



# Department of Defense Legacy Resource Management Program

PROJECT 09-346

Document Status: Final Draft

## Department of Defense Bat Risk Assessment

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16 February 2010

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## INTRODUCTION

The purpose of this Department of Defense (DoD) Utah Bat Risk Assessment is to consolidate, understand, and apply data and knowledge gained through Legacy Resource Management Program funded projects Legacy Phase I 07-346, Legacy Phase II 08-346, and Legacy Phase III 09-346I to support military mission activity and land management. This plan addresses DoD facilities in Utah whose management authority extends over 1.8 million acres, about 15% of total DoD lands ownership in the continental U.S. The current and potential land use on these facilities was researched to determine the available bat habitat on temporal and spatial scales. In order to sustain mission activities, available bat habitat on each installation should be managed and habitat losses should be mitigated. Working with Natural Resource managers, biologists, trainers, test officers, and plans and operations personnel on each base ensured an extensive analysis of potential interactions between mission plans and bat populations. We developed actionable management recommendations for each base to cover the improvement and or sustainment of bat populations including impact offset measures in active and former mission use areas. Lands adjacent to DoD facilities were also evaluated for potential improvement or protection of habitat to ensure that military testing and training capabilities throughout Utah remain sustainable and unrestricted. Because of the extensive work that has been put into interagency cooperation through Phase I and II Legacy funding, mitigation measures can be implemented at little to no cost to individual DoD facilities.

Nationwide, the density of federally listed species is 3 to 18 times greater on DoD lands than on any other federally managed lands. DoD facilities provide habitat for 320 federally listed species and over 550 species at risk (DoD 2005). The high occurrence of threatened, endangered, and species at risk on DoD lands result in an increased need to manage these lands for ecological integrity and recovery (DoD 2005). The presence of these species has the potential to limit DoD activities on many facilities. However, the presence of these species has also served as the catalyst for large scale management of habitat across DoD and adjacent lands. In North Carolina (Fort Bragg), the Army has created partnerships with adjacent land owners to sustain gene flow between fragmented populations of the red-Cockaded woodpecker. To limit the impact of human population expansion on wildlife along the front range of the Rocky Mountains in Colorado, the DoD has partnered with The Nature Conservancy. To maintain and

stimulate habitat and population growth of the desert tortoise, the DoD and multiple partners have begun ecosystem scale management of the species in the southwestern U.S. and Eglin Air Force Base has a model ecosystem management program, as applauded by Bruce Babbitt the Interior Secretary (DoD 2005).

We seek to mirror these ecosystem scale management methods by focusing on bat species of concern on DoD and adjacent lands in Utah. Bats are often cited as an indicator of ecosystem health, and thus proactive management of bat communities provides a base for ecosystem level biological management (Adams 2003). Indicator species are those biological species that define a trait of the environment and are among the most sensitive species in a region. They act as an early warning to biologists monitoring their populations (Indicator Species, Wikipedia 2009). These species are often some of the first species affected by environmental problems and indicate that ecosystems are under distress. By managing indicator species, we are managing some of the most sensitive species in an ecosystem. Management actions thereby – typically – result in the management of most other species in the system. DoD facilities provide a wide array of bat habitat including roosting, foraging, watering and migration habitat. These habitat types enable bat populations to avoid unsuitable climatic and ecological conditions on temporal and spatial scales (Kunz 1982). These four habitat types together allow the continued stability of bat populations and communities (Racey and Entwistle 2003).

Bat roosting habitat provides for maternity, day, night, hibernacula (locations where bats enter hibernation or torpor for the winter), and interim bat behavior all of which are critical to bat population stability. Maternity roosts provide a secure location for females to give birth and rear their young throughout the summer season (Humphrey 1975). Hibernacula provide a winter refuge for non-migratory bats (Johnson et al. 1998, Kuenzi et al. 1999, Raesly and Gates 1986). Day roosts are used by non-reproductive individuals of both sexes while night roosts are utilized by all bats, regardless of reproductive status, as a place to rest and to digest their prey between foraging bouts (Lacki 1994, Kerth et al. 2001). Night roosts are generally in different locations than day roosts and are used primarily at dawn and dusk (Anthony et al. 1981). Interim roosts are used in the spring before the young are born and again in the fall before retreating to the hibernation or winter roost (Dobkin et al. 1995, Twente 1955). Interim roosts provide short-term migratory stopovers for those North American species that migrate between winter and summer habitat.

Foraging habitat refers to the locations of an insect prey base provides for insect reproduction and wintering, and actual bat foraging. Bats in Utah feed on a variety of insects including, but not limited to the arthropod families *lepidoptera*, *coleoptera*, *diptera*, *plecoptera* and *ephemeroptera*. These diverse insect families require specific vegetative structures and climates to reproduce and winter. Thus, productive bat foraging locations are also associated with vegetative cover, most notably mesic (habitats containing a moderate amount of moisture) types as opposed to hydric or xeric (very dry).

Bats require water every one to three days. And, unlike birds, bats must drink in flight; therefore water sources must have open slow flowing or standing water with a smooth surface. At larger water sources, higher bat diversity and population densities are observed. This need for daily watering at relatively clutter free areas allows for reliable monitoring of local area use.

