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# Monitoring Results for Reptiles, Amphibians and Ants in the Nature Reserve of Orange County (NROC) 2002

Summary Report

**Prepared for:**

The Nature Reserve of Orange County – Lyn McAfee
The Nature Conservancy – Trish Smith

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

# Monitoring Results for Reptiles, Amphibians and Ants in the Nature Reserve of Orange County (NROC) 2002

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**Annual Report**

Prepared for:

The Nature Reserve of Orange County
The Nature Conservancy

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## ABSTRACT

Impacts from recent urbanization have created fragmented habitats along coastal southern California. In order to address habitat degradation and conservation planning, monitoring surveys for amphibian and reptile abundance, distribution, and diversity are currently being conducted in the Nature Reserve of Orange County (NROC) and other southern California lands. Surveys are being conducted by using drift fence arrays with pitfall and funnel traps (Figure 1). In conjunction with these pitfall traps, smaller pitfall traps are used to capture ants. To date a total of 10 study sites have been sampled over a period ranging from 3 –5 years for reptiles and amphibians and 3 years for the ants in the NROC lands. The study sites, encompassing diverse habitat types found in coastal southern California, range from coastal sage scrub extending east from the coastline to foothills and lower spurs of Santa Ana Mountains, chaparral along the slopes, southern oak woodland, grassland, and riparian habitat throughout scattered locations in NROC. Of the 43 herpetofaunal species known to historically occur in Orange County, 31 of these species have been recorded in NROC (Touré, Fisher, Backlin, in prep), however only 21 of these species were recorded from these same areas in 2002. This report is intended to summarize our data on the current status of amphibians, reptiles and ants in the NROC lands.


## RESEARCH GOALS

Our research goal for 2002 was to conduct baseline surveys for amphibians, reptiles and ants in core, edge, and fragmented habitat blocks within the NROC. Our objectives were to monitor and determine species richness, relative abundance, community assembleges, and detect changes in these indicies, and provide management recommendations for retaining or improving community structure and stability. We established survey sites in 3 coastal subregions and 7 central subregions. Herein we present preliminary results from this ongoing research program.

In the winter of 1999 we began sampling ants at these same study sites throughout NROC. Ants are an important part of the ecosystem, providing functions such as seed dispersal, pollination and diet for other animals. An intensive countywide ant survey such as this one has never been performed in Orange County, so the species list generated will provide a more comprehensive understanding of native ant community makeup. Also, two non-native, invasive ant species are present in Orange County. They are the Argentine ant (*Linepithema humile*) and the red imported fire ant (*Solenopsis invicta*). Only in the past five to ten years have red imported fire ants been detected in Orange County, so monitoring the invasive success as their range expands will provide valuable information. It will also be unique to witness how the two non-native species will interact in the southern Californian climate, which is quite different from the southeast where they have come into contact in the past. We plan to determine baseline species richness and abundance of ants within reserve biodiversity sites, monitor and compare changes in species richness and abundance at these fixed sites over time, and identify management needs resulting from reserve changes. We will compare ant species composition among core, edge and fragment sites to determine any net trends.

We are planning on completing a more comprehensive analysis of both the herpetofaunal and ant data collect thus far. This analysis will include the data represented in our past summary reports.

## STUDY AREAS

Within the Nature Reserve of Orange County, the ten biodiversity study sites are stratified into core, edge and fragment. Core sites are those that are buffered from any disturbance by a 300m distance. Edge sites have a portion of the site within 300m of disturbance. Fragment sites are small enough that no portion of the site is further than 300m from disturbance. Examples of disturbance are roads, urban development and agricultural lands. Within each site are between five and twenty-one arrays (Figure 1), each consisting of five ant traps. It is important to note that some core sites have edge arrays. In other words, the placement of some arrays in core sites is within 300m of disturbance and will thus be labeled edge arrays within a core site. The arrays themselves are further stratified by habitat type: coastal sage scrub, chaparral, grassland and oak woodland. Data will be reported both by site type (core, edge or fragment) and by habitat type. Ant traps consist of 50mL vials installed flush with the ground. They are filled half full with environmentally safer anti-freeze to aid in preservation once specimens fall in. Herpetofaunal traps are opened for five consecutive days across ten sampling periods each year. Ant traps are opened two times per year, once in summer and once in winter, for a ten-day duration.

