	10	8	11	14	8	7	4	14	2	3		2	163
Yellow Warbler																				1						1
Yellow-rumped Warbler														2												2
Total # Detections per Array	60	77	70	77	84	59	64	87	82	59	96	75	74	64	79	64	60	60	96	79	218	100	133	83	148	2148
Total # Species per Array	22	27	26	27	27	23	22	26	25	17	27	28	21	23	29	23	17	22	30	26	41	37	32	24	37	77

Table 10. Number of birds detected in the Santa Ana Mountains project area through Spring 2000 point count surveys

Species	Total	Species	Total
Acorn Woodpecker	149	Killdeer	20
Allen's Hummingbird	4	Lawrence Goldfinch	9
American Crow	326	Lark Sparrow	15
American Goldfinch	22	Lazuli Bunting	45
American Kestrel	17	Least Bell's Vireo	1
American Robin	20	Lesser Goldfinch	1025
Anna's Hummingbird	306	Loggerhead Shrike	1
Ash-throated Flycatcher	198	Mallard	30
Barn Swallow	1	Mourning Dove	391
Black-Chinned Hummingbird	52	Mountain Quail	29
Black-chinned Sparrow	74	Nashville Warbler	2
Bewick's Wren	156	Northern Harrier	1
Blue-gray Gnatcatcher	15	Northern Mockingbird	78
Brown-headed Cowbird	69	Northern Rough-Winged Swallov	29
Black-headed Grosbeak	41	Nuttall's Woodpecker	88
Blue Grosbeak	28	Oak Titmouse	162
Black Phoebe	77	Orange-crowned Warbler	86
Brewer's Blackbird	146	Oregon Junco	5
Black-throated Gray Warbler	1	Peacock	1
Band-Tailed Pigeon	32	Phainopepla	103
Bullock's Oriole	93	Pacific-Slope Flycatcher	69
Bushtit	423	Purple Finch	1
California Gnatcatcher	6	Ruby-Crowned Kinglet	1
California Kingbird	53	Rufous-crowned Sparrow	136
California Towhee	527	Red-necked Phalarope	3
Canyon Wren	3	Rock Dove	44
California Quail	145	Rooster	3
California Thrasher	155	Red-Shafted Flicker	83
Cassin's Vireo	1	Red-shouldered Hawk	43
Cedar Waxwing	10	Red-tailed Hawk	31
Chipping Sparrow	3	Red-winged Blackbird	153
Cliff Swallow	215	Sage Sparrow	14
Common Grand Dove	3	Say's Phoebe	14
Cooper's Hawk	7	Savannah Sparrow	10
Costa's Hummingbird	139	Song Sparrow	151
Common Raven	75	Spotted Towhee	560
Common Yellowthroat	67	Sharp-Shinned Hawk	1
Downy Woodpecker	1	Swaison's Hawk	1
Dusky Flycatcher	1	Tricolored Blackbird	5
European Starling	195	Townsend's Warbler	2
Fox Sparrow	1	Turkey Vulture	19
Great-Blue Heron	3	Warbling Vireo	3
Golden-crowned sparrow	2	White-breasted Nuthatch	4
Great Egret	1	White-crowned Sparrow	15
Gray Flycatcher	1	Western Bluebird	25
Greater Roadrunner	8	Western Kingbird	4
Grasshopper Sparrow	19	Western Meadowlark	121
Great-Tailed Grackle	2	Western Scrub Jay	226
Hairy Woodpecker	2	Western Tanager	2
Hermit Thrush	1	Western Wood-Pewee	4
Hermit Warbler	1	Wilson's Warbler	11
House Finch	821	Wrentit	561
Horned Lark	21	White-Tailed Swift	19
Hooded Oriole	40	Flycatcher Species	1
House Sparrow	60	Hummingbird Species	9
House Wren	160	Yellow-breasted Chat	27
Hutton's Vireo	37	Yellow-rumped Warbler	16
		Yellow Warbler	27
Grand Total			9576

Table 11. Birds banded through Rapid Ornithological Inventories (ROI) in the Santa Ana Mountains project area

Species	Santa Margarita	East Fork De Luz	Los Alamos	Tenaja Creek	Grand Total
Allen's Hummingbird	1	1			2
Anna's Hummingbird		2			2
Ash-Throated Flycatcher	1	3	1	4	9
Black-chinned Hummingbird				1	1
Bewick's Wren		1	1	1	3
Brown-headed Cowbird	2				2
Black-headed Grosbeak			3	4	7
Blue Grosbeak		6		1	7
Black Phoebe	2		3		5
Bushtit		2	2	1	5
California Towhee	1	16	5	11	33
California Quail				5	5
California Thrasher		1	3	3	7
Common Yellowthroat	3	1		6	10
Grasshopper Sparrow		2			2
House Finch			5	1	6
Hooded Oriole	3				3
House Wren		1		2	3
Lawrence's Goldfinch			5		5
Lazuli Bunting				1	1
Least Bell's Vireo				1	1
Lesser Goldfinch	4	16	6	7	33
Mourning Dove			1		1
Nuttall's Woodpecker		3	1		4
Oak Titmouse	2	2	4	6	14
Orange-crowned Warbler		1		1	2
Oregon Junco			1		1
Pacific-slope Flycatcher			2	1	3
Rufous-crowned Sparrow	1	5	1		7
Red-shafted Flicker		3			3
Song Sparrow	9	10	1	1	21
Spotted Towhee		8	9	17	34
Swainson's Thrush		3			3
Warbling Vireo		1			1
Western Bluebird		1			1
Western Scrubjay				1	1
Wilson's Warbler		3			3
Wrentit		2	17	22	41
Total Captures	29	94	71	98	292
Total Species	11	24	19	22	38

Table 12. Bat species detected within the Santa Ana Mountains project area during spring and summer 1999, 2000

SURVEY SITE	ID on Map	Big Brown Bat	California Myotis	Mexican Free-Tailed Bat	Pallid Bat	Pocketed Free-Tailed Bat	Small-Footed Myotis	Western Mastiff	Western Pipistrelle	Western Red Bat	Yuma Myotis	Grand Total
Tenaja Corridor (ordered from west to east)												
CNF-LOS ALAMOS CREEK	V	1					1	1	1		1	5
CNF-TENAJA CREEK/OLD FIRE STATION	U	2	2	2	1		2	1	1		2	13
TENAJA-VIEJO/TRIB OF TENAJA CREEK	T	1				1			1		1	4
TENAJA-REDONDO MESA	S		1									1
TENAJA-POND NEAR DOW PROPERTY	Q	2	2	2		1	2		2		2	13
TENAJA-DOW PROPERTY	R	1	1			1						3
TENAJA-LOWER DELUZ	P	1	1									2
TENAJA-UPPER DELUZ	O	1	1	1								3
TENAJA-NEAR CALLE MUCHO	W			1		1		1			1	4
SANTA ROSA PLATEAU-COLE CREEK	N	1				1					1	3
SANTA ROSA PLATEAU-POND NEAR MONUMENT HILL	M	1	1	1		1		1			1	6
SANTA ROSA PLATEAU-BEHIND VISITOR'S CENTER	Y	1	1	1			1			1	1	6
Other												
BLM ABOVE WEIGH STATION	E						1	1	1			3
NORTH GORGE	G	1					1		1		1	4
CENTRAL GORGE	I	2		2		1	3	3	3		3	17
SOUTH GORGE	A	2		2		1	2	1	2		2	12
NEAR EUCALYPTUS GROVE AT SMER-NORTH END	K			1			1	1			1	4
SMER CTRUS GROVE	B	1					1	1			1	4
SMER TRAILER NORTH END	L	1	1	1		1	2	2			1	9
NEAR SANDIA CREEK	X	1		1		1		1			1	5
STONE CREEK	C	1		1			1	1				4
TEMECULA CREEK-NEAR GOLF COURSE	F	1					1	1		1	1	5
Total Detections		22	11	16	1	10	19	16	12	2	21	130
Total Species		8	1	6	0	4	9	9	4	1	8	10

Table 13. Water quality parameters for sampling stations within Santa Ana Mountains project area.

		Water Temp		Turbidity		Salinity		D.O.%		D.O.MGL		T.D. Solids (ppm)		Conductivity		Conductivity (2)		pH	
Number	Condition	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
5	wet	11.8	19.1	10	35	0.2	0.2	51	89	5	9.8	262	285	253	389	339	465	7.4	8
7	wet	16.3	25	10	20	0.1	0.4	34	103	2.6	9.7	390	610	206	902	248	900	6.9	7.8
14	wet	16.6	22	0	35	0.2	0.9	63	96	5.7	9.4	1040	1400	399	1592	475	1701	6.7	7.6
15	wet	15.5	20.3	0	35	0.7	0.8	87	96	7.8	9.6	1000	1030	1276	1375	1486	1592	6.7	8.3
16	wet	17.4	20.9	0	10	0.7	0.9	81	95	7.2	9.6	1130	1130	1513	1529	1664	1788	6.9	8.2
17	wet	17.3	20.3	20	35	0.8	0.8	90	114	8.3	10.8	1020	1050	1347	1398	1522	1579	7.1	8.4
20	wet	19.3	21.8	0	35	0.8	0.9	79	98	7.2	8.6	1390	1400	1485	1608	1655	1732	7.4	8.1
21	wet	18	20	15	35	0.8	0.9	75	92	6.8	8.5	1040	1050	1391	1569	1539	1768	6.8	8.1
22	wet	16.8	21.1	35	35	0.8	0.9	92	110	8.3	10	1100	1130	1428	1517	1610	1722	7.1	8.2
23	wet	17.7	21.6	30	35	0.8	0.9	91	99	8	9	936	1111	1452	1522	1600	1704	6.9	8.2
24	wet	18.6	23.4	5	5	0.6	0.7	85	106	7.5	10	855	866	1174	1192	1230	1362	6.4	8.8
25	wet	19	20.4	35	35	0.7	0.8	88	98	7.9	9	988	993	1259	1335	1423	1487	6.5	8.2
26	wet	18.1	21.6	0	35	0.5	0.8	60	100	5.4	8.9	750	1330	1003	1460	1098	1567	7.1	8.4
28	wet	20.8	26.6	10	35	0.4	0.6	72	153	6.5	13	578	580	792	1177	861	1268	7.7	8.5
29	wet	19.3	24.5	0	35	0.6	0.7	66	110	6	9.9	877	975	1153	1358	1295	1417	6.8	7.9
30	wet	20.7	27	20	35	0.4	0.6	78	157	7	13.3	592	595	809	1174	882	1279	7.4	8.3
31	wet	12.9	23	30	100	0.6	0.7	85	112	7.3	11.7	866	905	860	1327	1150	1415	6.4	8.3
32	wet	14.9	23.5	0	35	0.7	0.8	94	108	8	10.8	961	965	1237	1427	1432	1532	6.5	8.3
38	wet	19.1	26.7	0	35	0.2	0.4	59	111	4.65	9.4	486	600	405	916	457	879	6.4	7.6
39	wet	16.7	25.4	35	35	0.3	1.2	60	120	5	10.3	740	1930	534	2248	636	2351	6.7	8.2
40	wet	17.3	23.2	0	0	0.7	0.8	75	92	6.7	8.8	1010	1080	1155	1469	1354	1595	6.4	8.2
41	wet	16.5	19.9	0	0	0.5	0.5	58	73	5.4	6.9	665	671	809	949	965	1051	7.3	7.6
42	wet	16.1	21.2	0	35	0.7	0.8	74	105	6.6	9.8	1040	1100	1217	1508	1468	1626	7.9	8.2
43	wet	17.1	22.8	0	35	0.8	0.8	88	90	7.5	8.7	965	1050	1300	1531	1532	1598	8.1	8.2
44	wet	16.5	25.1	15	15	0.7	0.8	87	94	7.2	9	914	990	1288	1469	1468	1536	7.9	8.7
46	wet	17.3	22.3	0	35	0.8	0.8	92	102	8.3	9.4	960	1020	1273	1447	1493	1528	7.3	8.2
49	wet	18.3	20.3	0	15	0.7	1.6	44	123	3.9	11.5	1080	2500	1138	2750	1303	3070	7.6	8.3
50	wet	11.2	24.9	10	25	0.7	0.9	39	96	3.3	10.1	960	1280	1263	1440	1438	1712	7.4	8.3
53	wet	17.4	19.8	0	35	0.8	0.8	75	85	6.9	8	980	1040	1288	1405	1518	1625	7.1	7.5
60	wet	14.6	20.4	35	35	0.4	0.8	55	106	5	10.7	570	1050	773	1473	848	1640	7.6	7.9

Table 13 (Continued -2). Water quality parameters for sampling stations within Santa Ana Mountains project area.

		Water Temp		Turbidity		Salinity		D.O.%		D.O.MGL		T.D. Solids (ppm)		Conductivity		Conductivity (2)		pH	
Number	Condition	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
1	dry	12	12	20	20	0.1	0.1	95	95	9.9	9.9	0	0	155	155	206	206	6.8	6.8
2	dry	10.6	20.9	15	30	0.1	0.3	20	90	1.7	10	365	365	142	522	196	562	7	7.7
3	dry	12	12	30	30	0.1	0.1	90	90	9.3	9.3	0	0	119	119	159	159	6.8	6.8
4	dry	11.2	18	45	45	0.2	0.3	33	94	3.1	9.8	0	0	233	461	316	533	7.6	9.6
6	dry	17.2	17.2	30	30	0.1	0.1	125	125	12	12	0	0	168	168	197	197	7.5	7.5
8	dry	15.1	25.9	25	35	0.1	0.2	85	90	7.4	8.5	0	0	124	385	153	385	6.8	7.7
9	dry	17.3	17.3	0	0	0.1	0.1	132	132	12.8	12.8	0	0	104	104	122	122	6.5	6.5
10	dry	25.2	25.2	20	20	0	0	130	130	10.4	10.4	0	0	86	86	86	86	4.8	4.8
11	dry	16.1	27.4	0	20	0.1	0.2	51	222	5.1	17	195	195	250	318	300	315	5.4	7.1
12	dry	11.9	11.9	20	20	0.1	0.1	86	86	9.3	9.3	0	0	188	188	250	250	4.4	4.4
13	dry	13.2	16.7	0	0	0.2	0.3	35	78	3.4	8.26	0	0	273	505	353	602	4.5	7.4
18	dry	16.7	23.2	15	15	0.5	0.7	5	51	0.5	4.3	0	0	918	1323	1093	1370	6.7	6.9
19	dry	28	28	0	0	0.7	0.7	160	160	12.7	12.7	0	0	1500	1500	1417	1417	8.3	8.3
27	dry	17.5	19.1	0	0	0.8	0.9	93	95	8.6	8.9	0	0	1391	1493	1567	1747	7.1	7.8
33	dry	18.2	25.8	0	0	0.7	0.7	102	137	8.5	11.2	940	940	1161	1423	1334	1403	6.6	8.2
34	dry	15.1	19.8	0	0	0.6	0.7	93	94	8.4	9.4	0	0	1017	1184	1255	1314	6.4	7.8
35	dry	18.8	24.9	0	0	0.7	0.8	105	135	9.2	11.1	1000	1000	1299	1507	1475	1512	6.5	8.4
36	dry	20.5	20.5	0	0	0.2	0.2	108	108	9.8	9.8	0	0	387	387	433	433	7.8	7.8
37	dry	23.4	30.9	0	0	0.2	0.3	89	156	6.6	13.2	0	0	386	641	398	577	6.7	9.1
45	dry	17.8	17.8	0	0	0.6	0.6	114	114	10.7	10.7	0	0	1078	1078	1250	1250	8.3	8.3
47	dry	14.7	17.7	0	0	0.9	0.9	92	100	8.7	10.1	0	0	1371	1454	1695	1707	7.3	7.9
48	dry	14.3	20	35	35	1	1.1	68	97	6.3	9.8	1630	1630	1594	1815	2004	2081	7.7	7.9
51	dry	17.2	17.2	0	0	0.2	0.2	89	89	8.5	8.5	0	0	390	390	459	459	7.6	7.6
52	dry	15	15.2	0	0	0.5	0.6	29	70	2.8	7	0	0	852	895	1048	1119	7.4	7.9
54	dry	15.6	27.4	0	0	0.2	0.3	65	78	6.3	6.4	0	0	310	615	379	593	7.6	7.8
55	dry	14.6	25.2	0	0	0.2	0.2	61	75	6.1	6.2	0	0	270	448	337	447	7.1	7.5
56	dry	12.9	16.8	0	0	0.4	0.4	47	50	4.8	4.9	0	0	555	714	722	860	7.3	7.3
57	dry	13.3	17.6	0	0	0.5	0.5	78	79	7.4	8.3	0	0	779	871	1004	1014	7.9	7.9
59	dry	13.9	15.5	0	0	0.3	0.3	88	88	8.8	9.1	0	0	462	558	562	711	7.9	8.2
61	dry	17	17.9	0	0	0.4	0.4	47	109	4.3	10.5	0	0	692	740	817	857	6.6	9
62	dry	14.8	17	0	0	0.7	0.7	80	99	8.8	9.6	0	0	1071	1187	1333	1402	7.1	7.6
63	dry	32.7	32.7	15	15	0.2	0.2	35	134	3.5	9.6	336	336	592	592	516	516	7.8	7.8

Table 14. Species detected in Santa Ana project area during amphibian night driving surveys.

