

2004 BAT SURVEY
Federal Parcel, Pinal County, Arizona



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EXECUTIVE SUMMARY

WestLand Resources, Inc. (WestLand) was retained by Resolution Copper Company (Resolution) to conduct a survey for bats on the approximately 1,224-hectare (3,025-acre) Federal Parcel (the Parcel). The Parcel is in the Tonto National Forest, east of the town of Superior, Pinal County, Arizona.

Resolution proposes to obtain the Parcel by way of a land exchange. In support of this effort, WestLand has been conducting baseline resource investigations on the Parcel. The purpose of this survey was to determine which bat species could be confirmed present on the Parcel.

This report includes a compellation of mist netting results from on-site surveys, comprehensive literature investigation, and data provided by the Arizona Game and Fish Department. In total it has been determined that 17 different species of bats have the potential to occur on the Parcel. Of the 17 potentially present species, three bat species were captured on the Parcel during mist netting efforts in July 2004.

The three species collected are:

- *Antrozous pallidus* (pallid bat),
- *Eptesicus fuscus* (big brown bat), and
- *Myotis ciliolabrum* (small-footed myotis).

None of these species are afforded special legal protection under any state or federal program.

1. INTRODUCTION AND BACKGROUND

1.1 STATEMENT OF PURPOSE

WestLand Resources, Inc. (WestLand) was retained by Resolution Copper Company (Resolution) to conduct a survey for bats on the approximately 1,224-hectare (3,025-acre) Federal Parcel (the Parcel). The Parcel is in the Tonto National Forest east of the town of Superior in Pinal County, Arizona. The Parcel occupies a portion of Section 36, Township 1 South, Range 12 East; portions of Sections 1 and 2, Township 2 South, Range 12 East; portions of Sections 28, 29, 30, 31, and 32, and Section 33, Township 1 South, Range 13 East; and a portion of Section 6, Township 2 South, Range 13 East (Figure 1). The Parcel is currently public land, managed by the US Forest Service.

Resolution proposes to obtain the Parcel by way of a land exchange. In support of this effort, WestLand has been conducting baseline resource investigations on the Parcel. The purpose of this survey was to determine which species of bats could be confirmed present on the Parcel, in accordance with established survey protocols and procedures.

