# Wildlife Use of Preserved Natural Open Spaces Within the Greater Phoenix Metropolitan Area

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**ABSTRACT -** The objective of our study is to identify habitat and environmental characteristics that contribute to avian and mammalian species diversity and relative abundance in order to establish guidelines for both land development and preservation of natural areas. We have selected representative areas of various types of habitat such as park preserves, river systems, washes, and undeveloped public land. Our initial data collection has been in the Lookout Mountain (LM), the Phoenix Mountain (PMP) Preserves, and Dreamy Draw (DD) where we have begun small mammal trapping, camera trapping, recreation counts, incidental observations, quadrat and line-transect vegetation sampling, scent station and track plate investigations, and owl broadcast surveys. Future data collection efforts will include direct observations, GIS analysis, water availability, and light and noise disturbance investigations. Thus far, 501 trap nights of small mammal trapping have yielded a success rate of 22% (n=111), a recapture rate of 57% (n=43), and established the presence of two rodent species in all three study sites (*Neotoma albigula* and *Chaetodipus intermedius*) and a third species in one study site (*Peromyscus eremicus*). Images of common gray fox (*Urocyon cinereoargenteus*), harris' antelope squirrel (*Ammospermophilus harrisii*), desert cottontail (*Sylvilagus audubonii*), and coyote (*Canis latrans*) were captured over 14 trap days worth of camera trapping. Incidental observations from 65 visits have documented 51 species (LM=42 species, PMP=36 species, DD=25). We are in the first year of this study, so we will continue current efforts and refine our observation techniques, in addition to implementing new investigative methods. Ultimately we will use our results to make recommendations to managers, developers and city planners, who are attempting to create a balance between the need for development and preservation of natural areas.

**INTRODUCTION -** As urban sprawl extends its claim through undeveloped land, wildlife habitat becomes increasingly fragmented. In these newly metropolitan areas, human encounters with native wildlife are more frequent. Some of these more abundant interactions are perceived as positive, such as viewing and feeding opportunities (Baker et al. 2004), and some are seen as negative, such as predator encounters (Beckmann and Berger 2003, Temby 2004, Ticer et al. 1998). Smaller patches of natural habitat become more isolated as development continues. An area's value as a wildlife resource decreases as its ability to support indigenous organisms wanes, resulting in a decline in abundance and eventually in the presence of native species (Fernández-Juricic 2000).

Investigations into such habitat fragmentation and into the increasing importance of connective biological corridors have become widespread in recent years. However, data must be collected in order to define the characteristics that limit the attractiveness, accessibility, and utilization of urban open spaces and corridors for native wildlife.

**OBJECTIVES**

1. To determine what characteristics of an open space contribute to higher species diversity and relative abundance.
2. To determine what characteristics of an open space promote the presence of native versus non-native species.
3. To determine what characteristics of an open space contribute to increased incidences with nuisance wildlife species.

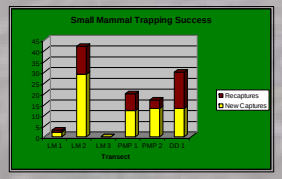
**STUDY SITES -** Although, there have been numerous studies investigating the relationship between habitat patch size and species diversity and abundance in wildland and rural areas, there have been far fewer studies in urban areas.

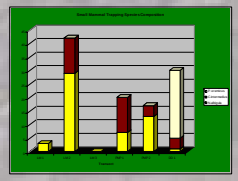
We are conducting this study throughout the Phoenix metropolitan area. For the purpose of this study, we are defining "open space" as natural desert habitat areas of varying sizes; we are, therefore, limiting our study sites to park preserves and undeveloped county land and are excluding developed urban parks and golf courses. Our study sites will include land managed by the City of Phoenix Parks and Recreation, Maricopa County Parks and Recreation, Maricopa County Flood Control District, among others. We are first focusing on areas that are completely isolated within the urban matrix and will proceed to areas on the city fringe if resources prove sufficient. We have begun investigations in Lookout Mountain Preserve, Phoenix Mountains Preserve – between 7th Street and Cave Creek Road, and the Dreamy Draw portion of the Phoenix Mountains Preserve.

**GENERAL METHODS -** Study areas are stratified into habitat types, and each of these parcels is subjected to the various methods of wildlife investigations described below. We are repeating these processes within each identified trimester date range (1 January – 30 April, 1 May – 31 August, and 1 September – 31 December). Project personnel began some field efforts in the third trimester of 2005. Many components will return their first complete data set after the completion of the first trimester of 2006.

**Small Mammal Trapping**
METHODS
•Project personnel set grids of 30 extra-long aluminum collapsible Sherman live traps separated into three rows and spaced 10m apart.
•We pre-bait traps with loose molasses cob for two nights, then trap for three consecutive nights.
•Observers collect various meteorological data for each night of trapping.
•Species and identifying characteristics are recorded for each specimen.
•For identification upon recapture, all trapped individuals are marked

RESULTS
•We have conducted small mammal trapping at six transects in three study sites for a total of 501 trap nights: three grids at LM, two grids at PMP, and one grid at DD.
•Our success rate was 22% (111 captures) with a recapture rate of 57% (43 recaptures out of 76 captures over 321 trap nights).
•There were white-throated woodrats (*Neotoma albigula*) and rock pocket mice (*Chaetodipus intermedius*) at all three study sites; cactus deer mice (*Peromyscus eremicus*) were captured at one of six transects, in the Dreamy Draw site only.