These four habitat types (roosting, foraging, watering and migration) vary across bat species and communities. The status of these habitat types has been linked to declines in bat population and communities. Many bat populations in North America are thought to be declining (Stebbing 1980, McCracken 1988, Richter et al.1993, Tudge 1994, Altingham 1996). The International Union for Conservation of Nature (IUCN) lists 10% of microchiroptera (one of two suborders of bats that include those species that typically feed on insects and echolocate; all Utah bats are microchiroptera) species as threatened (Mickleburgh et al. 2002). The combination of slow reproduction, natural rarity and genetic isolation make bats susceptible to population and range declines (Racey and Entwistle 2003). Of 45 bat species in the United States, six are listed as federally endangered and 19 are former candidates for listing (Code of Federal Regulations 1991; USFWS 2008). Additionally, a recent fungus referred to as White-Nose Syndrome (WNS), is becoming a nationwide threat against cave and mine roosting bats. Since its discovery in 2006, it has killed over 1 million bats in the eastern states with an almost 95% kill rate within infected caves and mines (Boyles and Willis 2009). Though WNS does not yet occur in the west, WNS has spread to 9 states in 3 years and is expected to spread as no cure or solution has been developed to combat the problem to date (Boyles and Willis 2009). Of Utah's 18 species, 6 are tier II species of concern (SAR) in the Utah Wildlife Action Plan (WAP) (UDWR 2005). Two of these species of concern are cave obligates and the arrival of WNS would lead to devastating population declines. Apparent declines in bat species may be attributed, in part, to loss of suitable habitats due to increased human recreational activity (caving and climbing), mine

closure programs, and urbanization (Humphrey and Kunz 1976). All of these human activities reduce the availability of roosting, foraging, watering, and migration habitat. One-third of Utah's bat species are in danger of declining due to changes in habitat availability.

Utah's six bat SARs have the greatest potential for Federal listing under the Endangered Species Act (ESA). Management of bat resources on DoD lands should therefore focus on retaining and maintaining suitable-to-be-occupied and occupied habitat for these species. The Utah WAP and the UDWR Utah Bat Conservation Plan identify specific threats to each SAR and general action required to mitigate these threats (UDWR 2005; Oliver et al. draft 2008). These actions, in addition to this DoD specific risk assessment, should be used by resource managers to target conservation actions for sensitive bat species. In general, threats to Utah's six SARs are related to changes in habitat availability and are emphasized below. The 12 bat species in the state that are not of direct conservation concern are also threatened by those factors affecting state sensitive species.

#### *Threats to Utah's Bat SARs*

Townsend's big-eared bat (*Corynorhinus townsendii*, COTO) habitat is threatened by recreation and management activities. This species is strongly associated with cavern habitat such as abandoned mines and caves (Adams 1990). Townsend's big-eared bats have been documented in a wide variety of habitat including ponderosa forests, pinion juniper woodlands, oak and maple forests, and desert scrub (Armstrong et al. 1994; Findley et al. 1975). Degradation of roosting habitat is strongly correlated with apparent population declines (Humphrey and Kunz 1976). Human disturbance within roosting habitat has led to the abandonment of cavern roosts (Wackenhunt 1990; Lewis 1994). Roosting habitat has also been lost through the closure of over 9,000 abandoned mines in Utah over the past 20 years. In addition, cave and rock shelter structures are becoming more popular for use by the Military as much of the War on Terror is occurring in mountainous, rugged terrain in Afghanistan. In order to mitigate these threats, the UDWR recommends control and monitoring of disturbance, restoration of degraded habitats, population level monitoring, and increased research.

Spotted bats (*Euderma maculatum*, EUMA) are threatened by human activities and a general lack of information on general life-history and population biology (Adams 2003). Spotted bats roost high on cliff walls in crevices (Peirson and Rainey 1998). This species is



generally found in arid areas of the southwest adjacent to high cliff walls across an array of habitats including desert scrub, ponderosa pine forests and riparian zones (Armstrong et al. 1994; Navo et al. 1992; Foster et al. 1997). Direct and indirect human disturbances are the primary threats to this species. Rock climbing has the potential to disturb this crevice roosting species (Adams 2003). Specific military threats to roosting habitat may be limited as activities do not typically occur high on cliff walls. Scientific collecting and harvesting via mist nets is also related to mortality. Environmental contamination and bioaccumulation via pesticides may also be linked to this species conservation status (Oliver et al. draft 2008). To mitigate these threats, the UDWR recommends habitat monitoring and research, control and monitoring of disturbance, and population monitoring and research.

Human activities threaten Allen's big-eared bat (*Idionycteris phyllotis*, IDPH) populations. Allen's big-eared bat roosts in rock crevices and is associated with cliffs, canyons, boulder fields and lava flows (Adams 2003). This species is considered rare in Utah and is associated with habitat from ponderosa forest and pinion juniper woodlands to riparian corridors and prefers forested canyons (Armstrong 1974). This species occurs only in the southern one-third of Utah (Black 1970). Direct human disturbance occurs via mine closures, roost disturbances, environmental contamination, pesticide use, and highway development (Oliver et al. draft 2008). The lack of information about this species also threatens populations. The UDWR recommends control and monitoring of disturbance, population monitoring and research, and habitat conservation. This species does not occur on any DoD lands in Utah.

Western red bats (*Lasiurus blossevillii*, LABL) are threatened by human disturbance. This species is rare in Utah. It roosts in the foliage of riparian trees and shrubs near perennial streams and rivers (Adams 2003). This species is migratory and primarily observed foraging in broad leaf forested riparian corridors (Findley et al. 1975; Hoffmeister 1986). The development and alteration of riparian roosting habitats is a significant threat to populations of this species (UDWR 2005; Oliver et al. draft 2008). The lack of information on the taxonomy of this species also impacts management. These threats can be mitigated by controlling disturbance, monitoring population, focusing research efforts, and protecting and restoring significant habitat areas.

The fringed myotis (*Myotis thysanodes*, MYTH) is threatened by roost disturbance, habitat loss in riparian zones, the general lack of information about population trends, and the

impacts of habitat alteration (O Farrell and Studier 1980). The fringed myotis is a cavern roosting species strongly associated with abandoned mines, caves and buildings (Adams 2003). Fringed myotis are associated with pinion juniper and oak woodlands as well as spruce fir forests (Adams 2003). Cave and rock shelter structures are becoming more popular for use by the Military as much of the War on Terror is occurring in mountainous, rugged terrain in Afghanistan and may threaten this species. The UDWR recommends control and monitoring of disturbance, population monitoring and research, and habitat monitoring and research (UDWR 2005; Oliver et al. draft 2008).