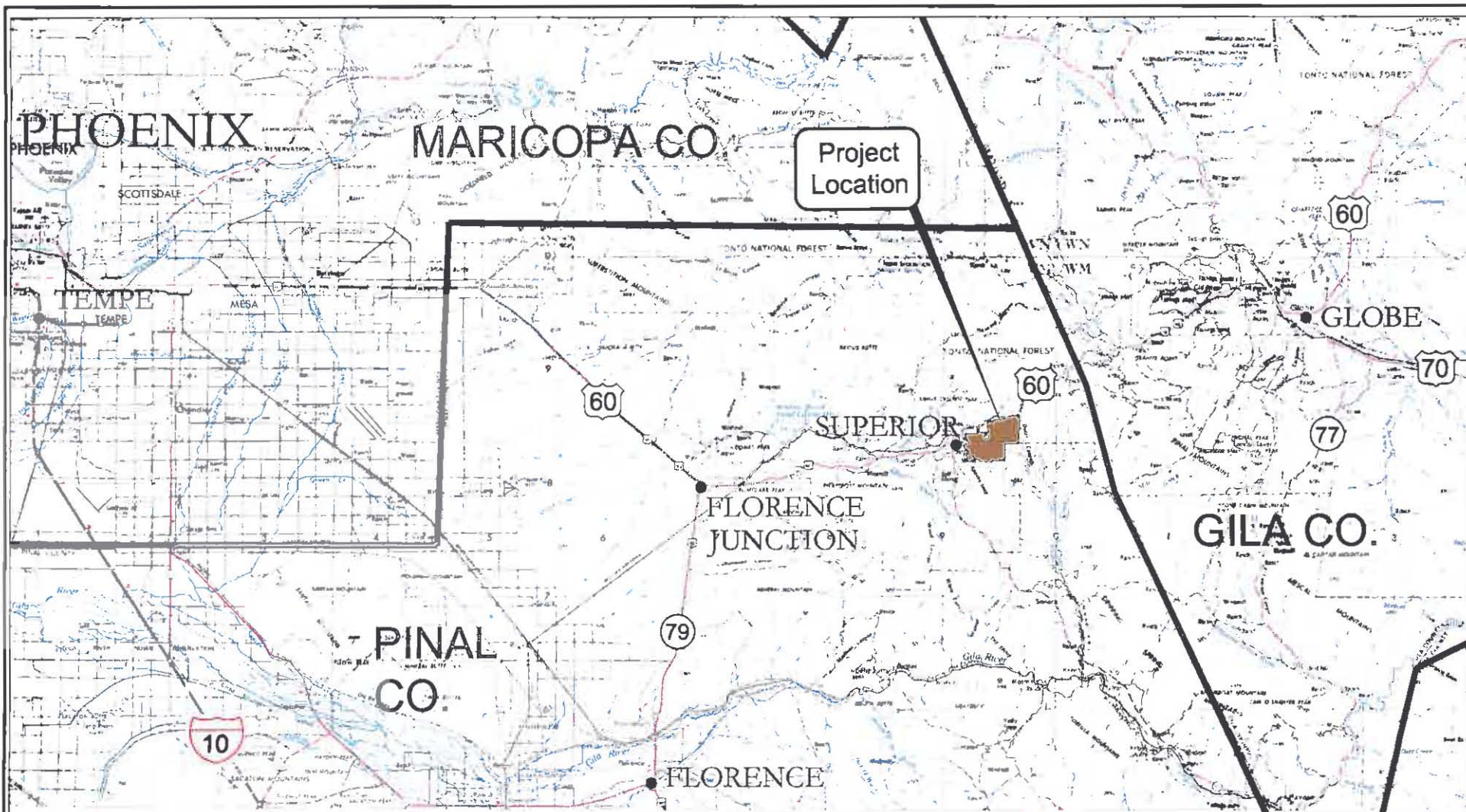
1.2 SITE DESCRIPTION

The Parcel is located in the Pinal Mountains within the Central Highlands Province, a transition zone between the Colorado Plateau and the Basin and Range Provinces. Elevation within the Parcel varies from approximately 900 to 1,500 meters (3,000 to 5,000 feet) above mean sea level.

Over 90 percent of the area of the Parcel is covered by the Apache Leap tuff, the youngest consolidated geologic formation, which forms the cap of the Apache Leap escarpment on the western portion of the Parcel. Underlying units are volcanic and sedimentary rocks exposed at the foot of the Apache Leap escarpment. A late Tertiary/early Quaternary weakly consolidated gravel and conglomerate unit overlies the Apache Leap tuff in a small area on the eastern portion of the Parcel.

The soils associated with the Apache Leap tuff are classified as Lithic Torriorthents (Brown, 1994), and were formed as a residuum weathered from the tuff. These soils are shallow, gravelly, and strongly sloping to very steep soils and, consequently, are well drained.

The Parcel is dominated by plant species associated with Interior Chaparral (east of Apache Leap) and Sonoran Desertscrub biotic communities (west of Apache Leap), as described by Brown (1994). Relatively isolated patches of xeroriparian and mesoriparian vegetation are located throughout the Parcel around stock tanks and in association with ephemeral drainages, Rancho Rio Creek, and Queen Creek.



Pinal County, Arizona
Mesa 1:250,000 USGS Map

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0 6.5 13 KM
Approx. Scale 1" = 13 KILOMETERS



Resolution
Copper Company

BAT INVESTIGATION REPORT,
FEDERAL PARCEL

VICINITY MAP
Figure 1

1.3 SUMMARY OF PREVIOUS SURVEYS CONDUCTED IN THE PARCEL VICINITY

WestLand prepared a *Baseline Biology and Land Use Report* (2003a) and a *Federal Lands Biological Assessment and Evaluation* (2003b) describing biological resources associated with the Parcel. The biological baseline work included a review of bat species identified as anticipated to occur or as having potential to occur on the Parcel. The results of this initial effort produced a list of 17 bat species potentially present (Table 1). Of those 17 bat species, five are identified as being "special status" species.

Specifically, the special status of these species includes a designation as:

- Listed as a Threatened or Endangered, or as candidate or proposed for such listing by the U.S. Fish and Wildlife Service (USFWS) under the Endangered Species Act (ESA),
- U.S. Forest Service (USFS) Sensitive species (a list maintained by each National Forest), and/or
- Wildlife of Special Concern (WSC) in Arizona (a list maintained by Arizona Game and Fish Department [AGFD]).

