

NORTHERN ARIZONA BAT ROOST INVENTORY

Summary of 1996 and 1997 Field Seasons

Objectives

Objectives of the Northern Arizona Bat Roost Inventory were to:

1. Identify and map key use areas for bats on BLM-administered public lands on the Arizona Strip. Key use areas included roosts in trees, snags, caves, mines, cliff faces, bridges, and culverts; watering areas at springs, stock tanks, and catchments; and foraging areas. Priority was given to bat species of concern (Table 1) as listed on the Arizona Game and Fish Department's Wildlife of Special Concern in Arizona (WSCA) and the Arizona BLM Sensitive Species List.
2. Within a fifteen mile radius of the Mt. Trumbull Ecosystem Restoration project:
 - A. Locate bat roosts in all habitat types.
 - B. Identify characteristics of trees / snags used as bat roosts. Map the availability of suitable roost trees / snags.
 - C. Develop a model to predict which trees / snags are most likely to be occupied roosting sites during the active season. Apply the model to control areas, pre-treatment, and treated areas within the context of the Ecosystem Restoration Project.
 - D. Evaluate the impacts of ecosystem restoration treatments on bat populations and the availability of roost habitat.
 - E. Where possible, document roost-switching and/or evidence of roost site fidelity by bats.
 - F. Evaluate the level of bat use of wildlife water developments in the area.

Methods and Materials

Bats were captured for identification using mist nets, harp traps, trip lines, and acoustic surveys. Processing included recording the time of capture, species, gender, reproductive status, ear length, tragus length, forearm length, and weight. A cyalume glow stick (light tag) (Chemical Light Inc., reference) weighing approximately 0.2 g was attached to target bat species to record the vocal signature of a known species, locate a roost or foraging areas, or assist in relocating radio tagged bats of the same species. Individuals of target bat species were selected for carrying a radio transmitter. Specific measurements were taken at trees and snags suspected to be bat roosts to evaluate whether roost selection is random or bat species exhibit preferences for sites with particular characteristics. Known or suspected roosts at mines or caves were monitored externally using exit counts, often in conjunction with acoustic survey techniques.

Roosts located in trees or snags were characterized by collecting the following data: location (UTM coordinates), species of tree, diameter at breast height (using a dbh tape), height of tree

(using a clinometer), height of roost, stage of bark exfoliation, percent slope (using a clinometer), slope aspect, elevation, position of tree on slope (based upon 1/5th length of slope), distance to open water, distance to nearest forest opening ≥ 0.5 ha, and distance to and stage of nearest restoration treatment area. In an effort to determine whether bats were selecting roost trees/snags at random or based upon specific characteristics, we chose five non-overlapping 11.3 m radius plots (0.04 ha each) as described by Rabe et al. (1998). One was centered on the roost tree/snag while the others were located at random distances from 20 - 50 m from the roost tree/snag in the each of the four cardinal directions. Data collected within plots included basal area at the center of the plot, percent canopy closure, number of trees within each of five dbh classes, the total number of trees per acre, number of shrub species, number of individual shrubs, number of snags, number of downed logs, and evidence of recent grazing.

Following a determination that roost trees/snags had characteristics that differed from random trees/snags, the intent was to develop a predictive model for identifying roost trees/snags in control, untreated, and treated areas. These trees/snags would then be examined for presence of roosting bats. The model would also be used to evaluate the impacts of the forest restoration project on bat roosts and predict whether pre-settlement forest conditions would provide more or fewer roost sites.