Road Transect	Length (km)	Survey Dates	Nights Sampled		Species Detected	Number of Detections				Total Number of Detections*
						Wet Night		Dry Night		
			Wet	Dry		Alive	Dead	Alive	Dead	
Avenida La Cresta	10.7	Mar 26, 1999 - May 26, 2000	10	11	*Bufo boreas* (Western toad)	46	74	4	7	132
					Hyla regilla (Pacific treefrog)	12	7	0	0	19
					Hyla spp . (treefrog species)	0	9	0	0	9
					Scaphiopus hammondii (Western Spadefoot)	1	0	0	0	1
					unknown bird species	-	0	-	1	1
La Cresta (dirt) (not mapped)	1.6	Mar 26, 1999 - May 25, 2000	7	9	*Bufo boreas* (Western toad)	28	7	6	0	41
					Hyla regilla (Pacific treefrog)	8	0	0	1	9
					unknown rodent species	0	0	1	0	1
Calle Companero/De Lobo	5.1	Feb 10, 2000 - Mar 5, 2000	3	0	*Bufo boreas* (Western toad)	16	2	-	-	18
					Hyla regilla (Pacific treefrog)	2	1	-	-	3
					Scaphiopus hammondii (Western Spadefoot)	1	0	-	-	3
Calle de Mucho	1.4	Jun 29, 1999 - Mar 7, 2000	5	7	*Bufo boreas* (Western toad)	1	0	1	0	2
					Hyla spp. (treefrog species)	1	0	0	0	1
Carancho Rd.	12.3	Feb 21, 1999 - Mar 4, 2000	1	6	*Hyla regilla* (Pacific treefrog)	1	0	0	0	1
					Pituophis melanoleucus (Gopher snake)	0	0	0	1	1
Clinton Keith Road	6.2	Feb 21, 1999 - May 25, 2000	14	28	*Bufo boreas* (Western toad)	35	16	5	4	60
					Hyla regilla (Pacific treefrog)	2	0	0	0	2
					tarantula species	1	1	0	0	2
					Chaetodipus spp. (pocket mouse species)	-	-	-	-	1
					unknown rodent species	-	-	-	-	1
Corona Cala Camino	2.6	Mar 10, 1999 - Mar 5, 2000	2	6	*Bufo boreas* (Western toad)	0	0	1	0	1
Cleveland Forest Road	1.6	Feb 21, 1999 - May 25, 2000	13	28	*Bufo boreas* (Western toad)	35	2	38	1	81
					Hyla regilla (Pacific treefrog)	2	0	0	0	2
					unknown rodent species	0	0	1	0	1
De Luz Road	26.2	Feb 21, 1999 - Mar 5, 2000	6	10	*Hyla spp* . (treefrog species)	10	84	1	2	97
					Hyla regilla (Pacific treefrog)	61	15	3	0	79
					Bufo boreas (Western toad)	19	15	0	0	34
					Hyla cadaverina (California treefrog)	7	0	0	0	7
					Scaphiopus hammondii (Western Spadefoot)	1	1	0	0	2
					Taricha torosa (California newt)	1	1	0	0	2
					Aneides lugubris (Arboreal salamander)	1	0	0	0	1
Los Gatos	1.6	Feb 21, 1999 - Mar 4, 2000	1	5	nothing detected	0	0	0	0	0
Rancho California Road	6.7	Jan 16, 2000 - Mar 5, 2000	6	6	*Bufo boreas* (Western toad)	1	8	0	1	10
Sandia Creek Drive	16	Jan 17, 2000 - Mar 5, 2000	5	7	*Hyla spp.* (treefrog species)	3	128	0	0	131
					Hyla regilla (Pacific treefrog)	62	12	3	1	81
					Bufo boreas (Western toad)	2	12	2	1	17
					Hyla cadaverina (California treefrog)	1	1	1	0	3
Tenaja Road	8.6	Feb 21, 1999 - May 25, 2000	14	32	*Bufo boreas* (Western toad)	122	48	33	5	208
					Hyla regilla (Pacific treefrog)	2	6	0	0	8
					Batrachoseps pacificus (Pacific slender salamander)	1	0	0	0	1
					Crotalus ruber (Red diamond rattlesnake)	0	0	1	0	1
					Crotalus viridis (Western rattlesnake)	1	0	0	0	1
					Dipodomys spp. (Kangaroo rat species)	-	1	-	0	1
					Lampropeltis getulus (California kingsnake)	1	0	0	0	1
					Peromyscus spp. (Cricetine mice species)	-	-	-	-	1
					Rana catesbeiana (Bullfrog)	0	0	1	0	1
Via Santa Rosa	3.5	Jan 16, 2000 - Mar 5, 2000	6	6	*Bufo boreas* (Western toad)	6	5	2	0	13
					Hyla regilla (Pacific treefrog)	8	2	1	0	11
					Hyla spp. (treefrog species)	1	7	0	0	8
					Hyla cadaverina (California treefrog)	1	0	0	0	1
					Scaphiopus hammondii (Western Spadefoot)	1	0	0	0	1
TOTAL			93	161		505	465	105	25	1114

* = Total number of detections may not equal sum of wet and dry night detections due to incomplete mortality data

- = No data available

Table 15. Species detected in Santa Ana project area during road kill surveys.

Road Transect	Length (km)	Survey Dates	Days Sampled	Species Detected	# Detections
Avenida La Cresta	10.7	Jan 15, 2000 - Aug 15, 2000	45	*Bufo boreas* (Western toad)	4
				Spermophilus beecheyi (Beechey ground squirrel)	2
				Buteo lineatus (Red-shouldered hawk)	1
				Canis latrans (Coyote)	1
				Lichanura trivirgata (Rosy boa)	1
				Masticophis lateralis (Striped racer)	1
				Pituophis melanoleucus (Gopher snake)	1
				Sialia mexicana (Western bluebird)	1
				Sturnella neglecta (Western meadowlark)	1
				Sylvilagus spp. (rabbit species)	1
				unknown bird species	1
Calle de Mucho	1.4	Jan 15, 2000 - Aug 15, 2000	45	*Pituophis melanoleucus* (Gopher snake)	2
Carancho Rd.	12.3	Jan 18, 2000 - Aug 15, 2000	39	*Bufo boreas* (Western toad)	4
				Spermophilus beecheyi (Beechey ground squirrel)	4
				Scapanus latimanus (California mole)	1
				unknown snake species	1
Clinton Keith Road	9.6	Jan 15, 2000 - Aug 15, 2000	45	*Bufo boreas* (Western toad)	2
				Procyon lotor (Raccoon)	2
				Aimophila ruficeps (Rufous-crowned sparrow)	1
				Canis latrans (Coyote)	1
				Corvus brachyrhynchos (American crow)	1
				Melanerpes formicivorus (Acorn woodpecker)	1
				Pituophis melanoleucus (Gopher snake)	1
				Spermophilus beecheyi (Beechey ground squirrel)	1
				Tyto alba (Barn owl)	1
				unknown bird species	1
Corona Cala Camino	2.6	Jan 15, 2000 - Aug 15, 2000	45	unknown lizard species	1
De Luz Road	26.2	Jan 17, 2000 - Aug 15, 2000	41	*Spermophilus beecheyi* (Beechey ground squirrel)	13
				Bufo boreas (Western toad)	8
				Pituophis melanoleucus (Gopher snake)	3
				unknown snake species	2
				Crotalus ruber (Red diamond rattlesnake)	1
				Didelphis virginiana (Virginia opossum)	1
				Masticophis lateralis (Striped racer)	1
				Neotoma fuscipes (Dusky-footed wood rat)	1
				Sylvilagus spp. (rabbit species)	1
				Toxostoma redivivum (California thrasher)	1
Interstate 15 Northbound	10.2	Jan 18, 2000 - Aug 15, 2000	38	*Canis familiaris* (domestic dog)	5
				chicken	1
				Masticophis lateralis (Striped racer)	1
				Tyto alba (Barn owl)	1
Interstate 15 Southbound	10.6	Jan 18, 2000 - Aug 15, 2000	38	*Canis latrans* (Coyote)	5
				Canis familiaris (Domestic dog)	2
				Sylvilagus spp. (rabbit species)	2
				Memphitis memphitis (Striped skunk)	1
				Urocyon cinereoargenteus (Gray fox)	1
Rainbow Canyon Road	9.6	Jan 18, 2000 - Aug 15, 2000	38	*Spermophilus beecheyi* (Beechey ground squirrel)	12
				Didelphis virginiana (Virginia opossum)	8
				Sylvilagus spp. (rabbit species)	8
				Memphitis memphitis (Striped skunk)	6
				Masticophis lateralis (Striped racer)	4
				Canis familiaris (Domestic dog)	2
				Canis latrans (Coyote)	2
				Felis catus (Domestic cat)	2
				Felis rufus (Bobcat)	2
				Neotoma spp. (wood rat species)	1
Rancho California Road	6.7	Jan 17, 2000 - Aug 15, 2000	41	*Anas platyrhynchos* (Mallard)	1
				Didelphis virginiana (Virginia opossum)	1
				Spermophilus beecheyi (Beechey ground squirrel)	1
Sandia Creek Drive	16	Jan 17, 2000 - Aug 15, 2000	41	*Spermophilus beecheyi* (Beechey ground squirrel)	12
				Canis latrans (Coyote)	2
				Bufo boreas (Western toad)	1
				Masticophis flagellum (Coachwhip)	1
				Neotoma fuscipes (Dusky-footed wood rat)	1
				Pituophis melanoleucus (Gopher snake)	1
				Sylvilagus spp. (rabbit species)	1
				unknown bird species	1
				unknown owl species	1
Tenaja Road	8.6	Jan 15, 2000 - Aug 15, 2000	45	*Bufo boreas* (Western toad)	4
				Spermophilus beecheyi (Beechey ground squirrel)	4
				Sylvilagus spp. (rabbit species)	2
				Coluber constrictor (Racer)	1
				Lampropeltis getulus (California kingsnake)	1
				unknown bird species	1
Via Santa Rosa	3.5	Jan 17, 2000 - Aug 15, 2000	41	nothing detected	0

Table 16. Species detections within the four Tenaja habitat nodes.

	Node 1	Node 2	Node 3	Node 4	Total Nodes Detected	Detected in all nodes
HERPETOFAUNA						
Pacific slender salamander	x	x	x	x	4	x
Arboreal salamander	x				1	
Monterey salamander	x		x	x	3	
California Newt		x			1	
Pacific treefrog	x	x	x	x	4	x
Western toad	x	x	x	x	4	x
Western pond turtle					0	
Southern alligator lizard	x	x	x	x	4	x
Gilbert skink				x	1	
Western skink	x	x	x	x	4	x
Western whiptail	x	x	x	x	4	x
Western fence lizard	x	x	x	x	4	x
Granite spiny lizard		x			1	
Side blotched lizard	x	x	x	x	4	x
Coast horned lizard				x	1	
Yellow-bellied racer	x	x	x	x	4	x
Ringneck snake	x	x	x	x	4	x
Night Snake					0	
California Kingsnake	x		x	x	3	
Striped racer		x	x	x	3	
Gopher snake			x		1	
Two-striped garter snake	x	x	x	x	4	x
Speckled rattlesnake		x			1	
Red diamond rattlesnake			x		1	
Southern pacific rattlesnake			x	x	2	
Western patch-nosed snake					0	
Total Herp Species	**14**	**15**	**17**	**17**		
# Pitfall Arrays per Node	**8**	**7**	**7**	**6**		
SMALL MAMMALS						
Peromyscus species	x	x	x	x	4	x
Deer mouse	x		x	x	3	
California mouse	x	x	x	x	4	x
Brush mouse	x	x	x	x	4	x
Desert shrew	x	x	x	x	4	x
Ornate shrew		x	x	x	3	
California vole	x	x	x	x	4	x
Botta's pocket gohper	x	x	x	x	4	x
Western harvest mouse	x	x	x	x	4	x
Desert cottontail		x			1	
Chaetodipus species	x		x	x	3	
California pocket mouse	x				1	
House mouse	x				1	
Total Small Mammal Species	**11**	**9**	**10**	**10**		
# Pitfall Arrays per Node	**8**	**7**	**7**	**6**		

Table 16 (Continued - 2). Species detections within the four Tenaja habitat nodes.