The five special status species with some potential to occur on the Parcel are the California leaf-nosed bat (*Macrotus californicus*), lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), Allen's big-eared bat (*Idionycteris phyllotis*), spotted bat (*Euderma maculatum*), and the Townsend's (or Western) big-eared bat (*Plecotus townsendii*). It is important to note that the lesser long-nosed bat, spotted bat, and Allen's big-eared bat were all identified as having very remote potential for occurring on the Parcel.

Table 1. Bat Species Potentially Occurring On The Parcel

Common Name	Scientific Name	Status
California leaf-nosed Bat	<i>Macrotus californicus</i>	WSC (AGFD)
Cave myotis	<i>Myotis velifer</i>	None
California myotis	<i>Myotis californicus californicus</i>	None
Western pipistrelle	<i>Pipistrellus hesperus hesperus</i>	None
Pale Townsend's (or Western) big-eared bat	<i>Corynorhinus townsendii pallescens</i>	None
Mexican free-tailed bat	<i>Tadarida brasiliensis mexicana</i>	None
Western mastiff bat	<i>Eumops perotis</i>	None
Yuma myotis	<i>Myotis yumanensis</i>	None
Fringed myotis	<i>Myotis thysanodes thysanodes</i>	None
Small-footed myotis	<i>Myotis ciliolabrum</i>	None
Big brown bat	<i>Eptesicus fuscus</i>	None
Pallid bat	<i>Antrozous pallidus</i>	None
Pocketed free-tailed bat	<i>Nyctinomops femorosaccus</i>	None
Hoary bat	<i>Lasiurus cinereus</i>	None

Table 1. Bat Species Potentially Occurring On The Parcel

Common Name	Scientific Name	Status
Allen's big-eared bat	<i>Idionycteris phyllotis</i>	None
Spotted bat	<i>Euderma maculatum</i>	WSC (AGFD)
Lesser long-nosed bat	<i>Leptonycteris curasoae yerbabuenae</i>	Endangered (USFWS) Sensitive (USFS) WSC (AGFD)

With the exception of the lesser long-nosed bat, all of the bats identified as potentially occurring on or near the Parcel are insectivorous bats. Unlike nectar feeding bats, insectivorous bats are not dependent on the presence of particular flora or timing of flowering. For insectivorous bats, the presence or absence of roosting habitat and water availability become the limiting factors in habitat suitability. With hundreds of abandoned mines and adits, as well as exceptional crevice habitat, the Parcel and surrounding lands offer an almost unlimited amount of suitable roosting habitat for insectivorous bats. The presence of standing water on and near the Parcel increases the Parcel's suitability for bat habitat.

The *Baseline Biology and Land Use Report* (WestLand, 2003a) provided a summary of two reports produced by Bat Conservation International, a firm that conducted a bat survey and assisted in some shaft and adit closures for BHP, an adjacent property owner. Table 2 details the finding from Bat Conservation International's (1997) evaluation of approximately 350 underground mine workings in the vicinity of and on the Parcel.

Table 2. Results of Bat Conservation International Survey of Mine and Adit Roosting Potential

Percentage of Adits Surveyed	With Potential for Bat Habitat	Examples of Typical Working Configurations
48%	Provided no habitat for bats.	Completely collapsed adits, shafts or declines; prospect diggings
31%	Marginal to no bat habitat, no sign of bat use.	Short adits (≤ 50 feet), shafts, or declines.
14%	Some bat sign evident, occasional use probable.	Deeper (>50 feet) adits, shafts, declines.
4.5%	Bats were present, frequent use probable.	Deeper and/or more complex adits and shafts.
2.5%	Bats were present, high probability of significant bat use.	More complex workings with inner-connecting adits, shafts, and/or declines; good airflow.

WestLand contacted AGFD to determine if supplemental information regarding bat use of the Parcel was available. AGFD provided data collected during mist netting efforts at Boyce Thompson Arboretum (approximately 7 miles [11 kilometers] west of the Parcel). AGFD conducted mist netting at the arboretum in September 2001 and June 2002. AGFD has captured 11 different species of bats during their mist netting efforts at the arboretum (Table 3). All of the species detected by AGFD on Boyce

Thompson Arboretum land had been identified by WestLand (2003a) in the *Baseline Biology and Land Use Report* as potentially occurring on the Parcel. Of particular interest is the confirmation of the presence of the Townsend's big-eared bat and California leaf-nosed bat, both of which are listed as USFS Sensitive species.