## RESULTS

### Reptiles and Amphibians

There are 43 species of amphibians and reptiles historically known to occur in Orange County (Touré, Fisher, Backlin, in prep). Of these 43 species, a total of 21 species (5 amphibians and 16 reptiles) were recorded in NROC lands in 2002. To date, this monitoring survey has documented a total of 31 species in the NROC lands. Results from our 2002 surveys are summarized (Table 1) and described herein.

Core sites: There are a total of four core sites (Limestone Canyon, Weir Canyon, San Joaquin Hills, Aliso and Woods Canyons). Within these sites, in 2002, we detected between 6 and 16 species. Core sites have the highest species diversity detected of all study sites. In 2001 Limestone had the highest species diversity detected 26 (with 60.5% of the total Orange County species represented) however in 2002 this site dropped considerably in species diversity detected 6 (with only 14% of the Orange County species represented). Weir Canyon also dropped in diversity detected from 25, (58.1% of the Orange County species represented) in 2001 to 7, (16.3% of the Orange County species represented) in 2002. The two core sites located in the coastal subregion are San Joaquin Hills (SJH) and Aliso and Woods Canyon (AWC). SJH had the greatest activity for a coastal site last year with a species diversity detected at 20 (46.5% of the Orange County species represented) but dropped to having a species diversity detected of 13 (30.2% represented) in 2002. AWC had the lowest species diversity detected 18 (with 41.9% represented) in 2001 but the greatest species diversity detected of all the sites 16 (with 37.2% represented) in 2002.

Edge sites**:** There are a total of three edge sites (Edison, Aqua Chinon, Rattlesnake Reservoir). Rattlesnake Reservoir was not sampled in 2002. In 2002 these sites had a species diversity detected ranging from 4 to 11 different species. Both Aqua Chinon and Edison had a species diversity detected of 16 with (37.2% of the possible species represented last year) however this dropped to a species diversity detected of 11 (with 25.6% of the species represented) for Aqua Chinon and 4 (9.3% respectively) for Edison.

Fragment sites: There are a total of three fragmented sites (Peter's Canyon, Orange Hills, University of California Irvine). Orange Hills was not sampled in 2002. These sites had a species diversity detected range of no less than 3 to no more than 5 in 2002. Fragmented site species diversity detected was lower than core sites as was consistent with last years data. Of the fragemented sites, Peter's Canyon had the highest species richness 15 (with 34.9% represented) last year but dropped to only 5 (11.6% represented) in 2002. University of California Irvine had a species richness of 9 (with 20.9% of the possible species represented) in 2001 whereas in 2002 this dropped to only 3 species (7% of the total possible species represented).

In summary, all sites surveyed in 2002 exhibited a lower species richness of amphibians and reptiles than we had calculated in 2001. Also, as is consistent with our data from 2001, we found that as you move from core to edge habitats the percent of the possible species represented decreased and the same applies from core to fragmented sites it. All species found in the edge and fragment sites were documented in the core sites.

These lowered numbers are a combination of two factors. The first being that 2002 recorded the least amount of rainfall in recorded history for Orange County. The amount of rain received during the winter months greatly affects the activity of the herpetofauna throughout the year. The second factor affecting the capture rates is that sites were surveyed for 10, 4 day sample periods in 2001. In 2002 only 3 of the 10 sites were sampled the entire 10 times. The rest varied in frequency with 2 sites not being sampled at all and the remaining 5 only being sampled a few times. This change is consistent with the scope of work developed in 1998.