	Node 1	Node 2	Node 3	Node 4	Total Nodes Detected	Detected in all nodes
BIRDS						
Acorn Woodpecker	x	x	x	x	4	x
American Crow	x	x	x	x	4	x
American Kestrel	x				1	
American Pipit				x	1	
American Robin			x	x	2	
Anna's Hummingbird	x	x	x	x	4	x
Ash-throated Flycatcher	x	x	x	x	4	x
Band-tailed Pigeon		x		x	2	
Barn Swallow	x			x	2	
Bewick's Wren	x	x		x	3	
Black Phoebe		x			1	
Black-chinned Hummingbird		x		x	2	
Black-chinned Sparrow		x	x	x	3	
Black-headed Grosbeak	x		x	x	3	
Black-throated Gray Warbler			x	x	2	
Blue Grosbeak				x	1	
Blue-gray Gnatcatcher		x			1	
Brown-headed Cowbird				x	1	
Bullock's Oriole	x			x	2	
Bushtit	x	x	x	x	4	
California Gnatcatcher	x	x			2	
California Quail	x	x	x	x	4	x
California Thrasher	x	x	x	x	4	x
California Towhee	x		x	x	3	
Canyon Wren	x				1	
California Kingbird				x	1	
Cliff Swallow	x	x			2	
Common Raven	x	x	x	x	4	x
Common Yellowthroat	x	x		x	3	
Costa's Hummingbird	x	x		x	3	
Downy Woodpecker	x				1	
European Starling	x	x	x	x	4	x
Golden-crowned sparrow					0	
Great Horned owl	x				1	
Greater Roadrunner			x		1	
Hermit Thrush				x	1	
House Finch	x	x		x	3	
House Wren	x	x	x	x	4	x
Hutton's Vireo	x	x	x	x	4	x
Killdeer					0	
Lark Sparrow	x	x	x	x	4	x
Lazuli Bunting	x				1	
Lesser Goldfinch	x	x	x	x	4	x
Lincoln's Sparrow	x		x	x	3	
Mallard		x	x	x	3	
Mountain Quail		x	x	x	3	
Mourning Dove	x	x	x	x	4	x
Northern Flicker	x	x	x	x	4	x

Table 16 (Continued - 3). Species detections within the four Tenaja habitat nodes.

	Node 1	Node 2	Node 3	Node 4	Total Nodes Detected	Detected in all nodes
BIRDS (continued)						
Northern Harrier					0	
Nuthatch				x	1	
Nuttall's Woodpecker	x		x	x	3	
Oak Titmouse	x	x	x	x	4	x
Orange-crowned Warbler		x	x	x	3	
Phainopepla	x	x		x	3	
Red-shouldered Hawk	x	x		x	3	
Red-tailed Hawk	x	x			2	
Red-winged Blackbird	x				1	
Rufous-crowned Sparrow	x		x		2	
Sage Sparrow		x		x	2	
Say's Phoebe			x		1	
Scrub Jay	x	x	x	x	4	x
Song Sparrow	x	x	x	x	4	x
Spotted Towhee		x	x	x	3	
Townsend's Warbler	x		x	x	3	
Turkey Vulture		x		x	2	
Warbling Vireo					0	
Western Bluebird	x		x	x	3	
Western Kingbird					0	
Western Meadowlark	x	x	x	x	4	x
Western Wood-pewee			x	x	2	
White-breasted Nuthatch	x	x	x	x	4	x
White-crowned Sparrow			x	x	2	
White-tailed Kite		x		x	2	
Wilson's Warbler			x	x	2	
Wrentit	x	x	x	x	4	x
Yellow Warbler				x	1	
Yellow-rumped Warber			x		1	
Total Bird Species	**45**	**42**	**41**	**57**		
# Point Count Stations per Node	**5**	**5**	**3**	**4**		
BATS						
Big Brown Bat	x	x	x	x	4	x
California Myotis	x	x	x		3	
Mexican Free-Tailed Bat	x	x	x		3	
Pallid Bat					0	
Pocketed Free-Tailed Bat	x		x	x	3	
Small-Footed Myotis	x		x		2	
Western Mastiff	x				1	
Western Pipistrelle			x	x	2	
Western Red Bat	x				1	
Yuma Myotis	x		x	x	3	
Total Bat Species	**8**	**3**	**7**	**4**		
Sampling Sites per Node	**4**	**2**	**2**	**1**		
LARGE MAMMALS						
Coyote	x	x	x	x	4	x
Dog	x	x	x	x	4	x
Gray fox		x	x	x	3	
Mountain Lion		x	x		2	
Bobcat	x	x	x	x	4	x
Mule deer	x	x	x	x	4	x
Virginia opossum		x			1	
Striped skunk			x	x	2	
American Badger	x				1	
Raccoon		x	x		2	
Long-tailed weasel		x			1	
Total Large Mammal Species	**5**	**9**	**8**	**6**		
Track Nights (# transects)	**96 (1)**	**173 (1)**	**119 (1)**	**99 (1)**		
Camera Nights (# cameras)	**529 (1)**	**726 (3)**	**722 (7)**	**426 (2)**		
Total Samping Effort	**625**	**899**	**841**	**525**		
TOTAL VERTEBRATE SPECIE	**83**	**78**	**83**	**94**		

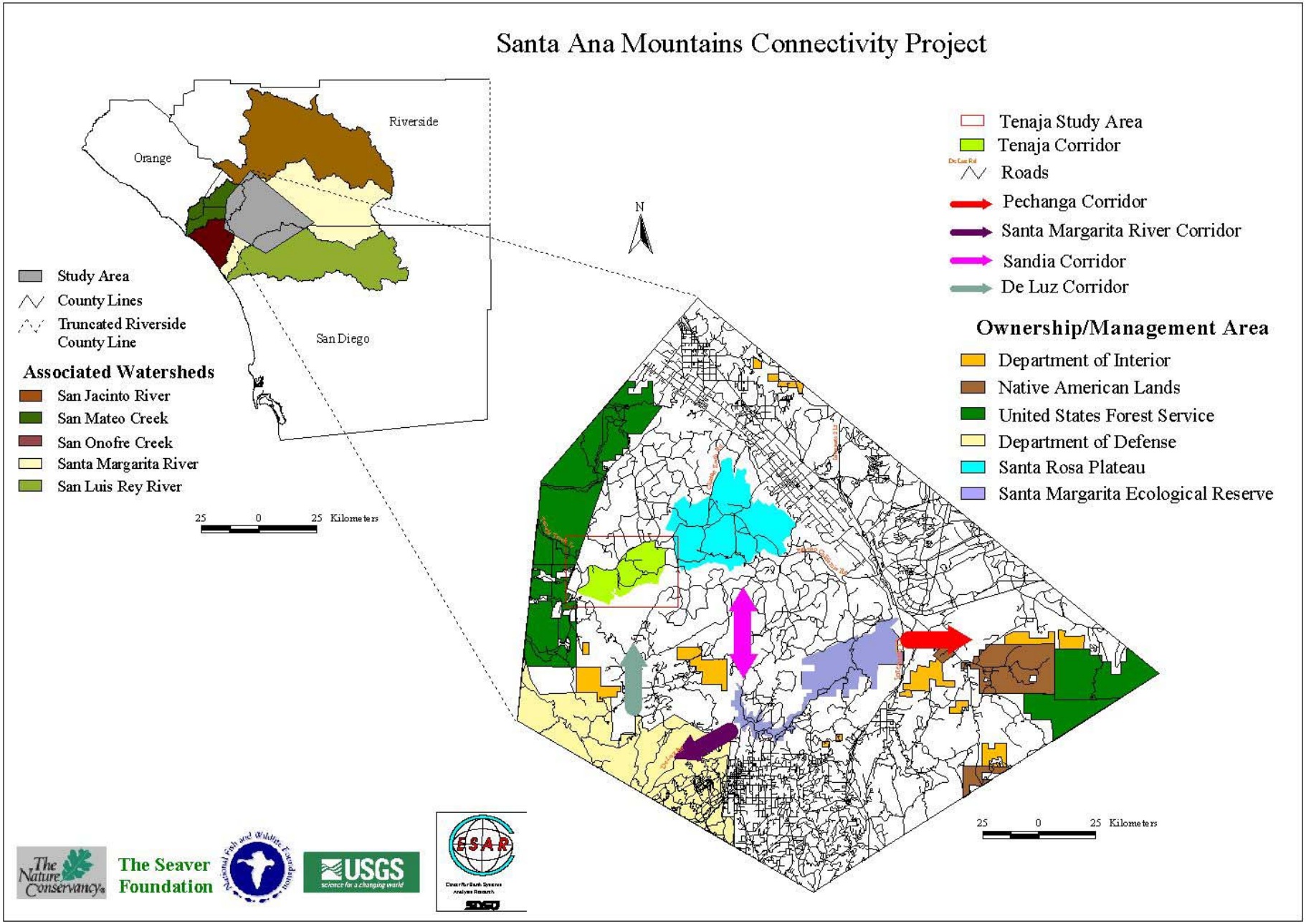

Figure 1. Location of the southern Santa Ana Mountains study area.

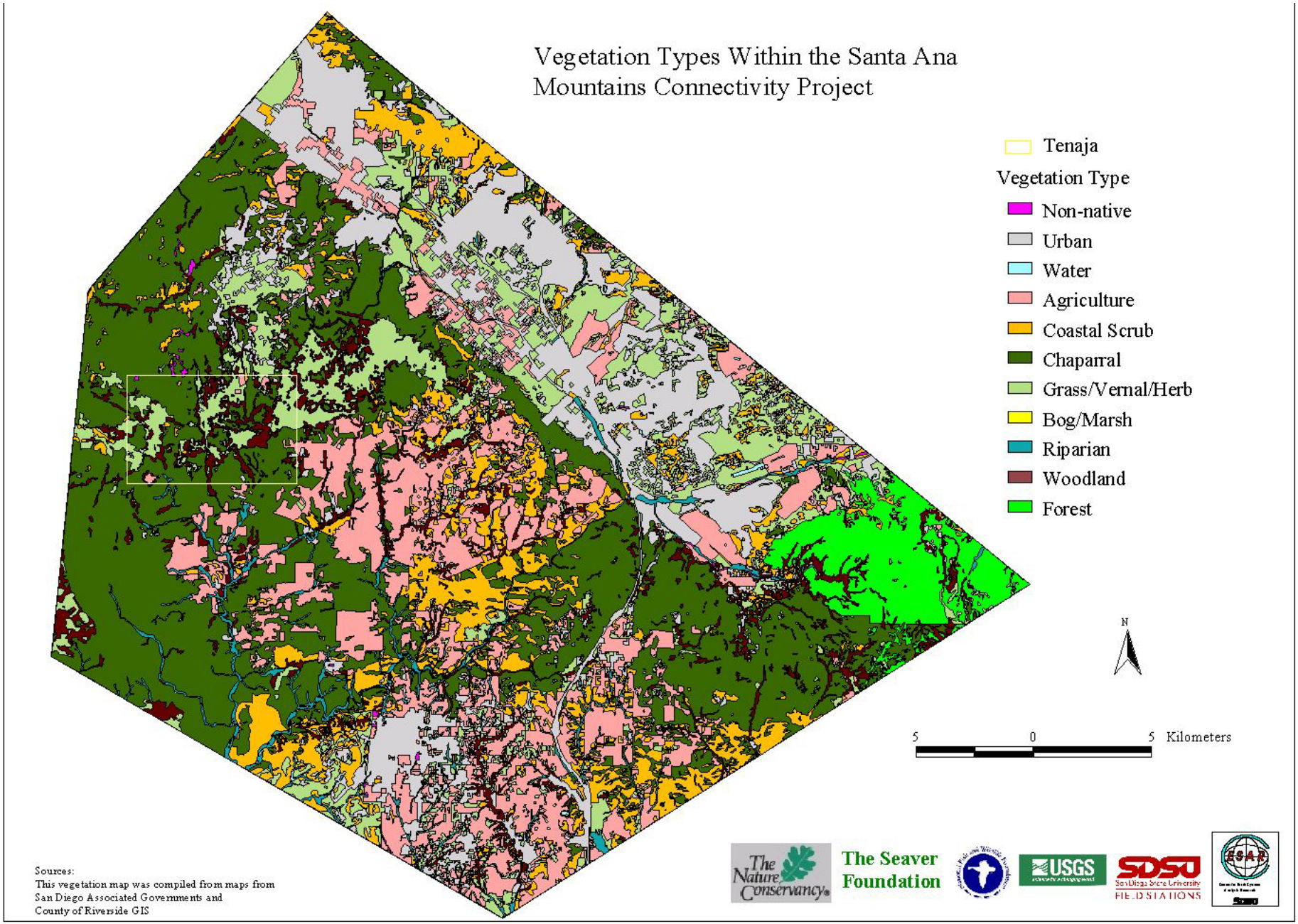

Figure 2. Vegetative map of the southern Santa Ana Mountains study area.

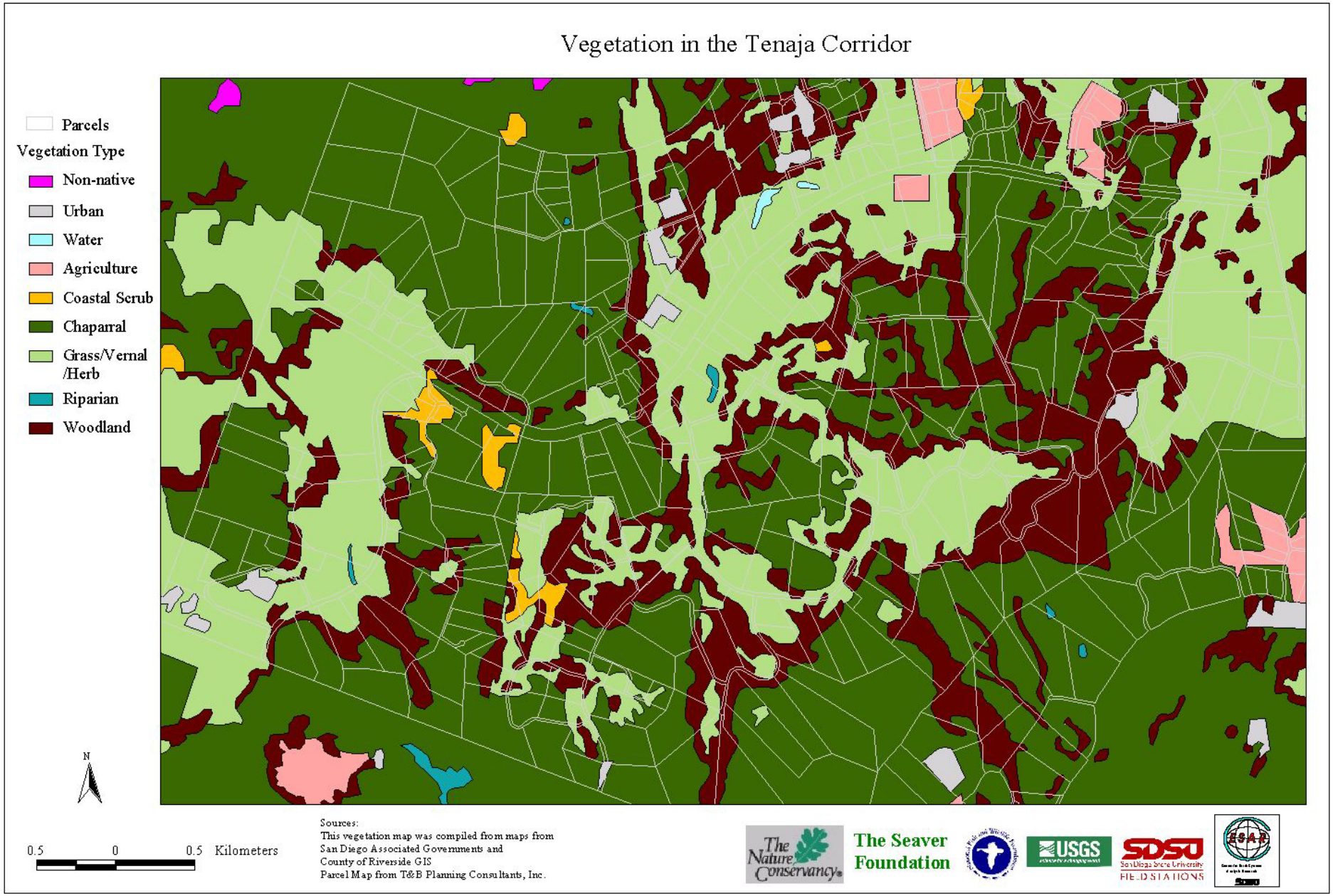

Figure 3. Vegetative map of the Tenaja Corridor.