Table 3. Bats Species Captured at Boyce Thompson Arboretum in 2001 and 2002

Common Name	Scientific Name
Pallid bat	<i>Antrozous pallidus</i>
Townsend's (or Western) big-eared bat	<i>Plecotus townsendii</i>
Western pipistrelle	<i>Pipistrellus hesperus hesperus</i>
California myotis	<i>Myotis californicus californicus</i>
Yuma myotis	<i>Myotis yumanensis</i>
Cave myotis	<i>Myotis velifer</i>
Mexican free-tailed bat	<i>Tadarida brasiliensis mexicana</i>
Pocketed free-tailed bat	<i>Nyctinomus femorosaccus</i>
Big brown bat	<i>Eptesiscus fuscus</i>
California leaf-nosed bat	<i>Macrotis californicus</i>
Western mastiff bat	<i>Eumops perotis</i>

Source: Tim Snow, pers. comm.

However, it is important to note that the environmental conditions occurring at the Boyce Thompson Arboretum are not exactly the same as the conditions on the Parcel. Boyce Thompson Arboretum has a multitude of large exotic trees and year round standing water, and lies at a lower elevation than the Parcel. The surrounding native desert (Sonoran Desertscrub) at the Boyce Thompson site more closely resembles the western portion of the Parcel below the Apache Leap and is certainly different than the Interior Chaparral biotic community found east of (atop) the Apache Leap escarpment.

2. METHODS

To confirm the presence of bat species utilizing the Parcel, limited mist netting was conducted. Although mist netting does not provide a complete census of bats present, it does provide an index of species present at the time of the field visit. July was identified as an optimal month to conduct mist netting based upon the migratory patterns of the species potentially using the Parcel. Six of the 17 potential bat species are not expected to be present in winter months (Table 4) due to their migration south. The July event also provided a sampling of bats between the mist netting events conducted by AGFD (June and September) at the arboretum.

Table 4. Bats Species Expected to be Absent During Winter Months

Common Name	Scientific Name
Pallid bat	<i>Antrozous pallidus</i>
Hoary bat	<i>Lasiurus cinereus</i>
California myotis	<i>Myotis californicus californicus</i>
Yuma myotis	<i>Myotis yumanensis</i>
Lesser long-nosed bat	<i>Leptonycteris curasoae yerbabuenae</i>
Cave myotis	<i>Myotis velifer</i>