**Track Plates and Scent Stations**
METHODS
•Line transects, conducted for three consecutive nights in each location, consist of five track plates and five scent stations placed in pairs (≤10m apart) with a minimum of 0.32km spacing between pairs.
•The track plates were constructed from 22-gauge steel sheets welded together.
•We spray a mixture of isopropyl alcohol and carpenter's chalk on the surface of each plate and place a scent tab lure in the center.
•Scent stations consist of a 1m diameter circular plot, cleared of vegetation, and covered with a layer of powdered gypsum.
•Observed tracks are measured and identified when possible.

RESULTS
•One track survey transect was done at LM.
•We recorded tracks from coyote (*Canis latrans*), domestic dog (*Canis familiaris*), possible fox, desert cottontail (*Sylvilagus audubonii*), possible black-tailed jackrabbit (*Lepus californicus*), unidentifiable birds, rodents, lizards, and snake.

**Camera Trapping**
METHODS
•We are using Bushnell Trail Cameras with a 2.1 megapixel digital camera, infrared (IR) flash, and night vision capability.
•Cameras are baited and set for 3 to24 hours at points of potential activity.
•Species and other variables of interest are recorded upon review of captured images.

RESULTS
•9 trap nights and six trap days have been completed in DD, 4 full days in PMP, and 1 full day in LM.
•Grey fox (*U.cinereoargenteus*), harris' antelope squirrel (*A.harrisii*), *S.audubonii, and C.latrans* tripped cameras at DD.
•*N.albigula* was photographed at PMP.
•No images were captured at LM.

**Incidental Observations**
METHODS
•Field personnel record time, task, and location for every site visit.
•They keep a corresponding account of all incidental observations of animals (wild, feral, and domestic) or identifiable animal sign (e.g., carcasses, feathers, scat, tracks, burrows, or nests).

RESULTS
•51 distinct species, representing at least 31 family taxa, have been documented in incidental logs.
•Birds, mammals, and reptiles have been observed at all three study sites.

**Owl Broadcast Call Surveys**
METHODS
•Researchers establish a transect with call points at least 300m apart to be observed within 4 days of the full moon.
•Surveyors begin with the smallest target species and broadcast the recorded call for 10s each in three directions (0, 120, and 240°), then listen for 60s .
•This process is done 3 times for each species.
•We then proceed to the next largest species.

RESULTS
•We have performed two owl broadcast surveys at a total of five points.
•Responses were heard from great-horned owls at PMP and DD.
•Western screech owls responded at PMP.

**Site Characteristics**
METHODS
•Personnel are contributing to site characteristic analyses through various data collection field procedures: investigations into seasonal presence of water in site washes, assessment of wash wall substrates and fence structures, perimeter verifications and scheduled counts of recreation and indigent use.
•We are using GIS analyses of existing materials and supplementary GPS files to determine the area, shape, perimeter, perimeter to area ratio, housing density, fence density, distance to water source, number of feeder corridors, connectivity to and distance from the urban boundary of each study site.
•Light pollution and noise disturbance are measured during various field activities.
•Project personnel assess vegetative type and ground cover in 0.25m² quadrats at 20 randomly selected trap sites for each small mammal trapping transect.
•They also measure substrate, species composition and cover using 30m line-intercept surveys from each of the four corners of the small mammal trapping grid.
•60m² strip transects to quantify holes are associated with the line-intercept transects.
•We regularly record the presence of domestic animals and significant sources of water, cover and disturbances on our incidental logs.

RESULTS
•All vegetation, substrate, and hole assessments associated with small mammal trapping transects to date have been completed.
•Two randomly scheduled recreation counts have been conducted in LM.

**FUTURE METHODS**
**Bird Sampling**
METHODS
•Bird indices will be compiled from multiple sources.
•Existent CAP LTER point count data will provide some presence/absence data.
•Data mining of other literature will provide addition information.
•Incidental logs are contributing to the compilation of bird species lists for study sites.
•CAP LTER protocol point count surveys will be used to supplement gathered data.

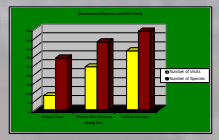
**Directed Observation**
METHODS
•Primary investigators will select locations based on scope of view and potential for concealment.
•Observers, wearing cryptic-colored clothing, will survey designated areas at randomly selected times while remaining silent and still.
•Daytime observations will be conducted with and without binoculars.
•Nighttime observations will be carried out in 15 minute intervals using night vision goggles and night vision bi-oculars with a built-in infrared illuminator.

**DISCUSSION -** As we are collecting data and building species lists, we will calculate species curves to determine when our efforts are yielding diminishing returns. When our species curves are approaching the asymptote we will calibrate our efforts based upon the number of new species we are obtaining.

After all data have been collected, we will explore logistic regression (Hosmer and Lemeshow 1989) and Classification and Regression Trees (Breiman et al. 1984, De'ath and Fabricius 2000) to determine the best technique for modeling species diversity and richness (dependent variables) based upon the characteristics (explanatory variables) in open spaces in Phoenix, Arizona.

We will also select species of special interest (e.g., nuisance, desirable, or rare species) and attempt to identify important site characteristics that increase the possibility of species occurrence. We will make management recommendations based upon any threshold values we identify. Principal components analysis, semi-partial correlation, or other appropriate statistical techniques will be used for these analyses.

We will present research results at professional meetings and submit manuscripts to be considered for publication in scientific journals. We will do informal presentations for homeowners' associations, land management agencies, or public groups upon requested as time permits. The final report, species lists, and site characteristics will be provided to land management agencies or groups upon request.



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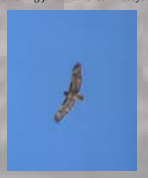

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