The big free-tailed bat (*Nyctinomops macrotis*, NYMA) is threatened by many of the same sources described above. This species is a crevice rooster associated with high cliff walls and occasionally buildings and trees (Adams 2003; Findley et al. 1975). Threats to this species include environmental contamination via pesticides, scientific collecting, and the limited distribution of this species (UDWR 2005; Oliver et al. draft 2008). To mitigate these threats, UDWR recommends population monitoring and research and investigations to determine and address factors limiting recovery.

**Table 1. Utah Species-At-Risk Summary.**

Species	Status	On/Near DoD Lands	Preferred Habitat
Townsend’s big-eared bat	WAP Tier II	Yes	scrub communities, pinyon-juniper woodlands, mines, caves
Spotted bats	WAP Tier II	Yes	high cliff walls, desert scrub, ponderosa pine forests, riparian zones
Allen’s big-eared bat	WAP Tier II	No	mines, tunnels, rock crevices, cliff walls, canyons, boulder fields, lava flows, ponderosa forest, pinion juniper woodlands, riparian zones; prefers forested canyons
Western red bats	WAP Tier II	No	roosts in deciduous trees, usually those with large broad leaves
fringed myotis	WAP Tier II	Yes	roosts in human habitations, abandoned mines, caves and buildings; desert scrub, pinion juniper and oak woodlands, spruce fir forests
big free-tailed bat	WAP Tier II	Yes	rugged rocky environments, sagebrush flats, requires tall cliffs for roosting

Of the mitigation measures identified in the WAP and outlined above, several have been initiated by UDWR, bat biologists throughout the state, and the Utah’s Bat Legacy Initiative.

The important bat habitat model was created by UDWR and TNC members, with important factors for habitat outlined and finalized by experts within the Utah Bat Conservation Cooperative (UBCC), and provided as a deliverable to the first phase of the Legacy project (07-346). The second phase of the Legacy project (08-346) provided an analysis of 103 years of historical data in Utah, creating a baseline for bat distribution and leading to the creation of a statewide monitoring protocol. Phase three of the Legacy project consisted of implementing a statewide monitoring protocol. The three phases of the Legacy project have increased the consolidation, analysis and collection of data for bats in Utah. The Legacy project has increased our understanding of bat habitat use on spatial and temporal scales and thus enabled a more informed management of bats on DoD and non-DoD lands.

#### *Bat SARs Occurrence on DoD Lands*

An analysis of the Bat Base data set (103 years worth of data) indicates that only a subset of bat SARs have been recorded on or adjacent to DoD managed lands (Diamond et al. 2007). The Allen's big-eared bat's southerly distribution and historical records indicate that this species habitat does not occur on DoD lands as the lands researched for this report occur entirely within the west central portion of the state. The western red bat's strong association with high flow riparian corridors and the lack of historical data for the species on or adjacent to DoD lands indicate that this species habitat does not exist on DoD lands in Utah. Therefore, we focused this risk assessment on the four SARs that have been shown to occur on or adjacent to DoD lands.

The goal of this risk assessment is to provide DoD land managers with the knowledge, education, and specific management recommendations to improve bat management on their lands to limit mission impacts and increase land sustainability. The specific objectives of this risk assessment are to:

1. Evaluate actual and/or potential bat SAR habitat on DoD land holdings.
2. Recommend specific management actions and INRMP language to retain or maintain current bat habitat (SARs).
3. Outline current knowledge about bat occurrences on DoD lands and address data gaps through specific management recommendations.

4. Facilitate regional intra-specific and interagency scale management of bat habitat on and adjacent to DoD lands.
5. Research, analyze and discuss historical, current, and, most importantly, future mission interface with current bat populations.
6. Outline avoidance, minimization, and mitigation recommendations for bat interactions with U.S. operational combat forces.

The goal and objectives of this plan will help ensure that data and information from the Legacy funded Utah Bat Initiative is filtered down to individual land managers for actual use day to day. The UBCC and bat biologists throughout the state have a good record of taking action instead of just discussing problems; the DoD and Legacy efforts are determined to take the same approach.

## METHODS

We conducted surveys for the detection of roosting, foraging, watering and migratory habitat. Roost surveys were conducted at known mine and cave habitat on or near DoD holdings in Utah. We also used data obtained during previous mine surveys on adjacent lands to assess bat use on or near DoD lands. We recorded a suite of structural and microclimatic variables in each mine surveyed to determine roosting suitability. Airflow, surface and ambient temperatures, and relative humidity were recorded at the entrance, working face, locations of any bat sign, and the entire length of the adit (horizontal entrance to an underground mine) using a digital radiometer. Temperatures were collected by focusing the digital thermometer on the roof of the mine above bat sign. Temperatures obtained reflect the microclimate (substrate temperature) at ceiling heights or mine features where bats may be found. Relative humidity and air temperature were recorded with a digital sling psychrometer. Daily and seasonal fluctuations in temperature and relative humidity can occur in the internal microclimate of the mine thus an insulation index was used to assess all mines for habitat suitability. Mine characteristics such as the geological nature of substrate, presence of crevices and fissures, and location and volume of suitable hibernation maternity and interim roosting structures were also recorded. We also used a landscape scale analysis of known and potential mine and cave roosts adjacent to DoD lands. The difficult detection of foliage, tree and crevice roosts required a land cover based analysis to locate areas of potential roosts.