**Ants**

Samples have been taken in winter 1999, summer 2000, winter 2000, summer 2001, winter 2001, summer2002 and the winter of 2002. Ants from the first three sample periods have been identified to genus and need to be identified to the species level. Samples from 2001 are currently being identified to the species level (see Table 2). Although the data have not yet been stratified by habitat type (CSS, chaparral, grassland or oak woodland), and statistical tests have yet to be run, strong trends can already be seen from the first three sample periods. Generic diversity is highest in core sites, with an average of 18 genera per site. Generic diversity declines in edge and fragment sites, with averages of 9 and 6 genera per site, respectively. Thus, distance from an array to some form of disturbance plays a large role in ant diversity. This is chiefly due to the negative impact of one exotic ant species, the Argentine ant, mentioned above. Plotting the number of native ant genera per array against the average number of Argentine ants revealed the following relationship: increased abundance of Argentine ants caused declines in native ant generic diversity. In other words, at arrays where more than a few Argentine ants were trapped, three or fewer native ant genera were present. These results support the idea that Argentine ants can

invade natural habitat in southern California only up to a certain distance from a constant moisture source, such as a backyard or irrigated avocado grove. This explains why Argentine ants are not found in the center of core sites.

Red imported fire ants have not been detected in our traps. By keeping in close contact with the Orange County Fire Ant Authority, we are aware of the growing presence of red imported fire ants in developed urban and agricultural lands and native riparian habitat in Orange County. But, native scrub habitat may be too dry for this species to inhabit. Current and future monitoring will be essential to determine the extent, limitations and effects of the red imported fire ant invasion of southern California.

**Recent Publications**

Results from this work are scientifically important worldwide and have recently been reported in journal articles from *Conservation Biology* and the *Journal of Animal Ecology*. Specifically, information on horned lizards (*Phrynosoma coronatum*), desert shrews (*Notiosorex crawfordi*), ornate shrews (*Sorex ornatus*) and many of the ant species they pray on are represented in these articles.

Fisher, R. N., A. V. Suarez, T. J. Case. 2002. Spatial Patterns in the Abundance of the Coast Horned Lizard. Conservation Biology **16**(1):205-215.

Laakkonen, J., R. N. Fisher, T. J. Case. 2001. Effects of land cover, habitat fragmentation and ant colonies on the distribution and abundance of shrews in southern California. Journal of Animal Ecology **70**:776-788.

## RECOMMENDATIONS

Monitoring of amphibians, reptiles and ants in the NROC should be ongoing. Below we include a list of recommendations for future monitoring of amphibians and reptiles in the NROC.

### *1) Implement an environmental educational outreach component for Park rangers and the public on wildlife enhancement*

Park rangers need to be educated on the importance of allowing temporary pools of standing water on dirt roads to remain. Amphibians, in particular spadefoot toads, have been found in various temporary pools of standing water on dirt roads within some Park Reserves. Currently these pools are normally drained after heavy rains before the toads are able to metamorph and disperse. By not draining these temporary pools natural populations existing within the NROC may be able to reestablish.

Environmental education increases awareness and knowledge about wildlife issues and provides the needed information to make informed decisions and take responsible actions on how to weigh various sides of an issue. Signs or pamphlets, such as “Living Close to Nature” published by The Irvine Company, The Nature Conservancy and the Nature Reserve of Orange County, inform the public about native habitat in their area and simple steps to make their backyards friendly to native species and to more fully enjoy the

wilderness on hikes. Informative signs should be placed along trails and pamphlets distributed frequently to increase public interest in preserving NROC.

### *2) Develop additional survey techniques to estimate population densities and community structure of other amphibians and reptiles*

Drift fence and funnel trap arrays are an effective method to evaluate the species richness and relative abundance of amphibian and reptile communities. These techniques, however, do not yield the absolute species diversity in the NROC. Techniques such as stream surveys, frog call surveys, and turtle trapping would provide additional information of other amphibians and reptiles within the NROC. These techniques often require less labor and funding than do pitfall traps. However, such techniques when used in conjunction with pitfall traps, would provide more refined information about the metapopulations of amphibians and reptiles within the NROC. This would allow for unprecedented data on metapopulations throughout the reserve, and could yield invaluable data on responses of species to habitat types (urban edges, roadways, and landscape linkages).

### *3) Systematically collect road-kill data throughout the NROC*

Throughout Orange County, employees of CALTRANS and local animal control offices pick up wild animals that are killed on roadways. Unfortunately, as of yet no systematic inventory of these kills is made available. We suggest a cooperative effort to collect and make road kill data accessible. This would require only minimal additional effort by the animal control officers because they already frequently record road-kills in log books. We recommend that the NROC supply a simple data sheet format on which officers could record the date, location, species, and age and/or sex if known. These sheets could then be periodically routed to a single collection site for database entry and analysis. Road-kill data could then be used to identify the species most susceptible to road-caused mortality, and the locations of barriers to natural dispersal and movement routes. Such information would be invaluable.