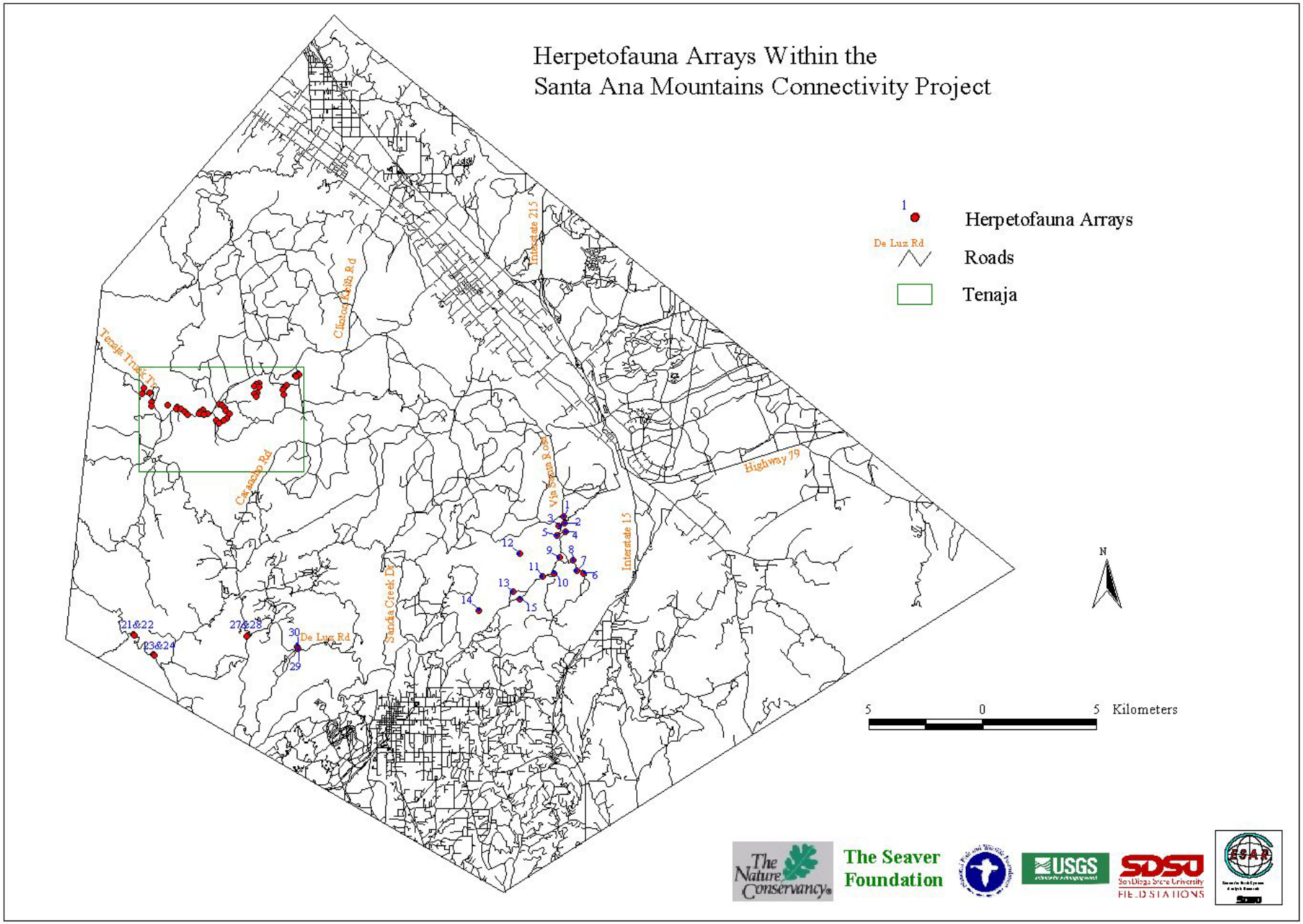

Figure 4. Location of herpetofauna pitfall sampling arrays in Santa Ana Mountains study area (see Figure 5 for Tenaja array numbers).

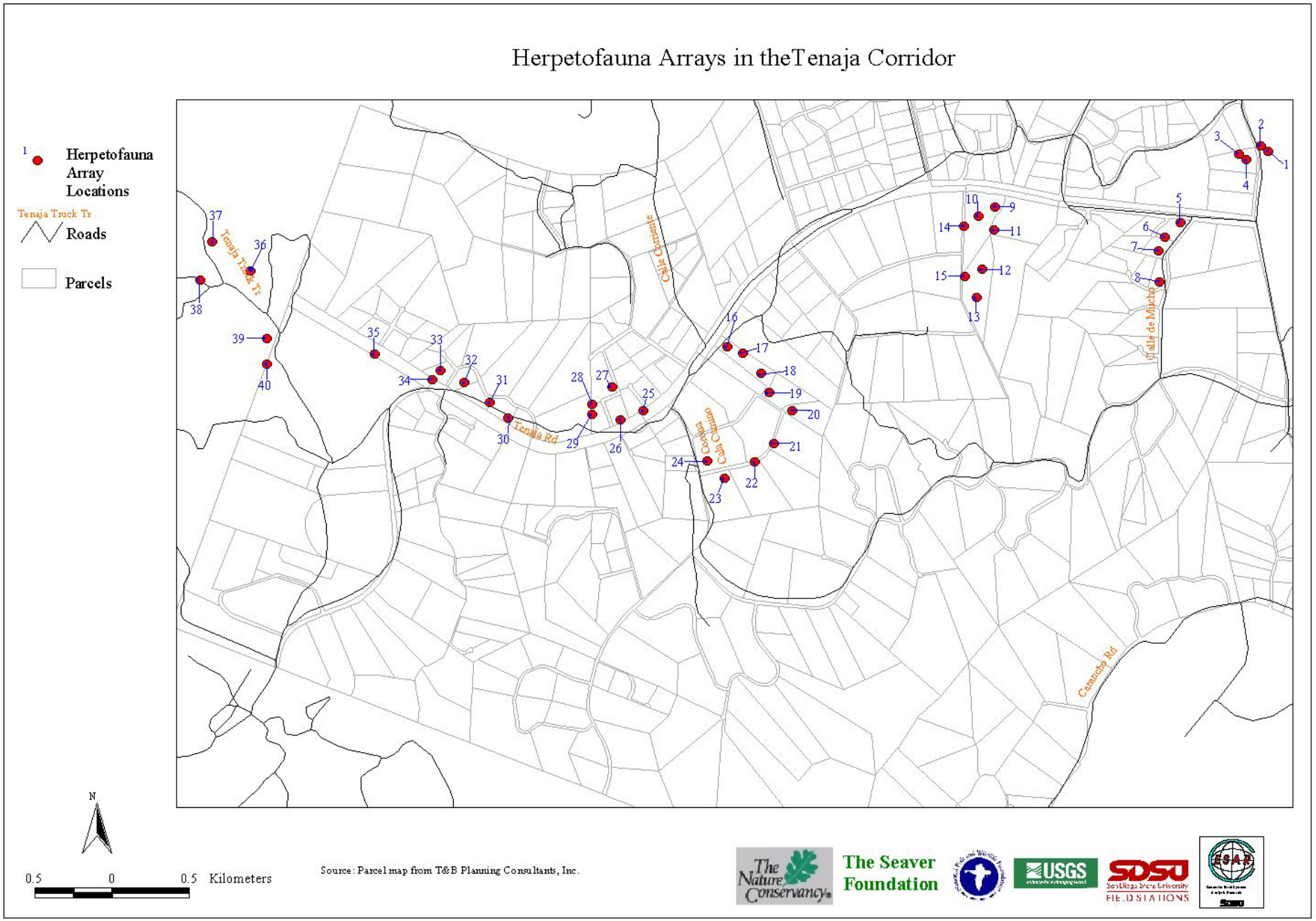

Figure 5. Location of herpetofauna pitfall sampling arrays in Tenaja Corridor.

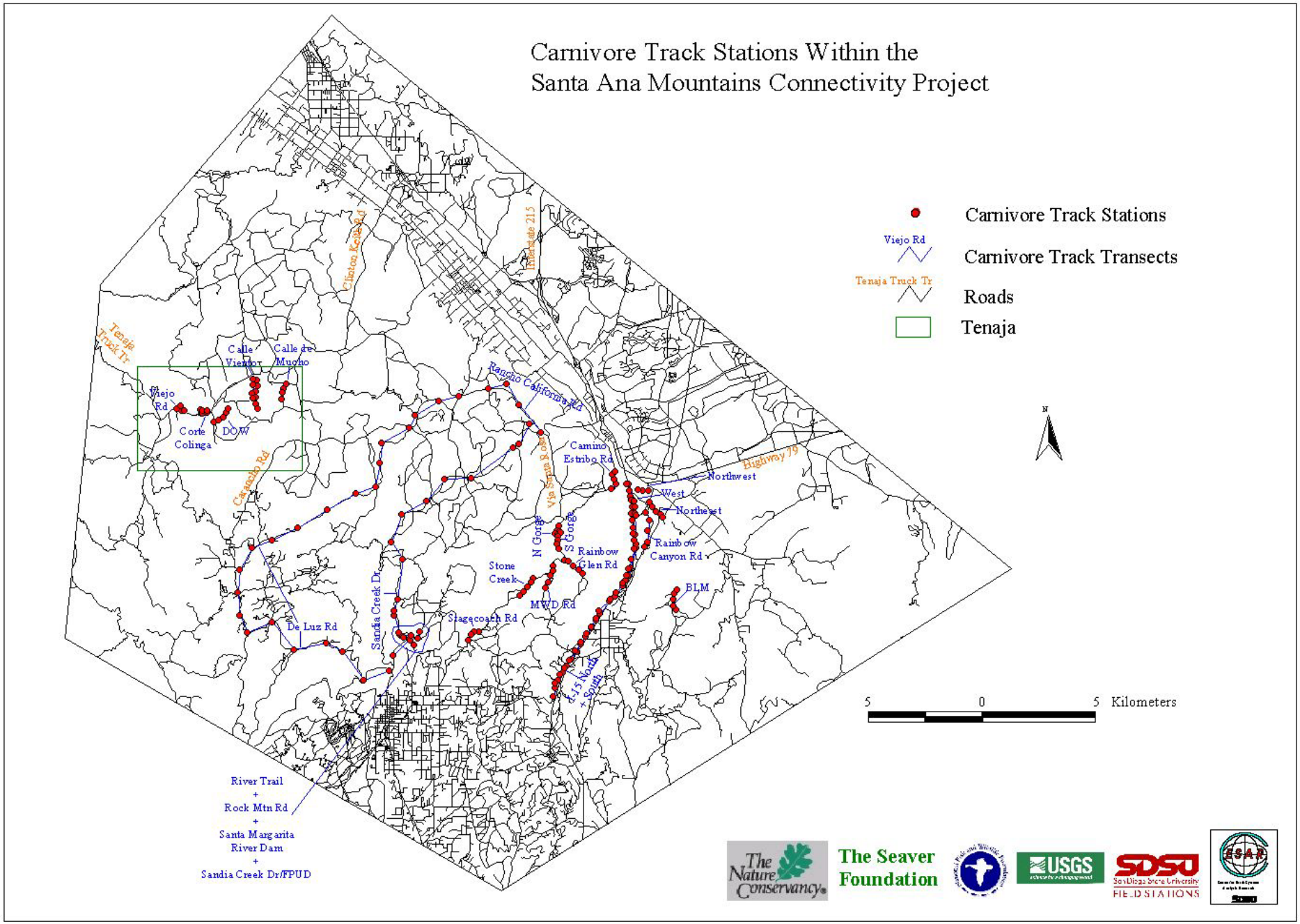

Figure 6. Location of mammalian carnivore baited track transects in Santa Ana Mountains study area.

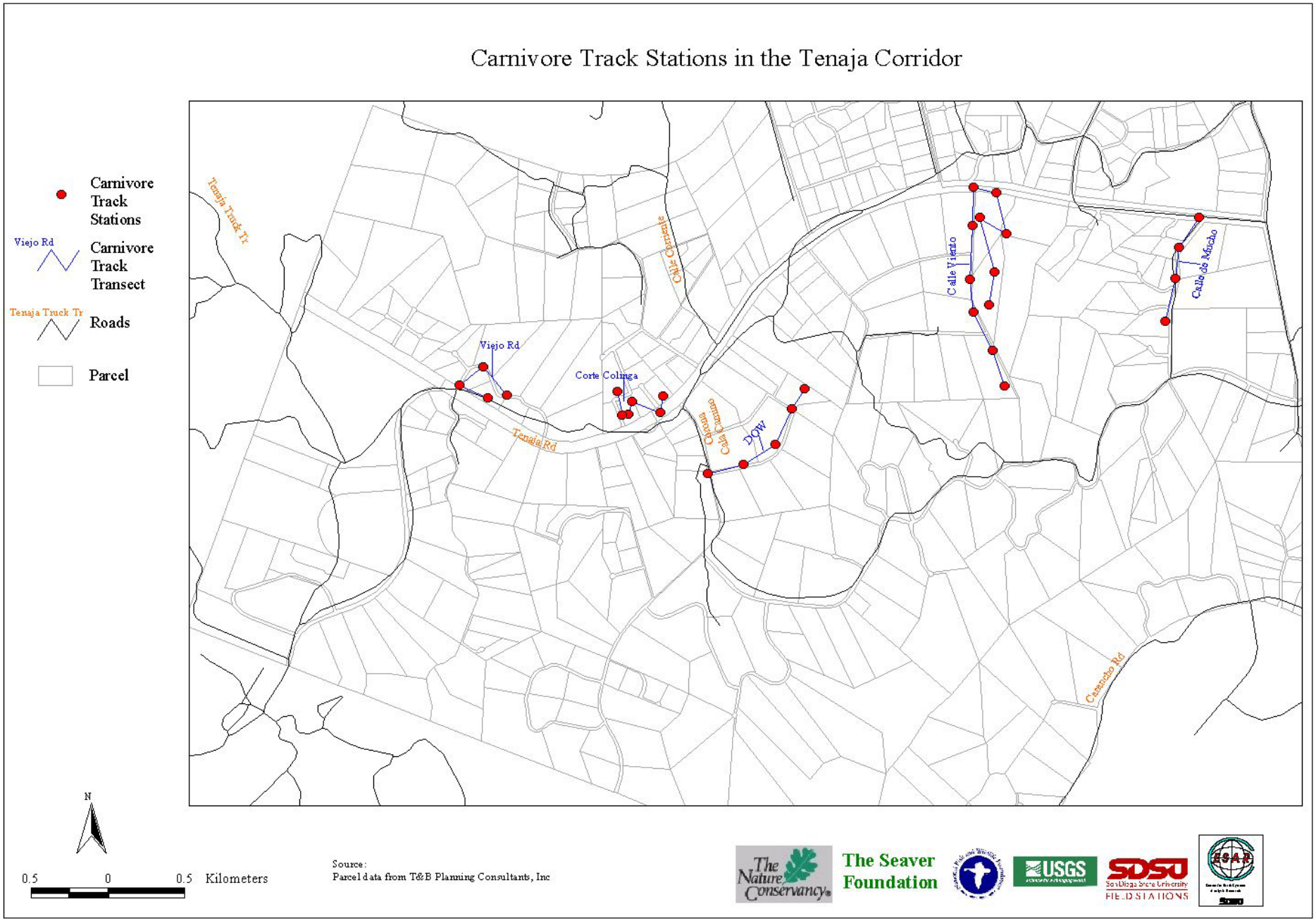

Figure 7. Location of mammalian carnivore baited track transects in Tenaja Corridor.