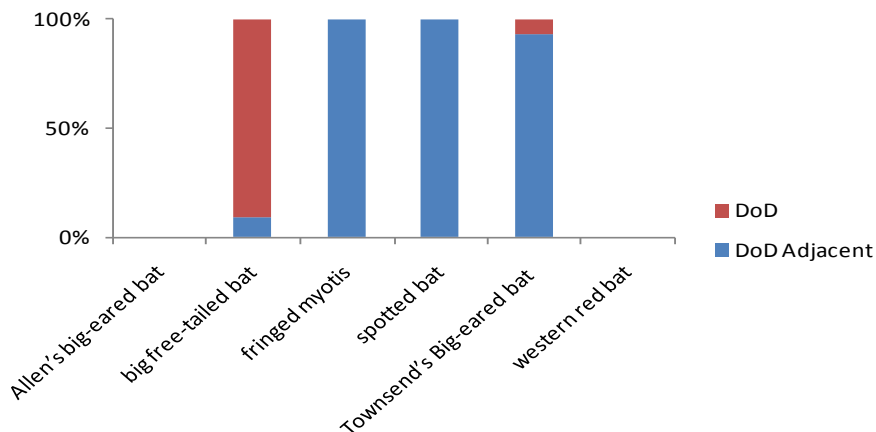
We assessed foraging habitat through the use of acoustic and capture sampling across DoD sites. Bats were monitored acoustically at Deseret Chemical Depot (DCD), while capture and acoustic surveys were carried out for all other DoD lands, to include Dugway Proving Ground (DPG), Tooele Army Depot (TEAD), Hill Air Force Base (HAFB), and Utah Test and Training Range North and South Ranges (UTTR N, UTTR S). We recorded acoustic data with an Anabat<sup>®</sup> or Binary Acoustic<sup>®</sup> device at water and non-water sites, following the Utah Bat Monitoring Protocol. The single exception to protocol was the surface area of the water body; limited at 400 square meters some water bodies on and adjacent to military lands are much larger reservoirs. Acoustic surveys were completed starting in 2007 on select bases and continued through 2009 on all bases.

Capture surveys were completed at water sites on all DoD lands except for DCD which did not have a water site small enough to sample with a mist net setup. We used a mist net set on water sites that fit within the Utah Bat Monitoring Protocol (principally, water sites with a mean value of 400 m<sup>2</sup>) and several water sites outside the protocol (DCD Rainbow Reservoir, DCD Recharge Reservoir, and DPG English Village Sewage Lagoon). Bats were identified to species, gender and age. These methods were used to record bat foraging and watering behavior. We also utilized the BatBase data analysis to provide historical records of bat activity on DoD lands (Diamond et al. 2008).

The episodic nature of migratory behavior required a data search to detect. We used the BatBase data set and analysis developed by Knight et al. (2007) and Diamond et al (2008) to locate migratory behavior on or within 24km of DoD land holdings. Any bat records on or adjacent to DoD lands between September to November and March to April were categorized as migratory behavior.

## RESULTS

Historically, bats of conservation concern have been rare on DoD lands. According to the data analysis, Allen's big-eared bat and the western red bat have not been observed on DoD lands. Fringed myotis and spotted bats have been observed primarily on lands adjacent to DoD lands. The majority of Townsend's big-eared bat records are from adjacent lands rather than DoD lands. In contrast, big free-tailed bat observations occur more frequently on DoD lands than those directly adjacent. An observation is a data point for a species within the data set that could have been collected in a number of different ways (mist netting, acoustic call, roost survey, etc.). Observations on DoD lands were extremely limited before the field season of 2009 however, which may account for the differences in observations on and adjacent to DoD lands. Access problems and limited coordination between agencies have prevented surveys in the past. Good working relationships between DoD land managers and UDWR biologists however have changed this. A total of 14 sites were surveyed by DoD biologists in the 2009 season (Figure 2) covering all military property in the West Desert of Utah. Overall bat diversity has been high on DoD lands in Utah. A high percentage of bat records for five species occurred on DoD lands. DoD facilities also had diversity index values higher than all other ownership types except, Bureau of Land Management (BLM) and privately held lands, even though DoD lands in Utah are 1/14 (7%) and 1/7 (14%) the land area of the BLM and private lands. DoD in Utah also lacks open water coverage such as that scattered across BLM lands and prominent on privately held lands (water is a much coveted resource in the west desert and greater dry climate of Utah). This high bat diversity is related to the unique DoD land holdings in Utah.