### *4) Watch for red imported fire ants*

The Orange County Fire Ant Authority (OCFAA) has had good success with public help in locating and reporting potential red imported fire ant (RIFA) mounds. Since we do not know the potential success of future RIFA invasions into native scrub habitat, it is even more important for all eyes to be watching for their presence. Everyone on or surrounding NROC lands should be encouraged to recognize the characteristic mounds made by RIFA, and given contact information for the OCFAA (www.ocfireant.com) to report any sightings. Immediate erradication efforts of RIFA will greatly reduce their harmful effects on native wildlife and humans.

**Table 1.** Summary of amphibian and reptile captures for 2002.

| | Site: | AGC | AWC | EDI | LIM | ORH | PET | RAT | SJW | UCI | WIR | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # of Arrays: | 7 | 17 | 5 | 19 | 5 | 5 | 5 | 21 | 5 | 12 | |
| | # of Sample Days (2002): | 36 | 40 | 4 | 8 | 0 | 4 | 0 | 36 | 4 | 4 | |
| Common Name | Scientific Name | | | | | | | | | | | |
| Black-bellied Slender Salamander | *Batrachoseps nigriventris* | | 10 | | | | | | 8 | | | 18 |
| Pacific Slender Salamander | *Batrachoseps pacificus* | 1 | 1 | | | | | | 20 | | 1 | 23 |
| Arboreal Salamander | *Aneides lugubris* | | | | | | | | | | | |
| Monterey Salamander | *Ensatina eschscholtzii* | | | | | | | | | | | |
| Large-Blotched Salamander | *Ensatina klauberi* | | | | | | | | | | | |
| California Newt | *Taricha torosa* | | | | | | | | | | | |
| California Treefrog | *Hyla cadaverina* | | | | | | | | | | | |
| Pacific Treefrog | *Hyla regilla* | | 4 | | | | | | 2 | | | 6 |
| Western Toad | *Bufo boreas* | 1 | 2 | | | | | | 27 | | 2 | 32 |
| Arroyo Toad | *Bufo microscaphus* | | | | | | | | | | | |
| Red-Spotted Toad | *Bufo punctatus* | | | | | | | | | | | |
| Red-Legged Frog | *Rana aurora* | | | | | | | | | | | |
| Bullfrog | *Rana catesbeiana* | | | | | | | | | | | |
| African Clawed Frog | *Xenopus laevis* | | | | | | | | | | | |
| Western Spadefoot Toad | *Spea hammondii* | | | | | | | | 1 | | | 1 |
| Western Pond Turtle | *Clemmys marmorata* | | | | | | | | | | | |
| Slider | *Trachemys sp.* | | | | | | | | | | | |
| Coastal Banded Gecko | *Coleonyx variegatus* | | | | | | | | | | | |
| Granite Night Lizard | *Xantusia henshawi* | | | | | | | | | | | |
| Desert Night Lizard | *Xantusia vigilis* | | | | | | | | | | | |
| California Legless Lizard | *Anniella pulchra* | | | | | | | | | | | |
| Southern Alligator Lizard | *Elgaria multicarinatus* | 1 | 45 | 1 | 2 | | | | 5 | 2 | | 56 |
| Gilbert Skink | *Eumeces gilberti* | | | | | | | | | | | |
| Western Skink | *Eumeces skiltonianus* | 1 | 27 | 3 | 1 | | 1 | | 62 | 5 | 6 | 106 |
| Orange Throated Whiptail | *Cnemidophorus hyperythrus* | 48 | | | | | 1 | | | | 1 | 50 |
| Western Whiptail | *Cnemidophorus tigris* | 4 | 4 | | | | | | 17 | | | 25 |
| Desert Spiny Lizard | *Sceloporus magister* | | | | | | | | | | | |
| Sagebrush Lizard | *Sceloporus graciosus* | | | | | | | | | | | |
| Western Fence Lizard | *Sceloporus occidentalis* | 23 | 106 | 4 | 29 | | 2 | | 65 | 4 | 10 | 243 |
| Granite Spiny Lizard | *Sceloporus orcutti* | | | | | | | | | | 1 | 1 |
| Side-Blotched Lizard | *Uta stanburiana* | 8 | | 2 | 1 | | 3 | | | | 2 | 16 |
| Coast Horned Lizard | *Phrynosoma coronatum* | 1 | | | 1 | | | | | | | 2 |
| Long-Nosed Leopard Lizard | *Gambelia wislizenii* | | | | | | | | | | | |