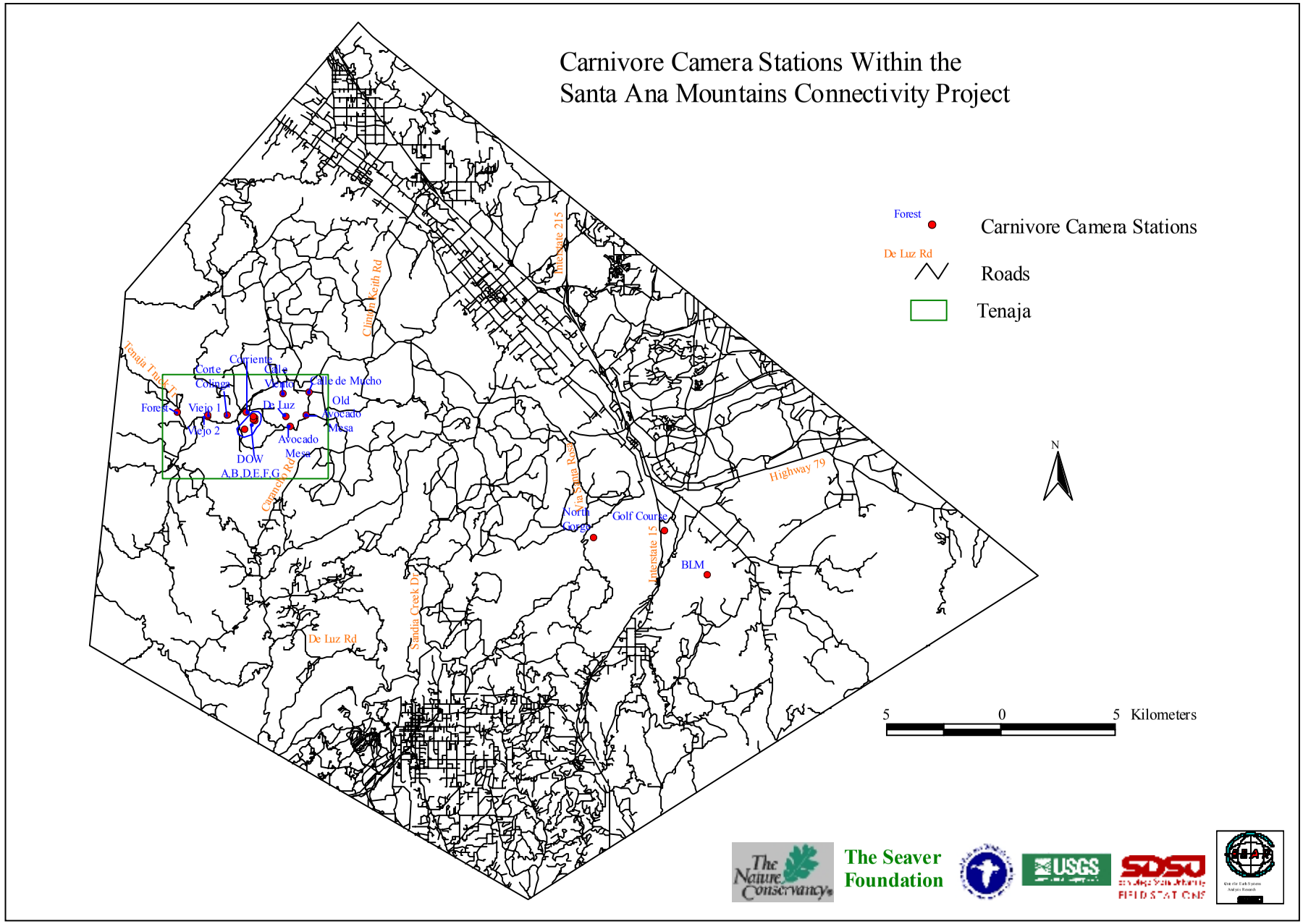

Figure 8. Location of remotely-triggered camera stations in Santa Ana Mountains study area.

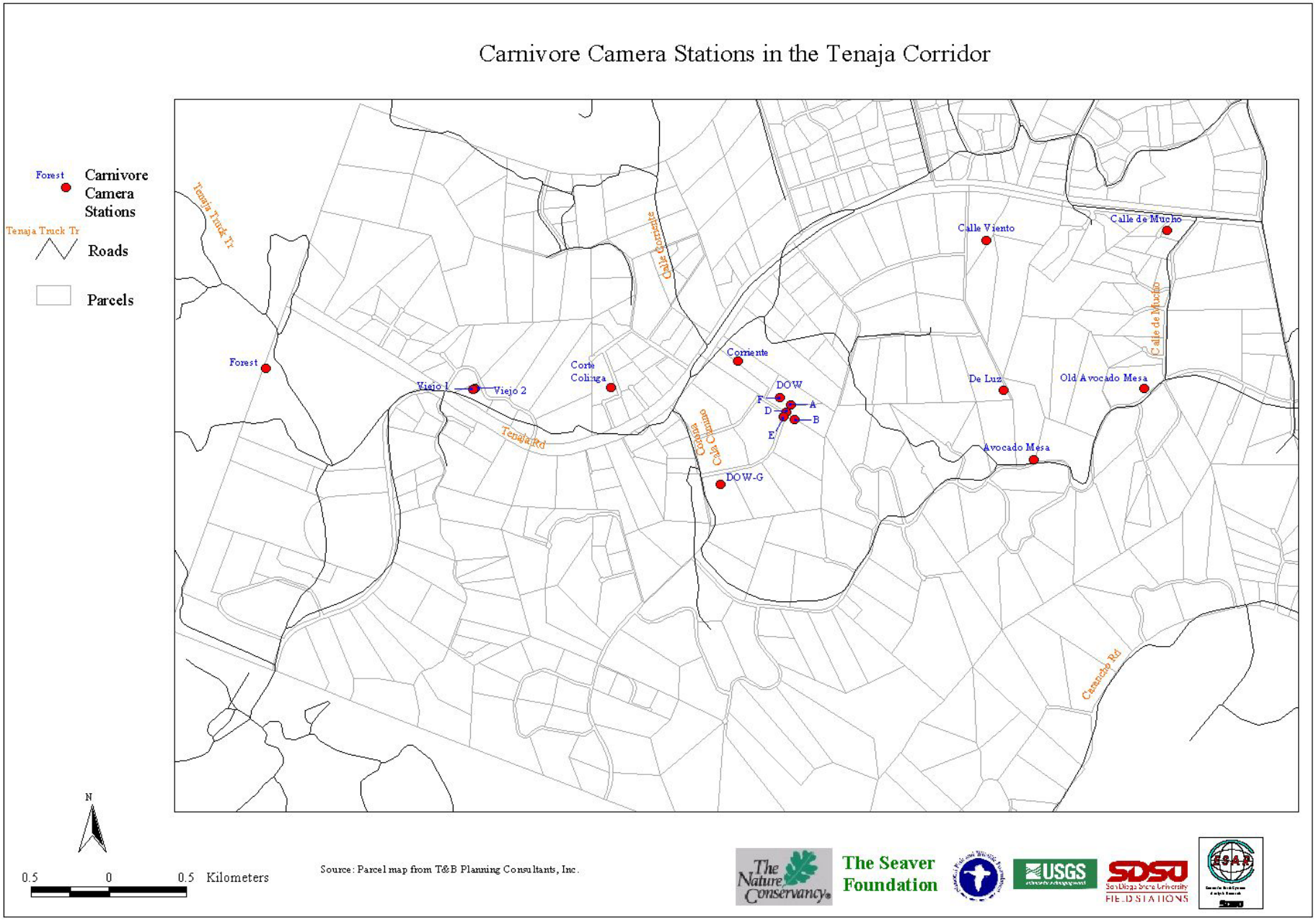

Figure 9. Location of remotely-triggered camera stations in Tenaja Corridor.

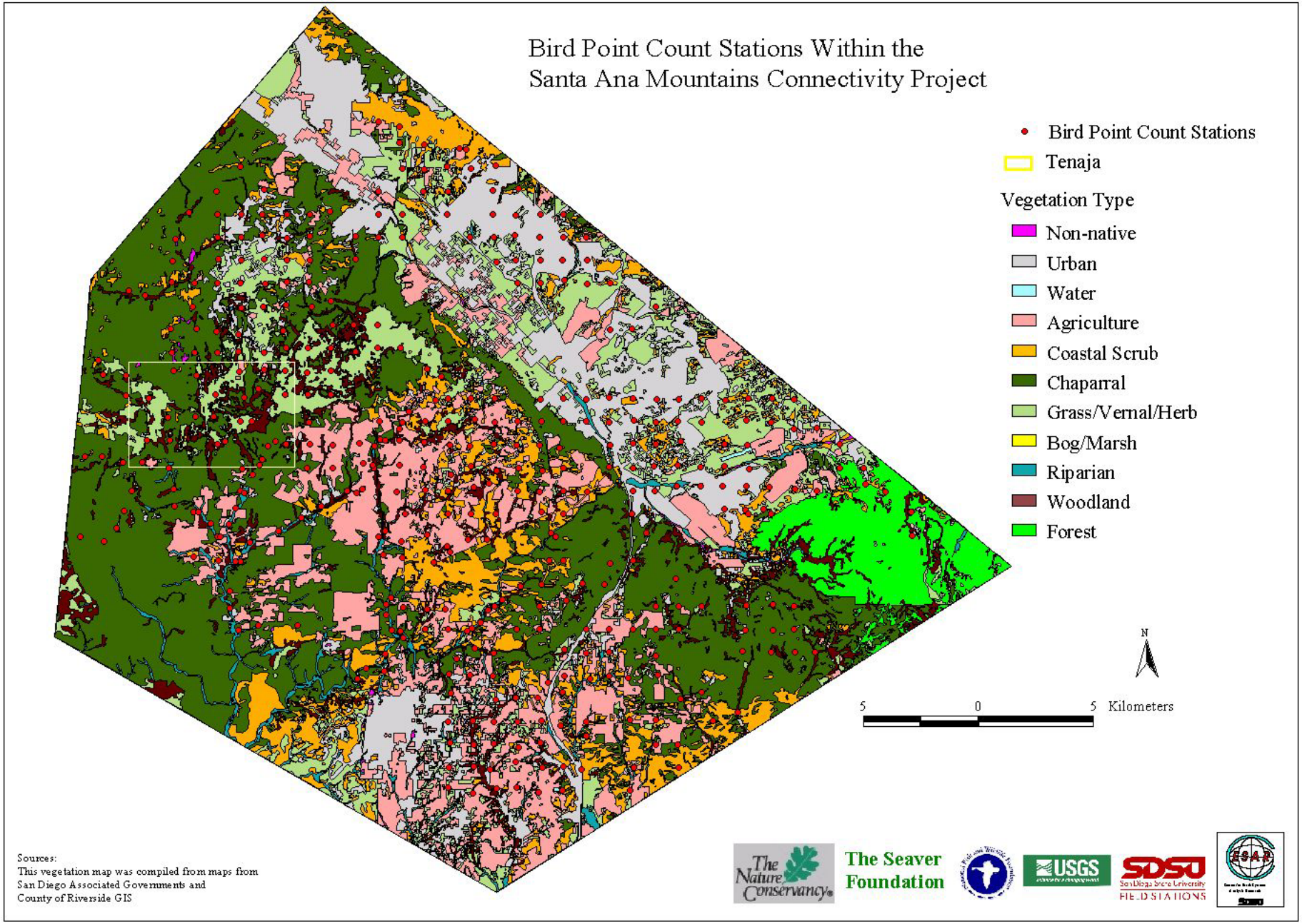

Figure 10. Location of bird point count stations conducted April-June 2000 in Santa Ana Mountains study area.

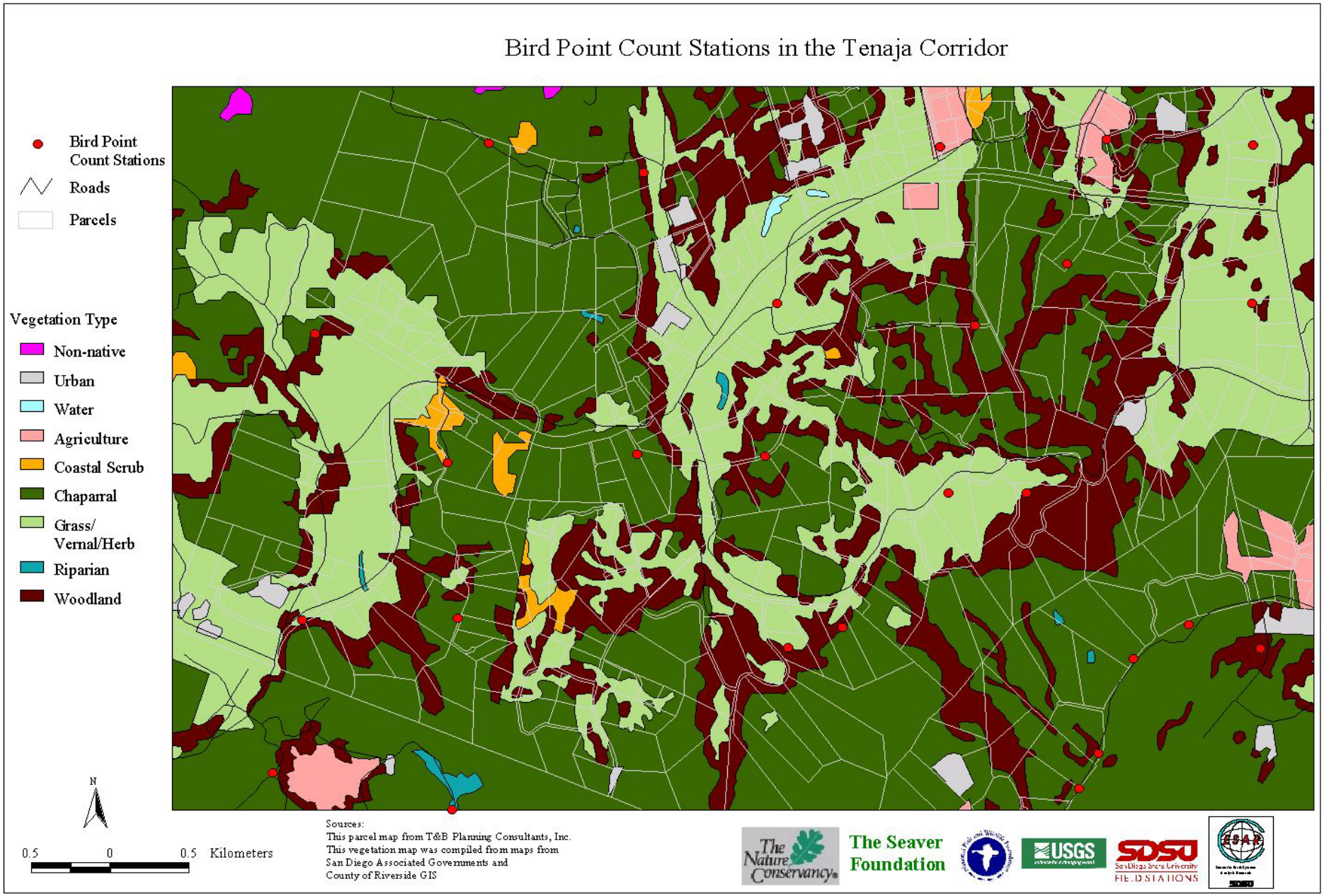

Figure 11. Location of bird point counts stations conducted April-June 2000 in Tenaja Corridor.