**Figure 1.** Historical distribution of Tier II bat species of concern on and adjacent to Department of Defense lands.

# Utah Legacy Bat Initiative DoD Bat Survey Locations 2009

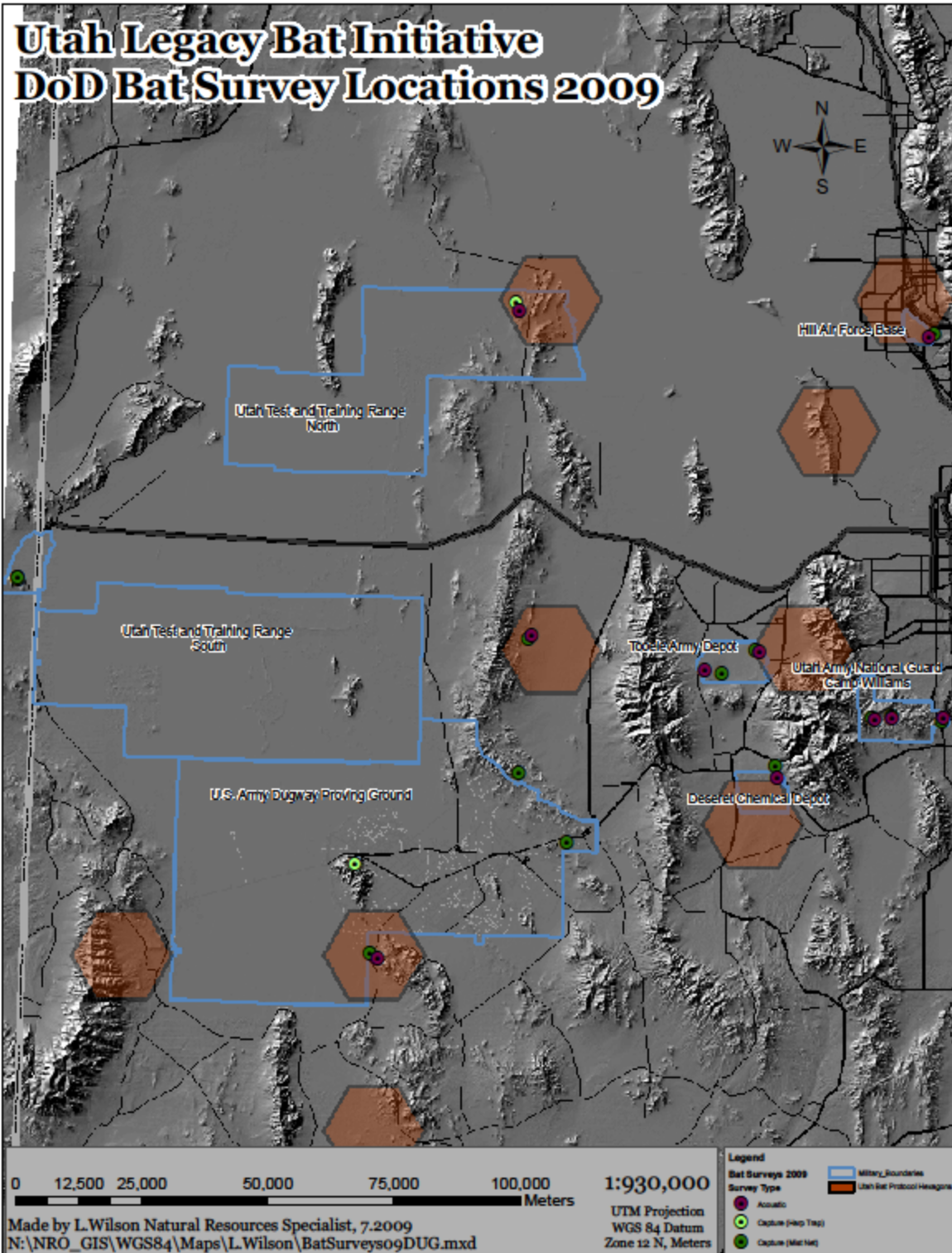


Figure 2. Utah Bat Monitoring Protocol Surveys on or near Department of Defense Lands in 2009.



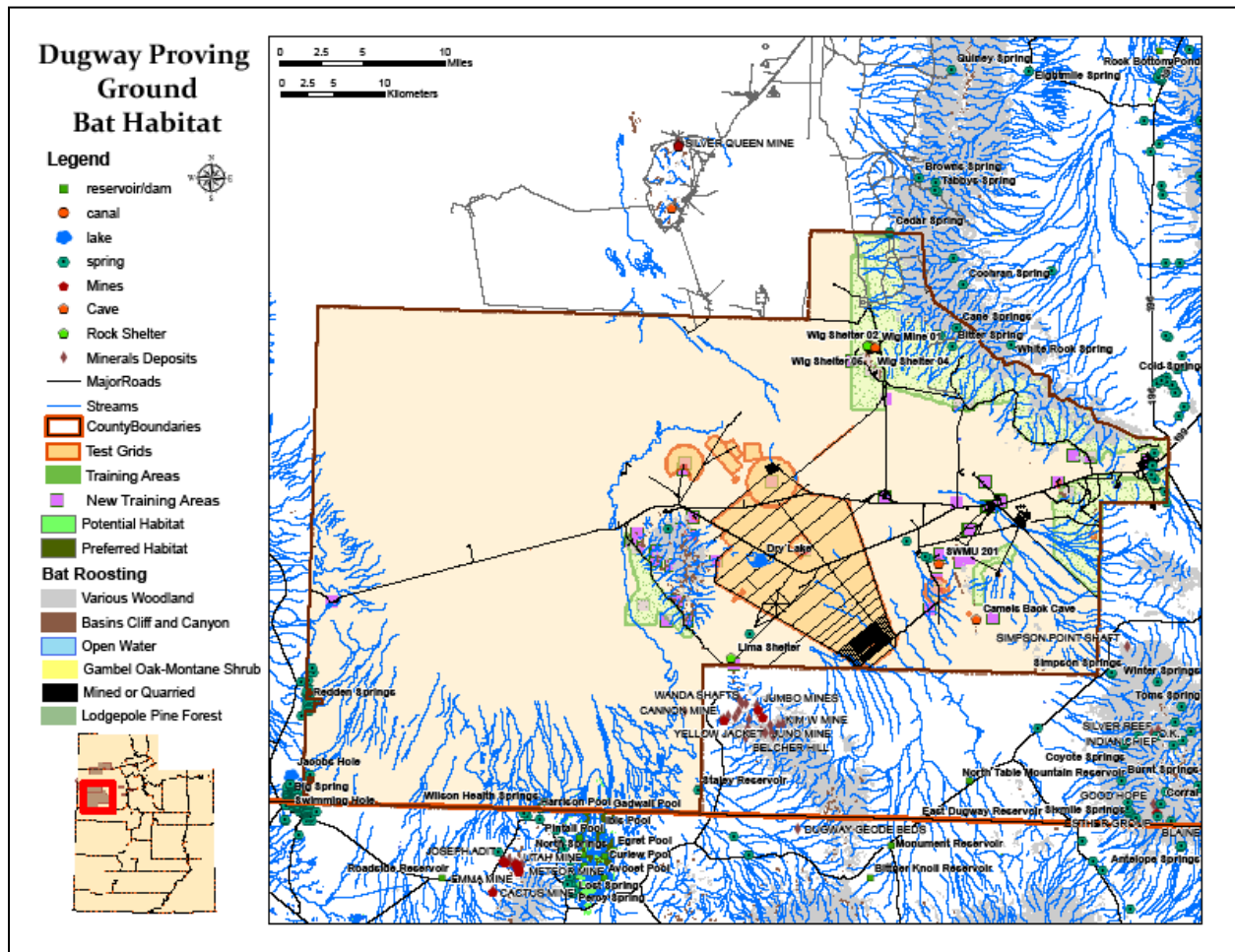
*U.S. Army Dugway Proving Ground (DPG)*

Bat activity was directly and indirectly observed across habitats on DPG. Roosting bats were observed using mines and buildings across DPG. Potential roosting habitat was observed across the DPG. Bats were captured at multiple locations across the base while foraging and watering. No direct bat migratory activity was observed.