**Table 1.** Summary of amphibian and reptile captures for 2002 (continued).

| | Site: | AGC | AWC | EDI | LIM | ORH | PET | RAT | SJW | UCI | WIR | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # of Arrays: | 7 | 17 | 5 | 19 | 5 | 5 | 5 | 21 | 5 | 12 | |
| | # of Sample Days (2002): | 36 | 40 | 4 | 8 | | 4 | | 36 | 4 | 4 | |
| Common Name | Scientific Name | | | | | | | | | | | |
| Western Blind Snake | *Leptotyphlops humilis* | | 1 | | | | | | | | | 1 |
| Coastal Rosy Boa | *Charina trivirgata* | | | | | | | | | | | |
| California Glossy Snake | *Arizona elegans* | | | | | | | | | | | |
| Western Yellow-Bellied Racer | *Coluber constrictor* | | | | | | | | | | | |
| Western Ringneck Snake | *Diadophis punctatus* | 1 | 1 | | | | | | 2 | | | 4 |
| Night Snake | *Hypsiglena torquata* | | | | | | | | | | | |
| California Kingsnake | *Lampropeltis getula* | | 1 | | | | | | | | | 1 |
| California Mountain Kingsnake | *Lampropeltis zonata* | | | | | | | | | | | |
| Coachwhip/Red Racer | *Masticophis flagellum* | | | | | | | | | | | |
| Striped Racer | *Masticophis lateralis* | 2 | 3 | | | | | | 3 | | | 8 |
| San Diego Gopher Snake | *Pituophis melanoleucus* | | 1 | | 2 | | | | 1 | | | 4 |
| Long-nosed Snake | *Rhinocheilus lecontei* | | | | | | | | | | | |
| Coast Patch-Nosed Snake | *Salvadora hexalepis* | | | | | | | | | | | |
| California Black-Headed Snake | *Tantilla planiceps* | | | | | | | | | | | |
| Two-striped Garter Snake | *Thamnophis hammondii* | | 1 | | | | | | | | | 1 |
| Common Garter Snake | *Thamnophis sirtalis* | | | | | | | | | | | |
| Lyre Snake | *Trimorphodon biscutatus* | | | | | | | | | | | |
| Speckled Rattlesnake | *Crotalus mitchelli* | | | | | | | | | | | |
| Red Diamond Rattlesnake | *Crotalus ruber* | | 2 | | | | | | | | | 2 |
| Southern Pacific Rattlesnake | *Crotalus viridis* | | 3 | | | | 1 | | 4 | | | 8 |
| | Total Captures | 91 | 213 | 10 | 36 | 0 | 8 | 0 | 218 | 11 | 27 | 614 |
| | Total Species | 11 | 16 | 4 | 6 | 0 | 5 | 0 | 13 | 3 | 7 | 21 |

**Table 2.** Summary of ant sampling and identification progress. S=sampled, I=identified.

| Site | Winter 99 | Summer 00 | Winter 00 | Summer 01 | Winter 01 | Summer 02 | Winter 02 |
|---|---|---|---|---|---|---|---|
| AGC | | S, I | S, I | S, I | S | S | S |
| AWC | S, I | S, I | S, I | S, I | S | S | |
| EDI | | S, I | S, I | S | S | S | S |
| LIM | S, I | S, I | S, I | S | S | S | |
| ORH | S, I | S, I | S, I | S | S | S | |
| PET | S, I | S, I | S, I | S | S | S | |
| RAT | S, I | S, I | S, I | S | S | S | |
| SJH | S, I | S, I | S, I | S | S | S | |
| UCI | S, I | S, I | S, I | S | S | S | |
| WIR | S, I | S, I | S, I | S | S | S | |