Table 2. Target Bat Species and Priority For Tagging

Scientific Name	Common Name	Probable Roosting Habitat
<i>Idionycteris phyllotis</i>	Allen's Lappet-browed Bat	Forest
<i>Lasiurus blossevilli</i>	Western Red Bat	Forest, Riparian
<i>Euderma maculatum</i>	Spotted Bat	Cliffs, Canyons
<i>Corynorhinus townsendii</i>	Townsend's Big-eared Bat	Caves, Mines, Lava Flows, Forest
<i>Myotis thysanodes</i>	Fringed Myotis	Caves, Mines, Lava Flows, Forest, Cliffs
<i>Myotis volans</i>	Long-legged Myotis	Forest
<i>Myotis yumanensis</i>	Yuma Myotis	Caves, Mines, Forest
<i>Myotis evotis</i>	Long-eared Myotis	Forest, Rocks, Cliffs
<i>Eumops perotis</i>	Greater Western Mastiff Bat	Cliffs, Canyons
<i>Nyctinomops macrotis</i>	Big Free-tailed Bat	Cliffs, Canyons
<i>Eptesicus fuscus</i>	Big Brown Bat	Forest

Results

A total of 1,157 bats were captured over two field seasons (262 in 1996 and 895 in 1997). The majority of the bats captured were taken in the ponderosa pine habitat type, either at Mt. Trumbull or near the Parashant Field Station. The most common bat captured was *Myotis volans* (312 of 1,157 = 27 %), a former candidate category 2 species and a low priority target species for radio telemetry. Other common species captured included *Pipistrellus hesperus* (230 of 1,157 = 20 %), *Eptesicus fuscus* (175 of 1,157 = 15 %), and *Myotis thysanodes* (142 of 1,157 = 12 %). Approximately 40 percent of all bats captured were netted within a 15 mile radius of the ponderosa pine forest on Mt. Trumbull.

Although capture success was significantly higher during 1997, we were unable to net two of the most productive sites in the Mt. Trumbull area due to drought conditions that dried up water sources at capture sites. During the 1996 field season, netting operations at these locations consistently yielded sensitive bat species considered high priority for radio telemetry work including: *Idionycteris phyllotis*, *Corynorhinus townsendii*, and *Euderma maculatum*. This limited our success for radio telemetry work on the highest priority target species and forced field crews to work the same sites with greater frequency than would be considered ideal or work in other areas away from the field site.

No radio transmitters were used during the 1996 field season. Radio transmitters were attached to 19 bats of seven different species during the 1997 field season. These included six on *Euderma maculatum*, three on *Corynorhinus townsendii*, two on *Eumops perotis*, two on *Idionycteris phyllotis*, two on *Nyctinomops macrotis*, two on *Myotis thysanodes*, and two on *Myotis volans*. Of the 19 bats captured, seven were netted within a 15 mile radius of the ponderosa pine habitat at Mt. Trumbull, including the three *Corynorhinus townsendii*, one of the *Idionycteris phyllotis*, both *Myotis thysanodes*, and both *Myotis volans*. Roosts were located for five of the seven bats tagged at Mt. Trumbull, including two roosts in ponderosa pine snags used by *Myotis volans*. The radio tagged *Idionycteris phyllotis* was tracked to a small grove of aspen trees on the north facing slopes of Mt. Trumbull, but the exact roost site was never found. Roosts were located for *Myotis thysanodes* in crevices and cracks in rocky outcrops within the forest. A roost was located for one of the *Corynorhinus townsendii* in a small tube in a lava flow. The other radio tagged *Corynorhinus townsendii* were not relocated.

Plans For The Upcoming 1998 Field Season

Among forest roosting bats using the Mt. Trumbull area, only three roosts were identified for two species, one *Idionycteris phyllotis* and two *Myotis thysanodes*. This was in part due to lack of availability of radio tags during the 1996 field season and part due to the lack of water at capture locations during the 1997 field season. There are currently 40 radio transmitters available for the 1998 field season. Weather conditions have been favorable and we expect that all the stock tanks will be full. Efforts will focus on capturing individuals of these two species as forest obligates, rather than on facultative species on the sensitive species list. We will also radio tag *Eptesicus fuscus* because of its large body size and relative abundance. Crews will consist of two full time temporary employees (one BLM and one from AGFD), plus two volunteer interns.