Bat roosting habitat exists within the confines of the base as well as the surrounding areas. Observed roosting activity was limited to mine structures in the mountainous areas of the base and surrounding areas and buildings within the developed areas of the base. Roosting was also reported within large cracks on power line poles; follow up surveys by biologists were unsuccessful at locating roosters for species identification. Of the 18 mines surveyed on and around the base we located several day, night, and hibernacula roosts and potential maternity activity. A single cave and multiple rock shelters also provide potential bat habitat. Tree and foliage roosting habitat exist within the residential portions of the base and the adjacent mountainous areas. Building roosts also exist within the residential areas of the base; several (about 4) bats have been reported or observed by the Natural Resources Office to roost on English Village buildings, including a Mexican Free-Tailed Bat. Eighteen mines were surveyed on DoD lands and along the southern border. Twenty five percent of surveyed mines provided winter habitat and/or potential summer habitat for Townsend's big-eared bats. Four mines (i.e. two on DPG and two approximately 5 miles south of the southern border on the Dugway Range) were identified as Townsend's big-eared bat hibernacula. Three mines contained one hibernating bat (probably male), and one mine contained two (probably female as female Townsend's tend to hibernate in small groups). Dugway locations included Granite and Wig Mountain. No other species of conservation concern occurred in the mines.

Foraging and watering habitat is distributed across the base. About seven natural springs are found on the base and over 70 on adjacent lands. These springs provide reproductive hotspots for arthropod prey as well as evenly distributed watering sites. Municipal sewage lagoon sites (four), man-made ponds (six), and wildlife guzzlers (12 though can vary based on the proper functioning of units) also provide watering and foraging sites. Capture surveys on DPG in 2009 resulted in bats captured while foraging and watering over man-made ponds and natural springs; acoustic surveys in 2008 confirmed bat use of wildlife guzzlers. We captured six

female Townsend’s big-eared bats entering the El Dorado Mine to water over three surveys. At protocol site 20 (Staley Springs), three miles south of the DPG border, a reproductive Townsend’s big-eared bat was also caught. On and adjacent to DPG lands Townsend’s big-eared bats were the only species of concern recorded in 2009. Fringed myotis were consistently recorded on lands adjacent to DoD lands but not within the boundaries (i.e. approximately 20 miles away from DPG at 8-Mile Springs in 2007 and September 2009). Similarly, no bats of conservation concern were observed using DPG sewage lagoons or White Rocks (a natural spring on the northern extreme of the base).



**Figure 3.** Map of Dugway Proving Ground’s actual and potential bat habitat. Maps consist of Department of Defense management layers, water source layers and roosting site layers. Note that the stream layer indicates dry stream channels about 90% of the time.

Intensive acoustic monitoring has been conducted on DoD over the past 2 years. While this data has yet to be analyzed over 10,000 call records exist. Intensive capture surveys have

also been conducted at mines and springs. These surveys detected multiple species at watering sites. And several mines serve as bat roosts or watering sites. The North Granite Tunnel, serves as a hibernacula and interim roost and the El Dorado Mine serves as a watering site for Townsend's big-eared bat.

No direct migration events were recorded on DPG. However, bats were observed in small numbers roosting on the exterior of buildings for short periods of time (1-2 days) in the fall, including the Mexican free-tailed bat (2008), a migratory species found as singles often during migration on buildings. Historical records indicate that Townsend's big-eared bats have been observed during periods of migration on or near the base.