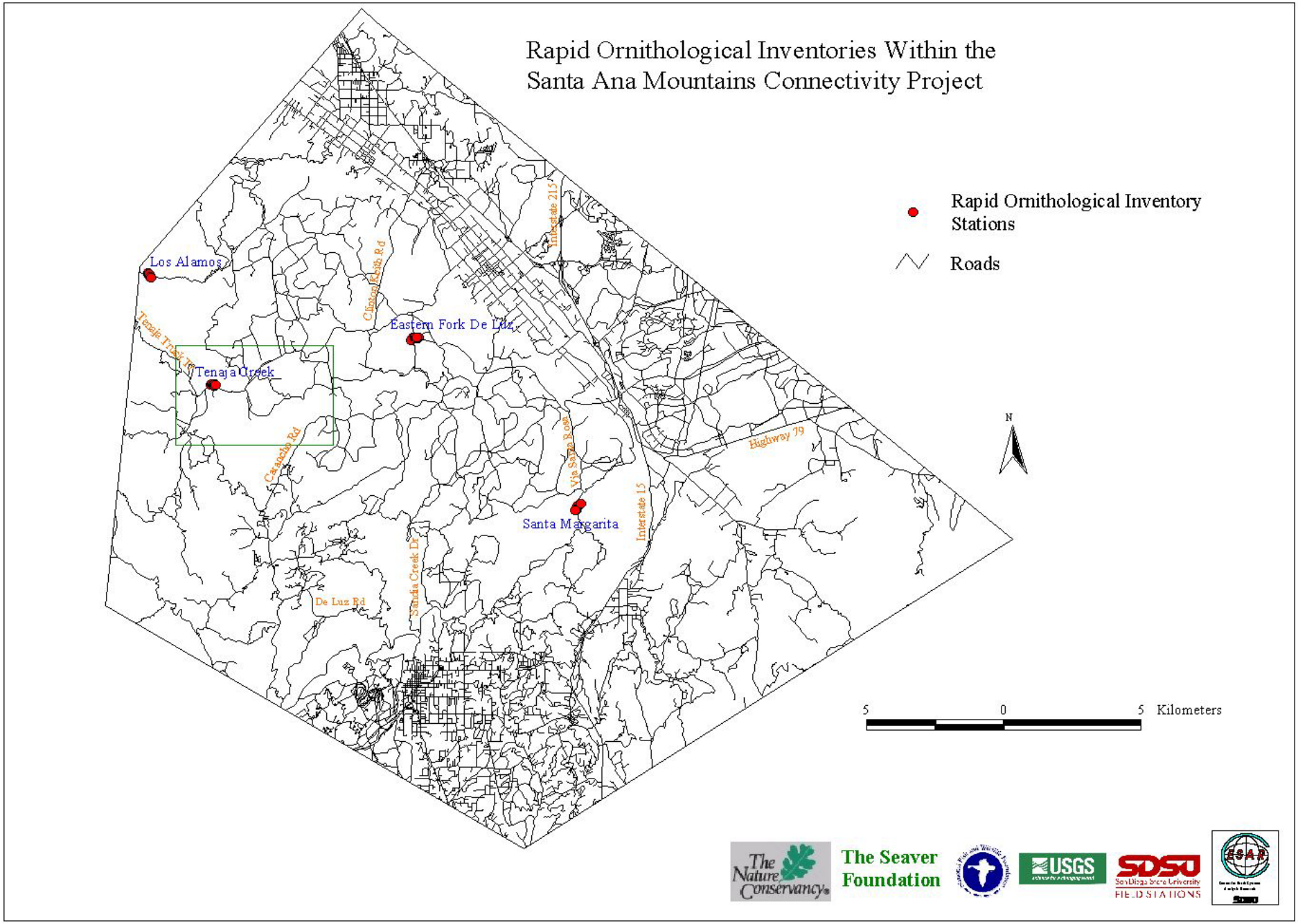

Figure 12. Location of Rapid Ornithological Inventory (ROI) sampling stations in Santa Ana Mountains study area.

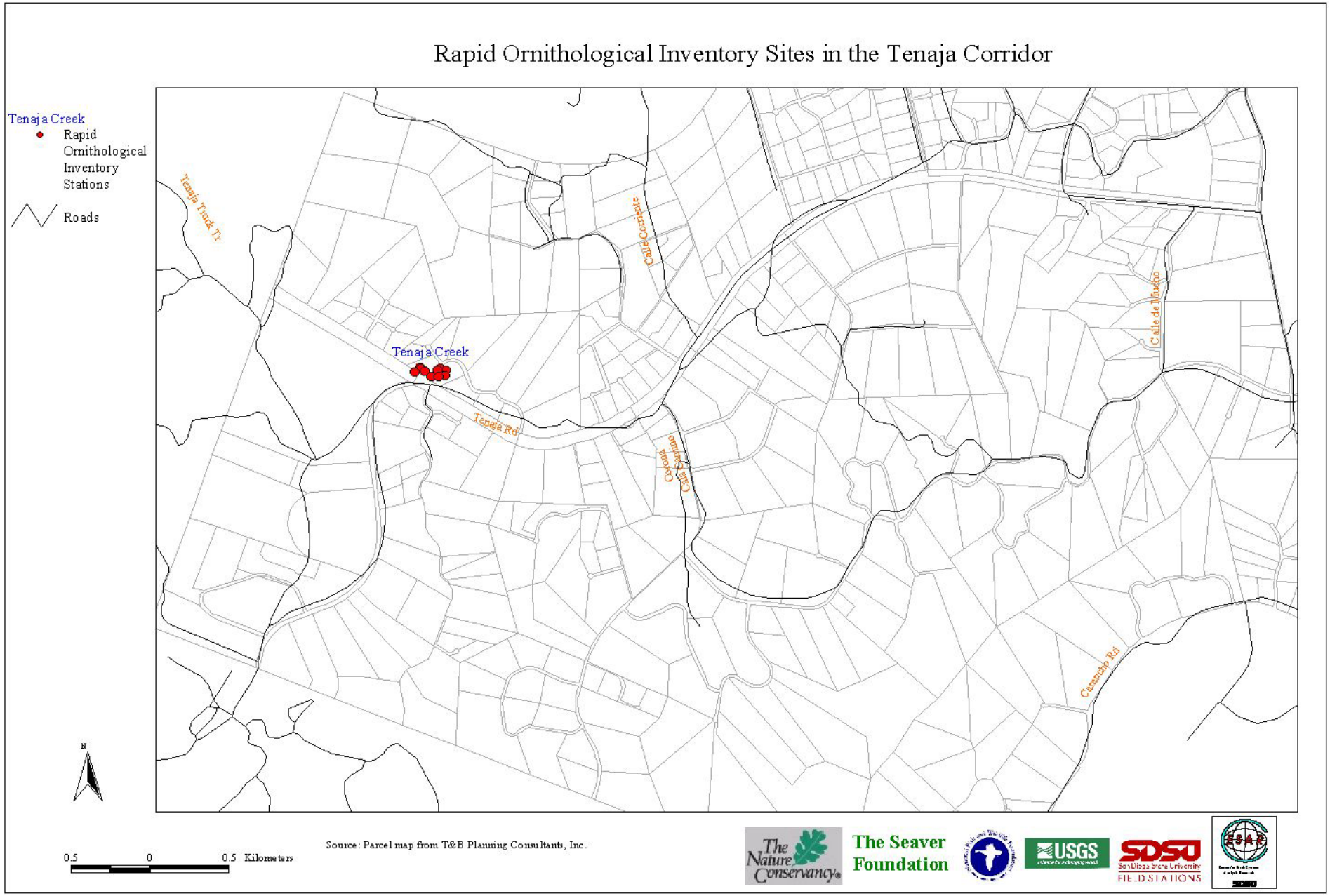

Figure 13. Location of Rapid Ornithological Inventory (ROI) sampling stations in Tenaja Corridor.

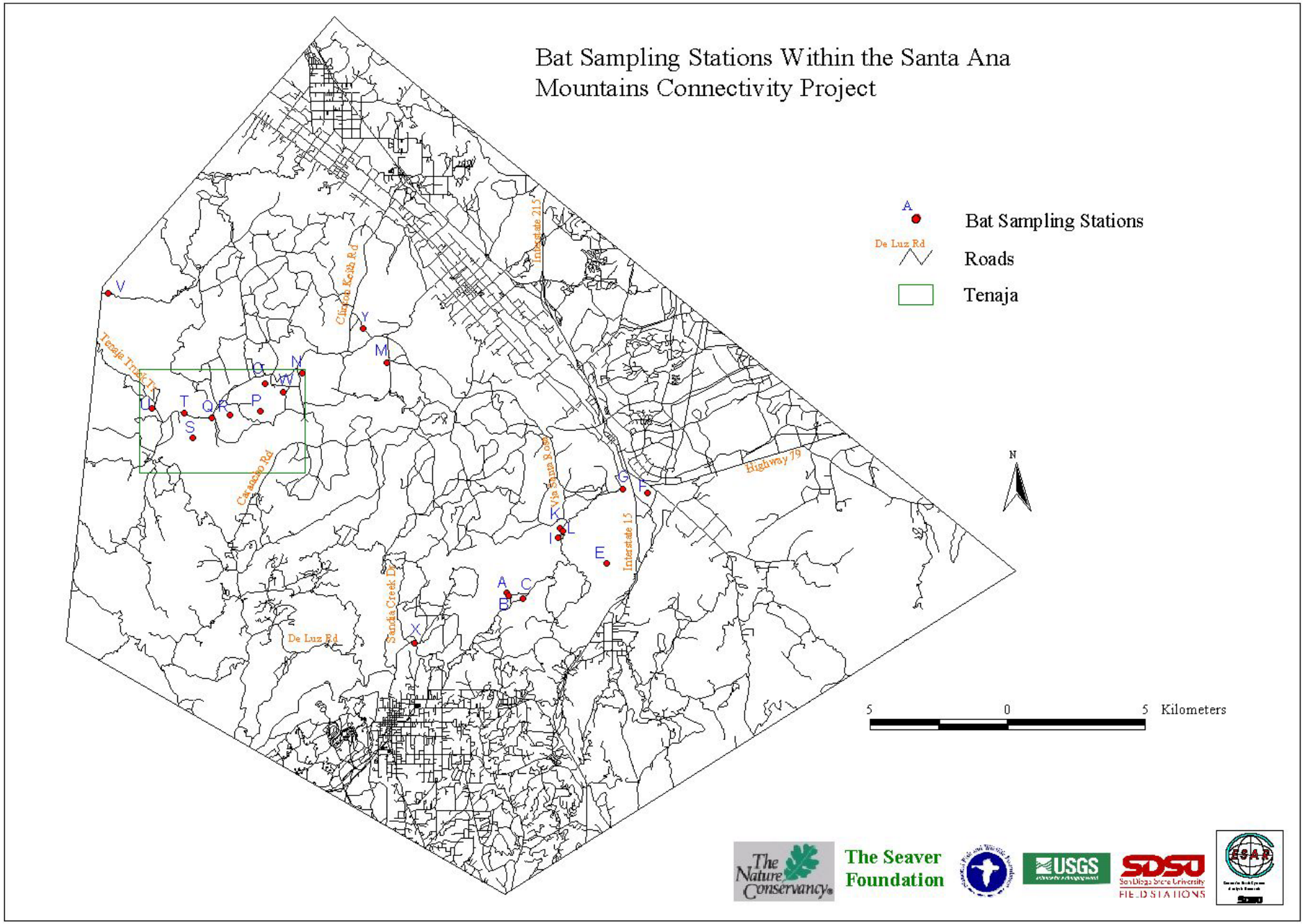

Figure 14. Location of bat sampling stations in Santa Ana Mountains study area.

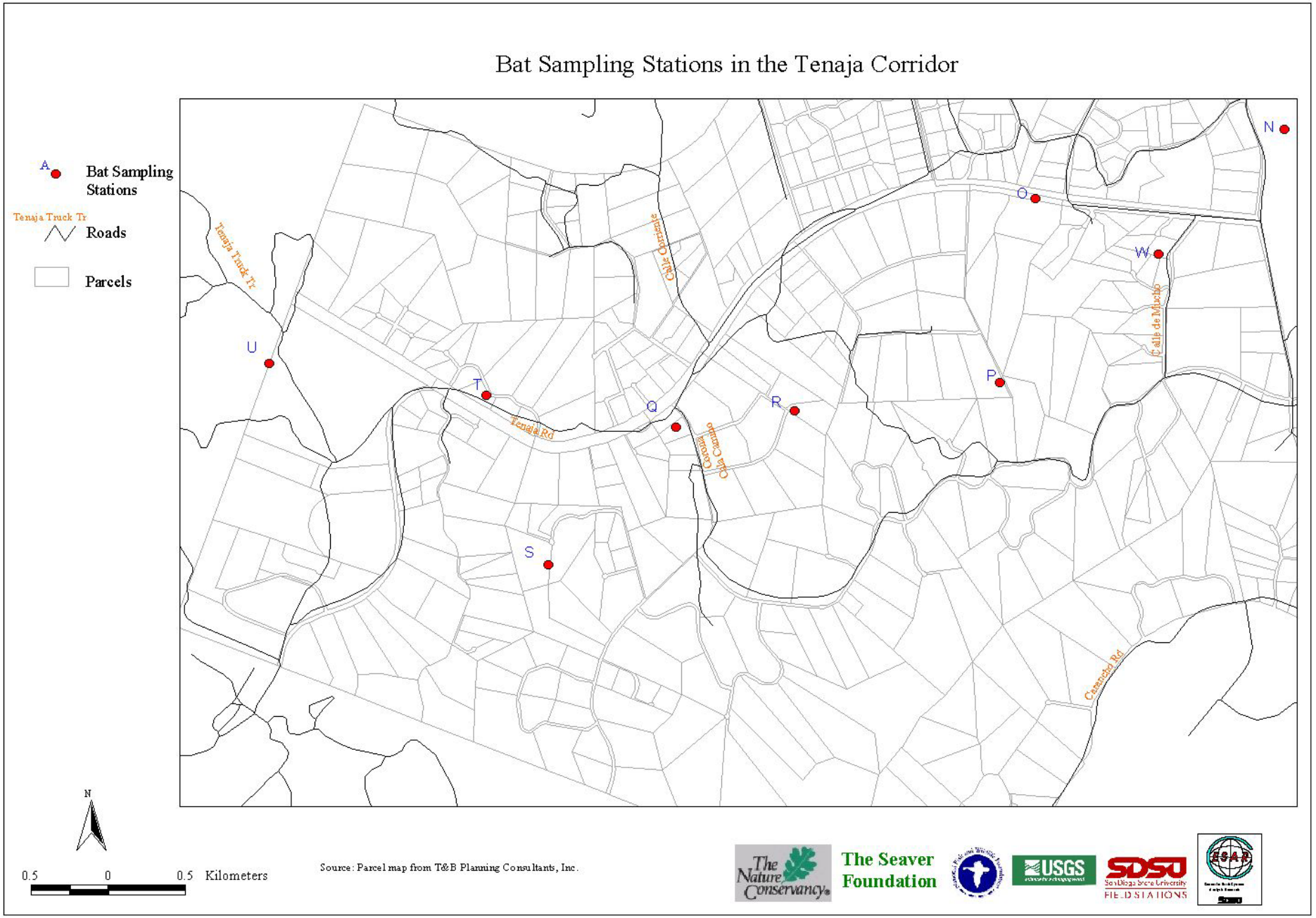

Figure 15. Location of bat sampling stations in Tenaja Corridor.