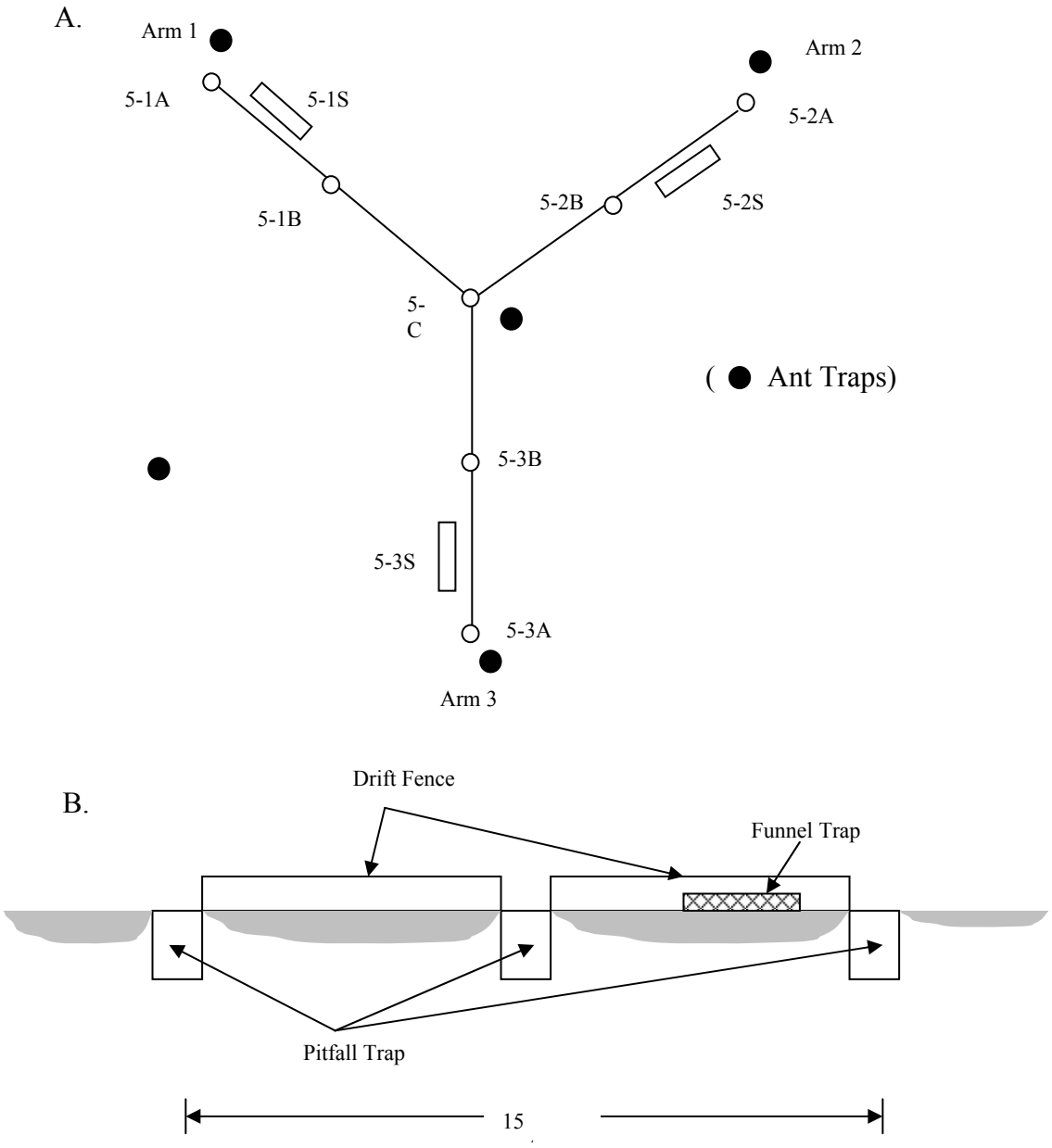


**Figure 1.** Pitfall Array Design.
A. Overhead view of array design, showing pitfall traps, funnel trap, and drift fences. For the purposes of this example, the traps are numbered as if at array 5 of a site. B. The side view of a single arm, indicating the relative positions of the three trapping elements. Diagrams not to scale.