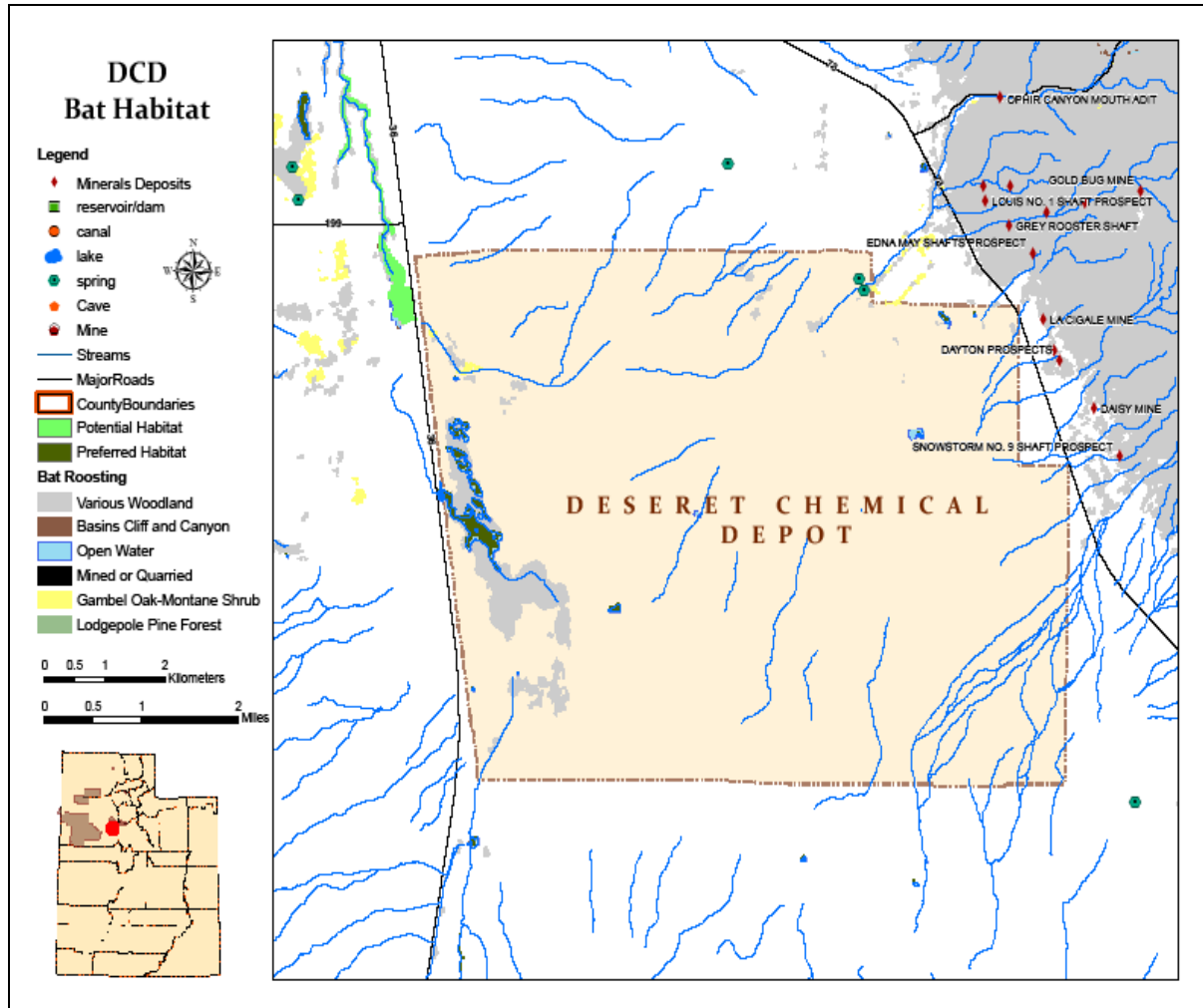
Intensive capture surveys conducted on this base indicate that three species use the base as maternity, foraging and watering habitat. Two bat species, Townsend's big-eared bat and western small-footed myotis, both adult and sub-adult for these species were recorded using the El Dorado Mine as a watering source (table 2). DPG sewage overflow ponds were used by sub-adult western small-footed bats. Reproductive adult female western small-footed bats were observed at the White Rocks water source. Sub-adult pallid bats and western small-footed myotis were also observed at White Rocks (table 2). Maternity sites for these three species use DPG as watering and foraging habitat.

**Table 2. Bat Capture Locations on Dugway Proving Ground across Three Sample Periods in 2009.** Capture across six demographic types; AM=adult male non-reproductive, AM repro=adult male reproductive, AF=adult female non-reproductive, AF repro= adult female reproductive, SM=sub-adult male, and SF=sub-adult female. Five species were observed: COTO=Townsend's big-eared bat, MYCI=Western small-footed bat, LACI=hoary bat, EPFU=big brown bat, and ANPA= pallid bat.

Site	Period	AM	AM repro	AF	AF repro	SM	SF
DPG El Dorado mine	1				COTO		
DPG El Dorado mine	2	COTO/MYCI		MYCI	COTO/MYCI	COTO/MYCI	MYCI
DPG El Dorado mine	3		MYCI	MYCI		MYCI	MYCI
DPG Sewage Overflow	1			MYCI			
DPG Sewage Overflow	2	MYCI	LACI	EPFU/MYCI			
DPG Sewage Overflow	3	MYCI	LACI			MYCI	MYCI
DPG whiterocks	1						
DPG whiterocks	2		MYCI		MYCI		
DPG whiterocks	3		MYCI		MYCI	ANPA/MYCI	MYCI
Staley Springs	1		PIHE				
Staley Springs	2		ANPA		MYCI		
Staley Springs	3	LANO	COTO/PIHE		PIHE	ANPA/MYCI/PIHE	PIHE

*U.S. Army Deseret Chemical Depot (DCD)*

Actual and potential bat activity was observed on DCD. Bats were observed using building roosts on DCD and mines adjacent to the base serve as cavern roosts. Bats were recorded watering and foraging at large water sites adjacent to and on the base. Bat activity indicative of migration habitat was also found.



**Figure 4.** Map of Deseret Chemical Depot's actual and potential bat habitat. Maps consist of Department of Defense management layers, water source layers and roosting site layers. Note that the stream layer indicates dry stream channels about 90% of the time.

We conducted a survey of potential roosting habitat on DCD during the spring of 2009. While the nature of the operations on DCD requires that buildings be sealed, several building roosts were discovered. Two building roosting sites for unknown species were observed on the base. One was an old loading dock for rail cars at CAMDS, a small long narrow building, with

an office in one end (total building dimensions were about 8x8 feet) located near the sewage lagoons. The second building roost was an old school foundation with a hole in the floor which is where the guano was found. Base personnel also observed bats occasionally roosting on the concrete blocks which protect the storage igloo doors. On the eastern boundary of the base, a series of abandoned structure foundations provide potential habitat for bat species. It should be mentioned that DCD is scheduled for closure under BRAC and all structures are planned for demo and restoration to grass lands. Adjacent to the eastern boundary of the base, a multitude of Townsend's big-eared bat day, night, maternity and hibernacula roosts exist in the Ophir Mountains. Mines in the Sheeprock Mountains to the west also have a multitude of known Townsend's big-eared bat roosts as well as a fringed myotis maternity roost. Thirteen of these mines are within 4 km of DCD. Given that Townsend's big-eared bats have a range of approximately 20 linear km bats roosting within 4km of the base are likely utilizing the base for foraging and watering. Scattered cottonwood groves provide potential tree and foliage roosting habitat.

No bat capture surveys at the one perennial water source on DCD have been completed due to its large size (approximately 300m x 150m). However, acoustic surveys at Rainbow Reservoir, located on the eastern boundary of the base, indicate that the site is heavily used by bats. A night or day roost was also identified adjacent to the reservoir at one of the picnic pavilions. While the acoustic data has yet to be analyzed, over 1,000 individual files have been recorded. The base also has 3 active sewage lagoons and 2 inactive lagoons that provide foraging and watering habitat though they have not been sampled acoustically or with capture. Two springs within the boundaries of the base and four within 2 km of the base provide foraging and watering habitat, though those on base do not provide perennially reliable open water. A small marsh on the western boundary may provide foraging and watering habitat as well. Two reservoirs adjacent to the base provide foraging and watering habitat as well, one of which was mist netted during three capture surveys during 2009. Only one species (Hoary bat) was captured during these survey periods (table 3).