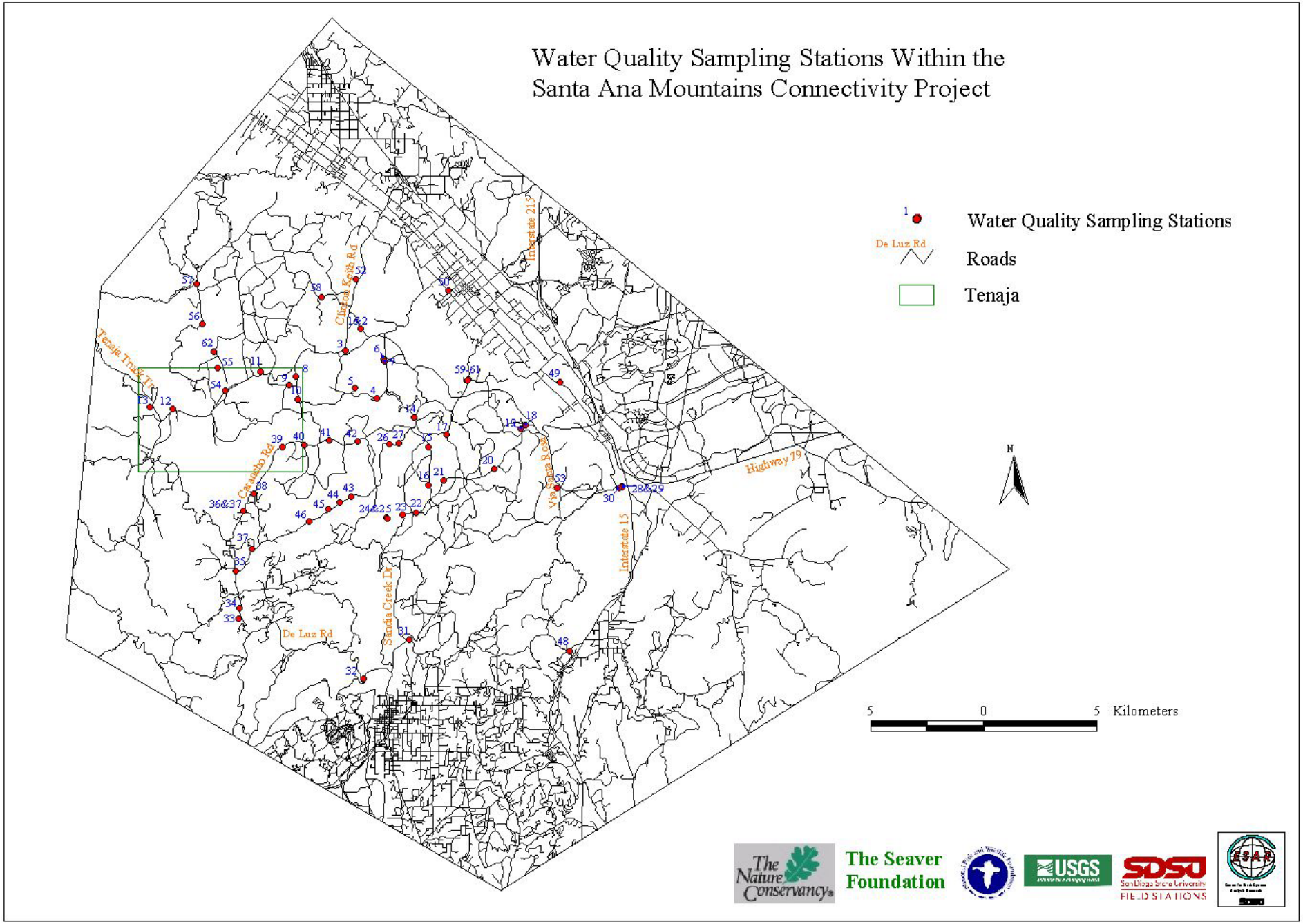

Figure 16. Location of water quality sampling stations in Santa Ana Mountains study area.

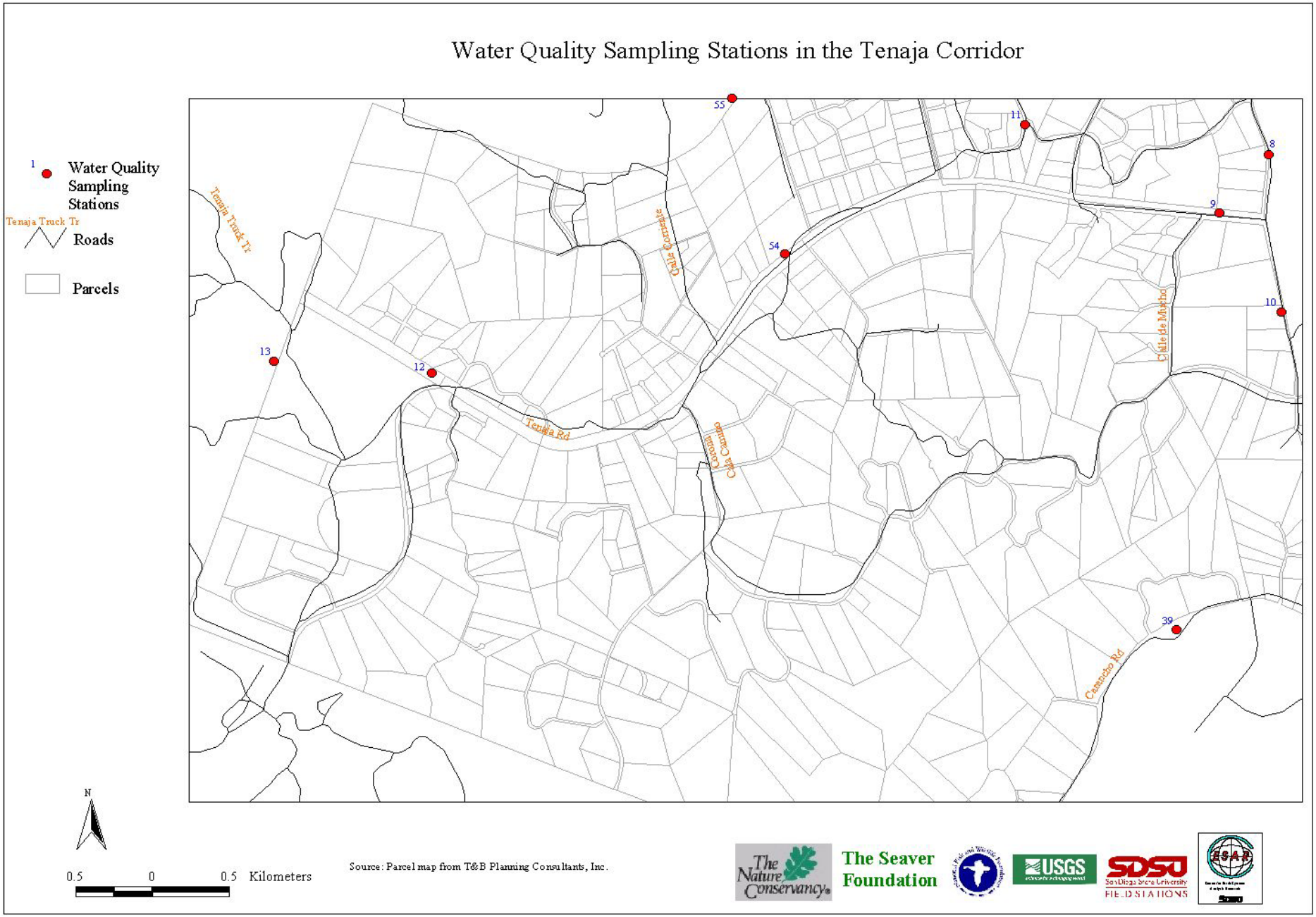

Figure 17. Location of water quality sampling stations in Tenaja Corridor.

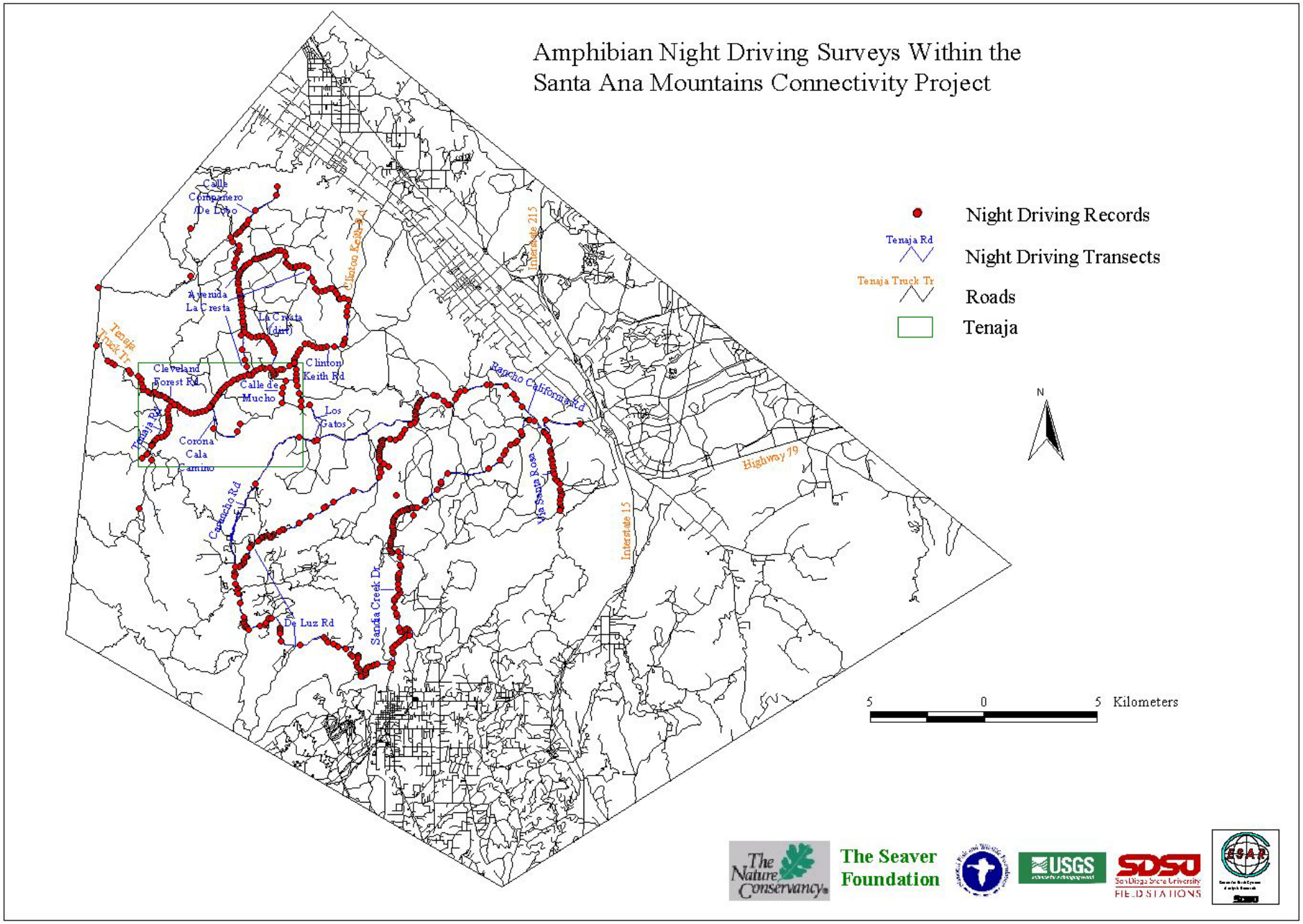

Figure 18. Location of amphibian night driving road transects in Santa Ana Mountains study area.