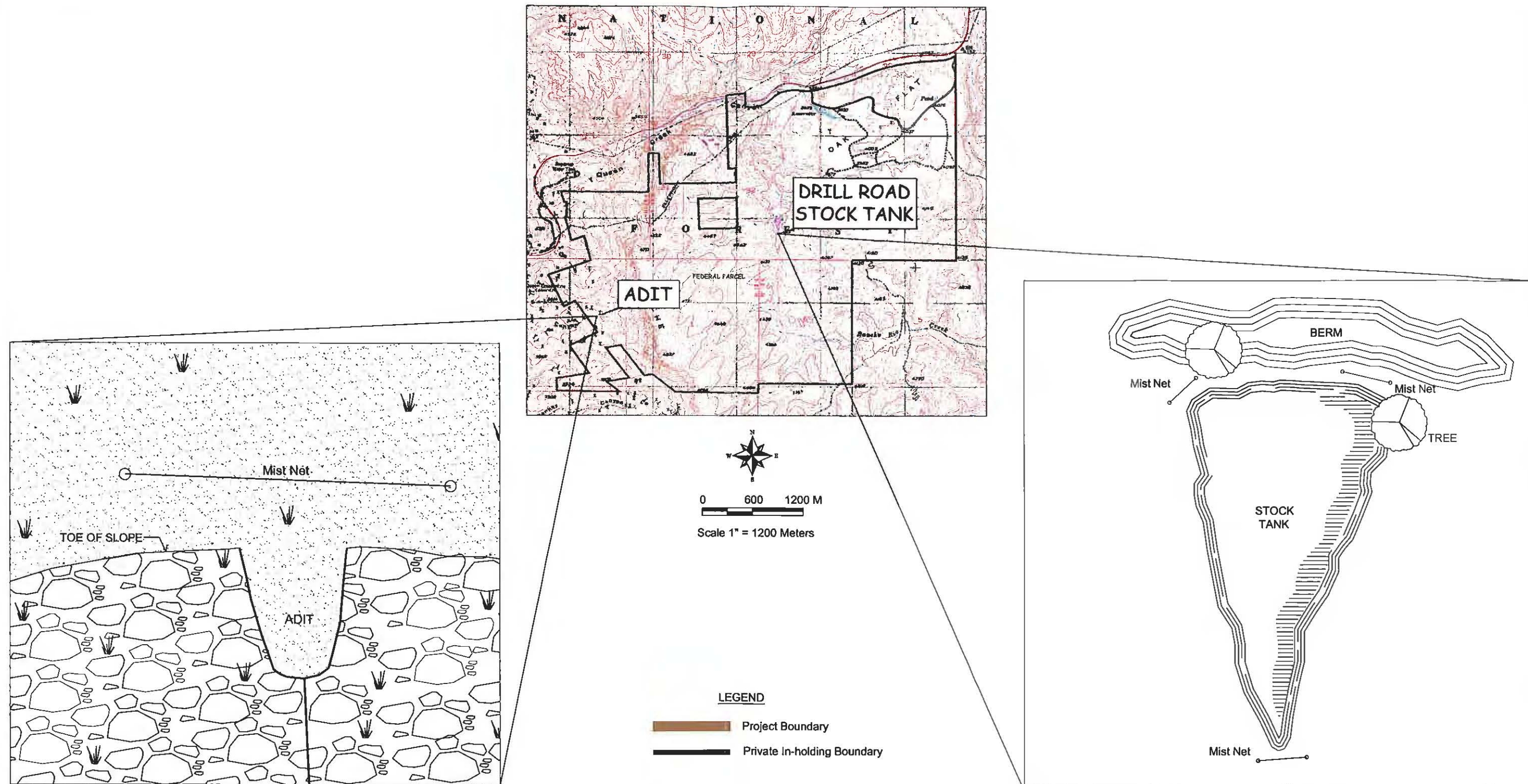
A field visit with AGFD nongame biologist Tim Snow was conducted on June 22, 2004 to obtain recommendations regarding mist netting sites. Two areas were identified as appropriate for mist netting. These areas were an abandoned adit west of Apache Leap and a stock tank identified as the Drill Road Stock Tank (Figure 2). The adit had previously been fitted with a bat gate. It was selected based on the assumption that if the adit merited the installation of bat gates, there was a high probability of bat use. The stock tank was selected because during summer months most bat species are reliant on standing water for foraging. The Drill Road Stock Tank was one of only two locations with standing water present on or near the Parcel at the time of the field visit and was in part selected due to accessibility.

Two different configurations of nets were utilized. Netting at the adit consisted of one 18-meter (60-foot) net. At the tank, an array of three nets was utilized ranging from 9 to 18 meters (30 to 60 feet) in length.

Mist netting was conducted at the adit on July 13, 2004. The single net used at the adit was stretched across the opening approximately 9 meters (30 feet) away from the adit opening, at the toe of the slope accessed by the adit (Figure 2). The net was open at dusk and remained open for approximately 4 hours. The effort was suspended due to high winds and rain.

Mist netting was conducted at the stock tank on July 14, 2004. The three nets used at the Drill Road Stock Tank were placed in areas that were identified as likely bat flyways to the stock tank (Figure 2). Net #1 was placed at the northeast corner of the tank, Net #2 was placed at the northwest corner of the tank, and Net #3 was placed on the south end of the tank intercepting the channel that drains into the tank. Nets were opened at dusk and left open until 0230. Nets were checked for the presence of bats approximately every 15 to 20 minutes. A total of 21 net hours was expended at the stock tank.

In addition to the mist netting, a shallow adit located near the Oak Flat campground was investigated for the presence of bats on August 18, 2004. The visit to the adit revealed the presence of bat guano and large insect wings that had been clipped by an insectivorous bat.



ADIT (Not to Scale)

DRILL ROAD STOCK TANK (Not to Scale)

Pinal County, Arizona
Superior 7.5' USGS Map

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BAT INVESTIGATION REPORT

MIST NETTING DETAILS

Figure 2

3. CONCLUSIONS

3.1 GENERAL FINDINGS

During two nights of mist netting, a total of eight individual bats were captured. No bats were captured at the adit; all bats handled were captured at the Drill Road Stock Tank. The eight bats represented a total of three different species: pallid bat, big brown bat, and small-footed myotis. Species accounts for these species are provided in the following section. All three of the species had been previously identified in the *Baseline Biology and Land Use Report* (WestLand, 2003a) as potentially occurring on the Parcel. Two of the species (the pallid bat and big brown bat) had previously been documented by AGFD at Boyce Thompson Arboretum. The small-footed myotis had not been confirmed through AGFD's mist netting efforts at Boyce Thompson Arboretum. Accordingly, 12 bat species have now been identified on or near the Parcel. Six species identified as potentially occurring on or near the Parcel have not been confirmed. The six species yet to be confirmed are the lesser long-nosed bat, spotted bat, Allen's big-eared bat, fringed myotis, and the hoary bat.