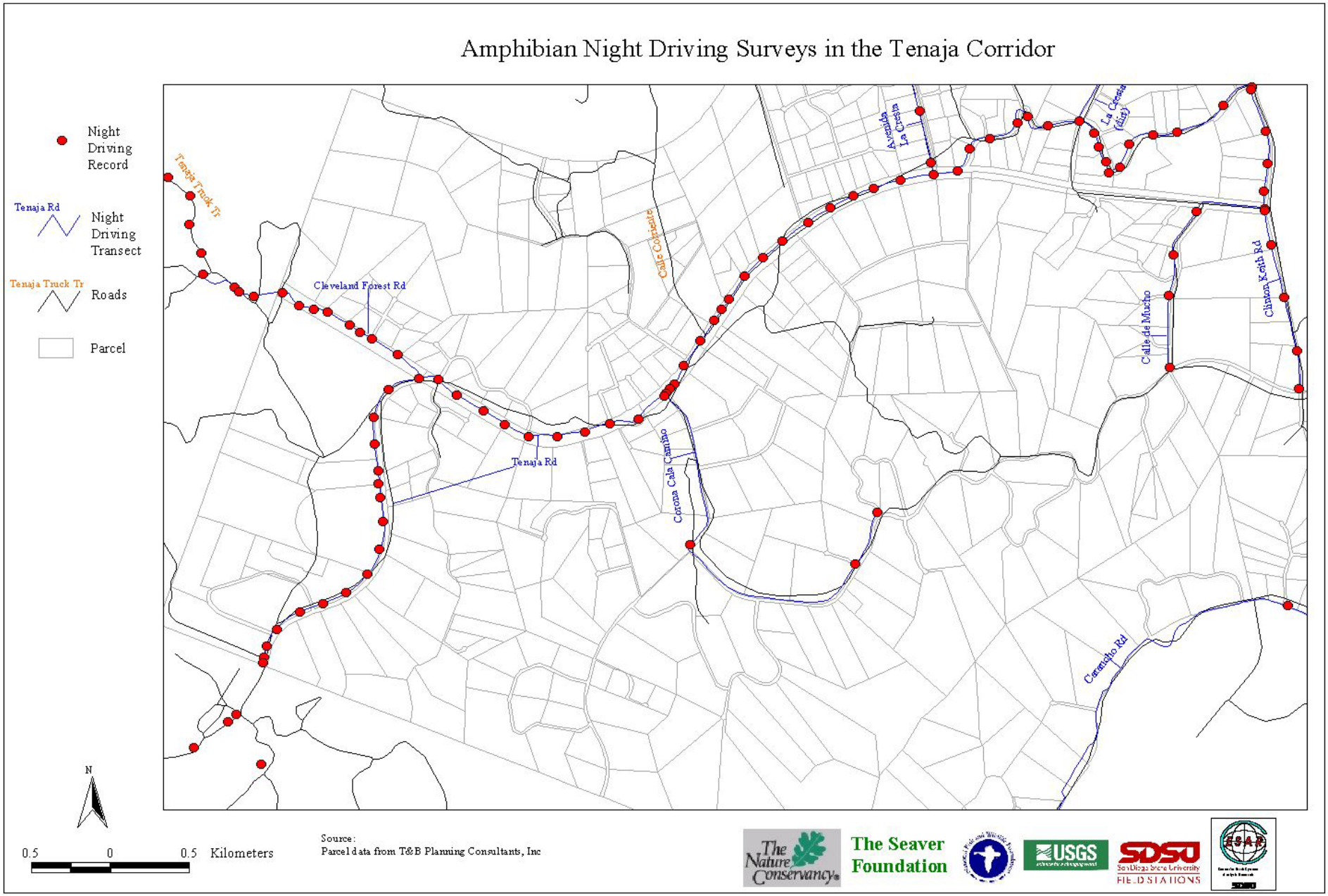

Figure 19. Location of amphibian night driving road transects in Tenaja Corridor.

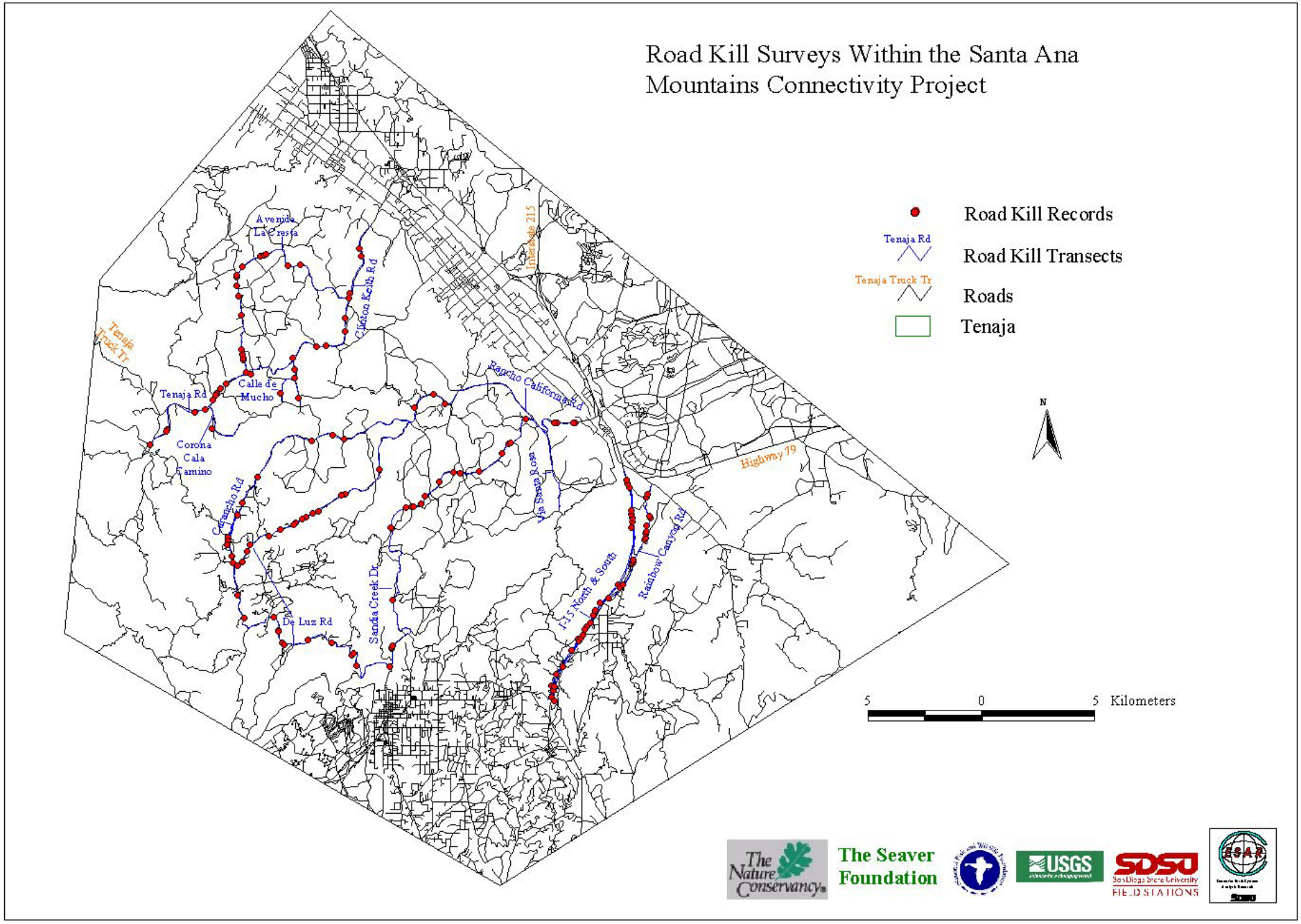

Figure 20. Location of road kill transects in Santa Ana Mountains study area.

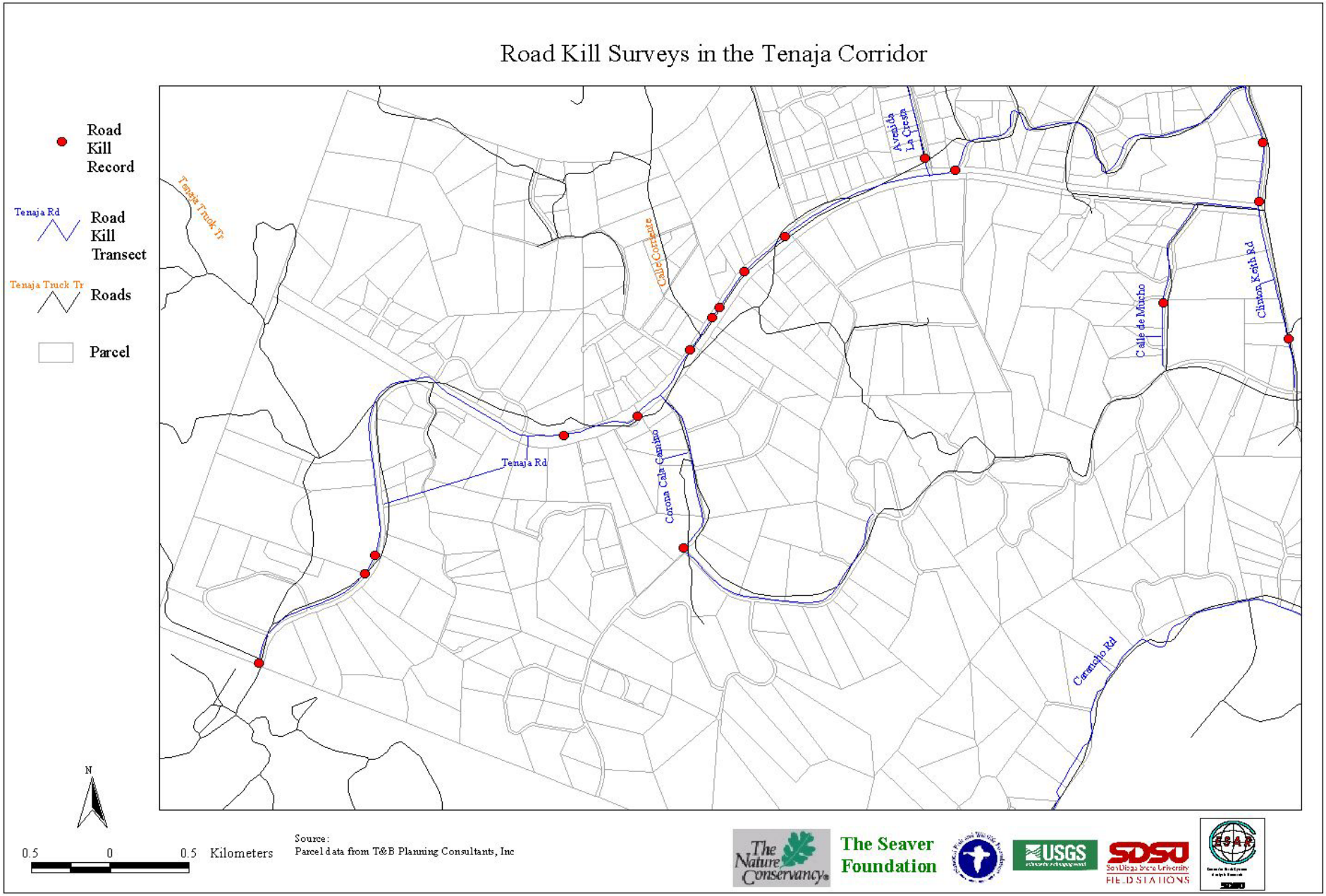

Figure 21. Location of road kill transects in Tenaja Corridor.

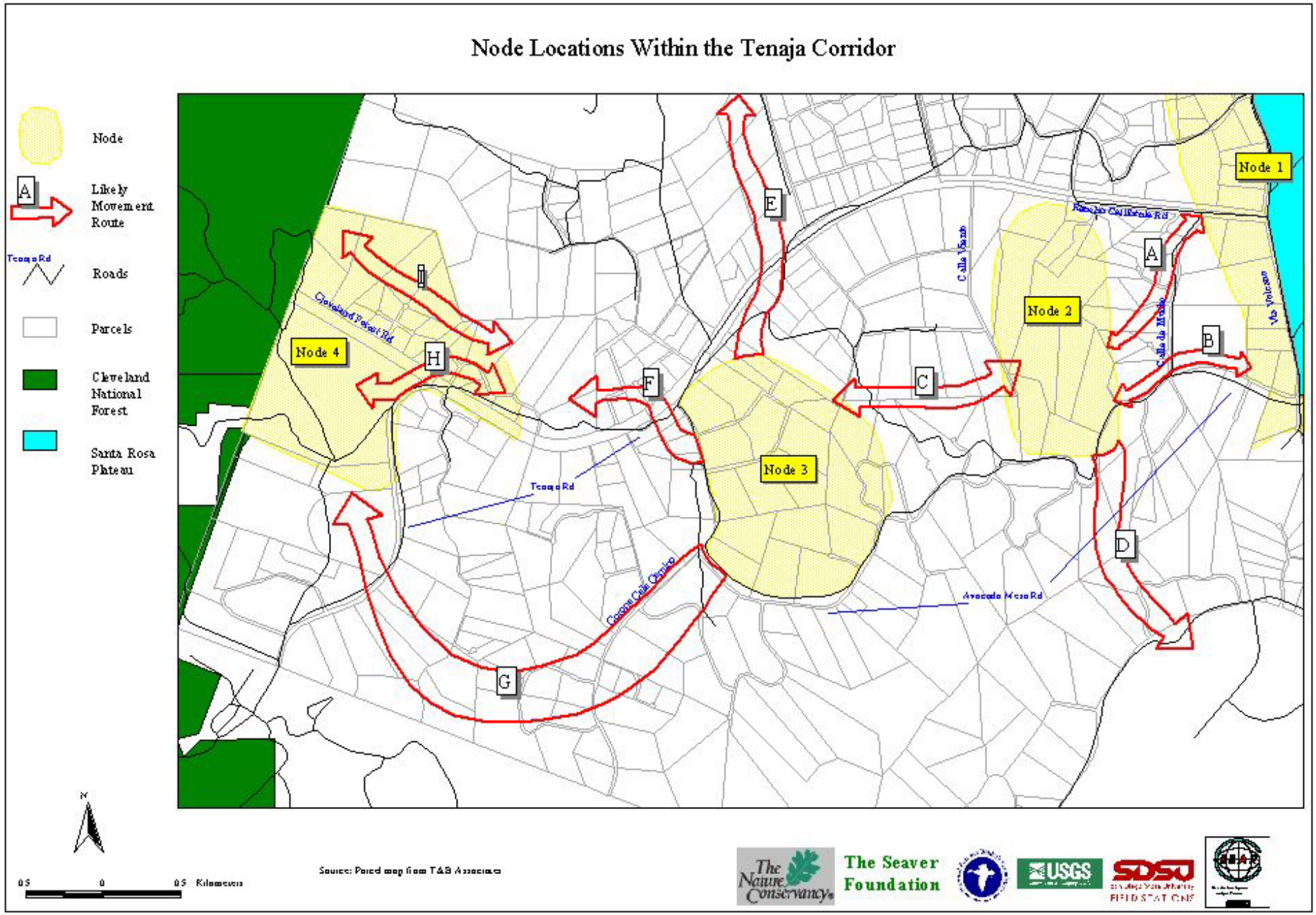

Figure 22. Location of nodes in Tenaja Corridor.

Appendix. Representative photographs from camera stations.

Avocado Mesa camera station.

Bobcat

Coyote

Mule Deer

Old Avocado Mesa camera station.

Gray Fox

Opossum

Appendix (Continued – 2). Representative photographs from camera stations.

Corte Colinga camera station.

Bobcat

Gray Fox

Badger

Coyote

Raccoon

Striped Skunk

Appendix (Continued – 3). Representative photographs from camera stations.

Corriente camera station.

Coyote

Mule Deer

Raccoon

Striped Skunk

De Luz camera station.

Bobcat

Coyote

Appendix (Continued – 4). Representative photographs from camera stations.

De Luz camera station.

Mule Deer

DOW camera station.

Bobcat

Coyote

Forest camera station.

Mountain Lion

Raccoon

Appendix (Continued – 5). Representative photographs from camera stations.

La Cresta camera station.

Coyote

Calle de Mucho Camera station.

Badger

Bobcat

Coyote

Mule Deer

Appendix (Continued – 6). Representative photographs from camera stations.

Viejo camera station.

Bobcat

Coyote

Gray Fox

Striped Skunk

Calle Viento camera station.

Bobcat

Coyote

Appendix (Continued – 7). Representative photographs from camera stations.

Calle Viento camera station.

Mule Deer

Gray Fox

Raccoon

Long-tailed Weasel

Via Volcano / Cole Creek Culvert camera station.

Coyote