As stated above, mist netting does not provide a complete census of bats occurring; however, mist netting does provide an index of presence at the time of the field visit. Several variables can affect the success of mist netting. Environmental conditions such as rain and wind can make the nets more detectable to bats and therefore less effective. Net placement also determines capture success. With eight bats captured, the three net set appears to have been relatively effective, particularly since the tank was large enough to provide multiple access points for bats utilizing the tank. Since poor weather was experienced during the survey at the adit, it is not possible to determine if the bats were detecting the net and therefore avoiding capture, or if no bats were exiting from the adit. Bats were observed exiting another open shaft just north of the netted entrance. Due to the close proximity, it is assumed that the other shaft is part of the same mine complex.

The guano and insect wings found in the shallow adit near the Oak Flat Campground are almost certainly evidence of a night feeding roost for a pallid bat (pers. comm. Tim Snow). This determination is based on the known presence of pallid bats and the large size of the insect wing clippings, indicative of pallid bat foraging.

3.2 SPECIES ACCOUNTS

3.2.1 Pallid Bat

The pallid bat is insectivorous and has the ability to take larger prey items such as beetles and moths (AGFD, 2002). The pallid bat is even known to take prey such a centipedes off the ground. The shallow cave at Oak Flat campground is an excellent example of a pallid bat feeding area. Pallid bats often take

large prey items to feeding roosts to clip wings and ingest the insect body; evidence of this practice was observed at the shallow cave.

The pallid bat is a colonial species and roosts in groups of up to 100 individuals (AGFD, 2002). The pallid bat is known to roost in a multitude of differing sites, including buildings, attics, roofs of barns and sheds, the underside of bridges, mine tunnels, crevices of cliffs, exposed eaves of buildings, and many other shelters. The many mines, adits, boulder piles, and rock crevices occurring on the Parcel provide an abundance of roosting habitat for this species.

The pallid bat primarily inhabits desert scrub habitat, but has been known to be present in a wide range of habitats including scrub-oak and even evergreen forests. The presence of the pallid bat on the Parcel was not surprising as they are one of the most common bats found at the lower elevations in Arizona (Hoffmeister, 1986). In fact, the pallid bat has been detected almost statewide (AGFD, 2002).

Currently the pallid bat is not listed as a “special status” species under any state or federal program.

3.2.2 Big Brown Bat

The big brown bat is an insectivorous bat which feeds on a large array of insect species, including termites, flying ants, and leafhoppers (AGFD, 2004). It is a generalist in its roosting habitat, roosting in man-made structures such as attics, behind shutters, and beneath bridges, as well as in natural caves and mine tunnels (AGFD, 2004). It appears that this bat roosts in small colonies, with the highest recorded number of individuals being 40 (Hoffmeister, 1986). This bat is widely distributed in Arizona (AGFD, 2004) and is commonly found in woodlands, deciduous and coniferous forests, and desert scrub (Hoffmeister, 1986). With such an ability to utilize a large array of roosting structures, the Parcel offers plentiful roosting habitat for this species. As with the pallid bat, it is not a surprise that this bat was captured during the mist netting effort.

Currently, the big brown bat is not listed as a “special status” species under any state or federal program.

3.2.3 Small-Footed Myotis

The small-footed myotis is an insectivorous bat which feeds on a large array of smaller insect species, including termites, flying ants, and a variety of small beetles (AGFD, 2003).

The small-footed myotis roosts in crevices, and cavities of cliffs or rocks, or possibly in caves and abandoned mines (Hoffmeister, 1986). As with the aforementioned species, the Parcel offers an abundance of suitable habitat for this species.

The small-footed myotis is widely distributed in Arizona and utilizes a variety of habitat types, including oak, juniper, chaparral, and riparian areas (AGFD, 2003). The small-footed myotis is one of nine species

of myotis in Arizona (Hoffmeister, 1986). The occurrence of this bat, like the other two species collected, was not unexpected on the Parcel.

Currently the small-footed myotis is not listed as a "special status" species under any state or federal program.

4. REFERENCES

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