**Table 3. Bat Capture Locations on Deseret Chemical Depot across Three Sample Periods in 2009.**

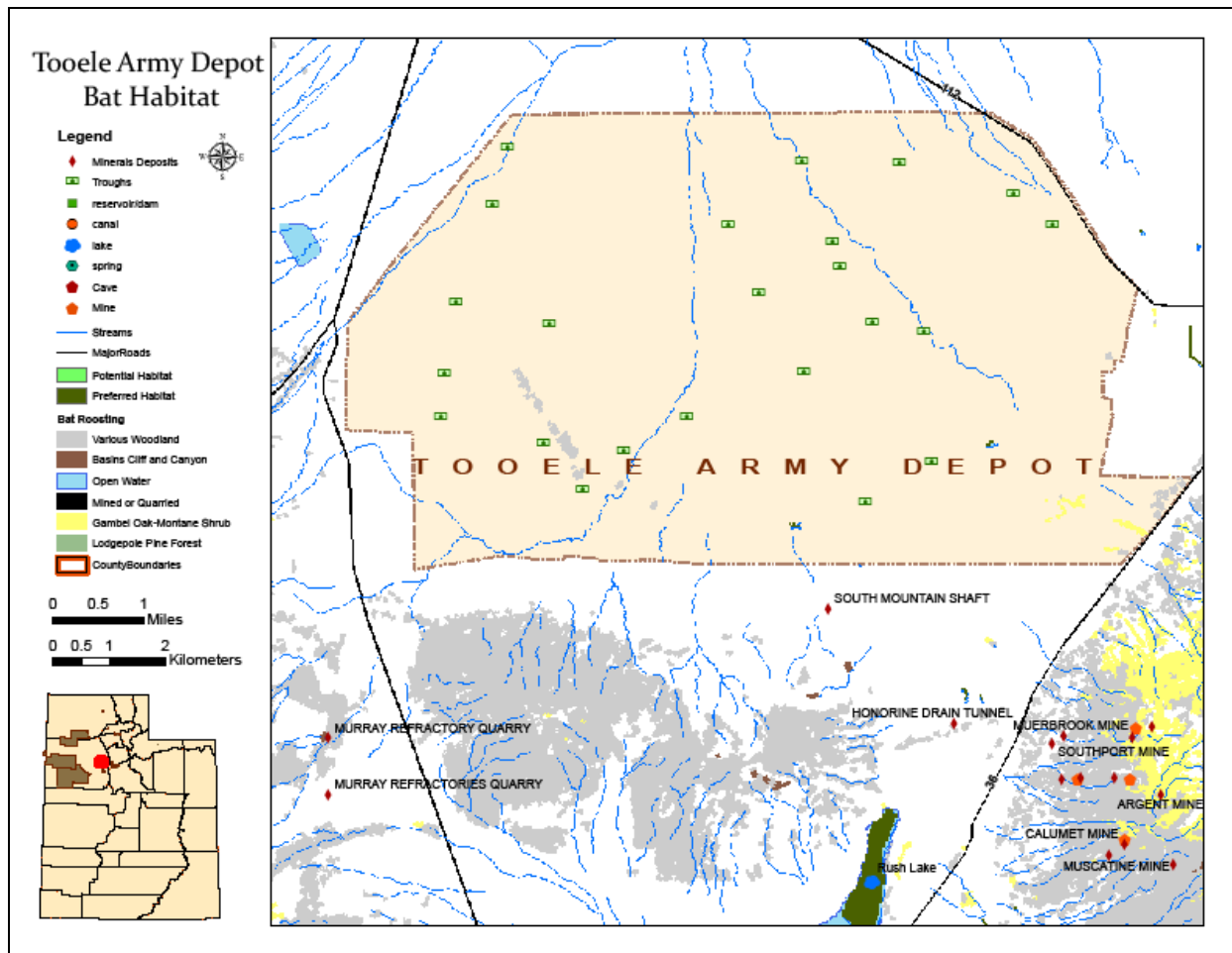
Capture across six demographic types; AM=adult male non-reproductive, AM repro=adult male reproductive, AF=adult female non-reproductive, AF repro=adult female reproductive, SM=sub-adult male, and SF=sub-adult female. One species was observed; LACI=hoary bat.

Site	Period	AM	AM repro	AF	AF repro	SM	SF
DCD Recharge Res	1						
DCD Recharge Res	2		LACI				
DCD Recharge Res	3						

*Tooele Army Depot (TEAD)*

Bat potential and actual habitat use was observed. While no bat roosts were recorded on TEAD, mine roosts were observed adjacent to the base. We also observed bats foraging and watering on the base. No migration activity was observed.

While we observed no actual roosts on TEAD, potential building roosts exist and known mine roosts occur adjacent to the base. Mine roosts adjacent to the base in the Southport and Settlement areas of the Ophir Mountain foothills provide Townsend big-eared bat day, night, maternity and hibernacula roosts. Fifteen of these mines are within 4 km of the base. Potential foliage, tree and cliff roosts also occur adjacent to the base. Watering and foraging habitat was observed on the base and adjacent. The well lit main entrance to the base with 24-hour security guards apparently provide good foraging habitat; a single acoustic survey was completed here though data (422 files recorded) has yet to be analyzed. Twenty-three, seasonally full stock troughs are dispersed across the base. Most of the tanks are turned off during the summer months as the cattle are taken elsewhere for grazing, however at least three were full during June site selection for capture surveys. Rush Lake to the south of the base provides foraging and watering habitat as well.



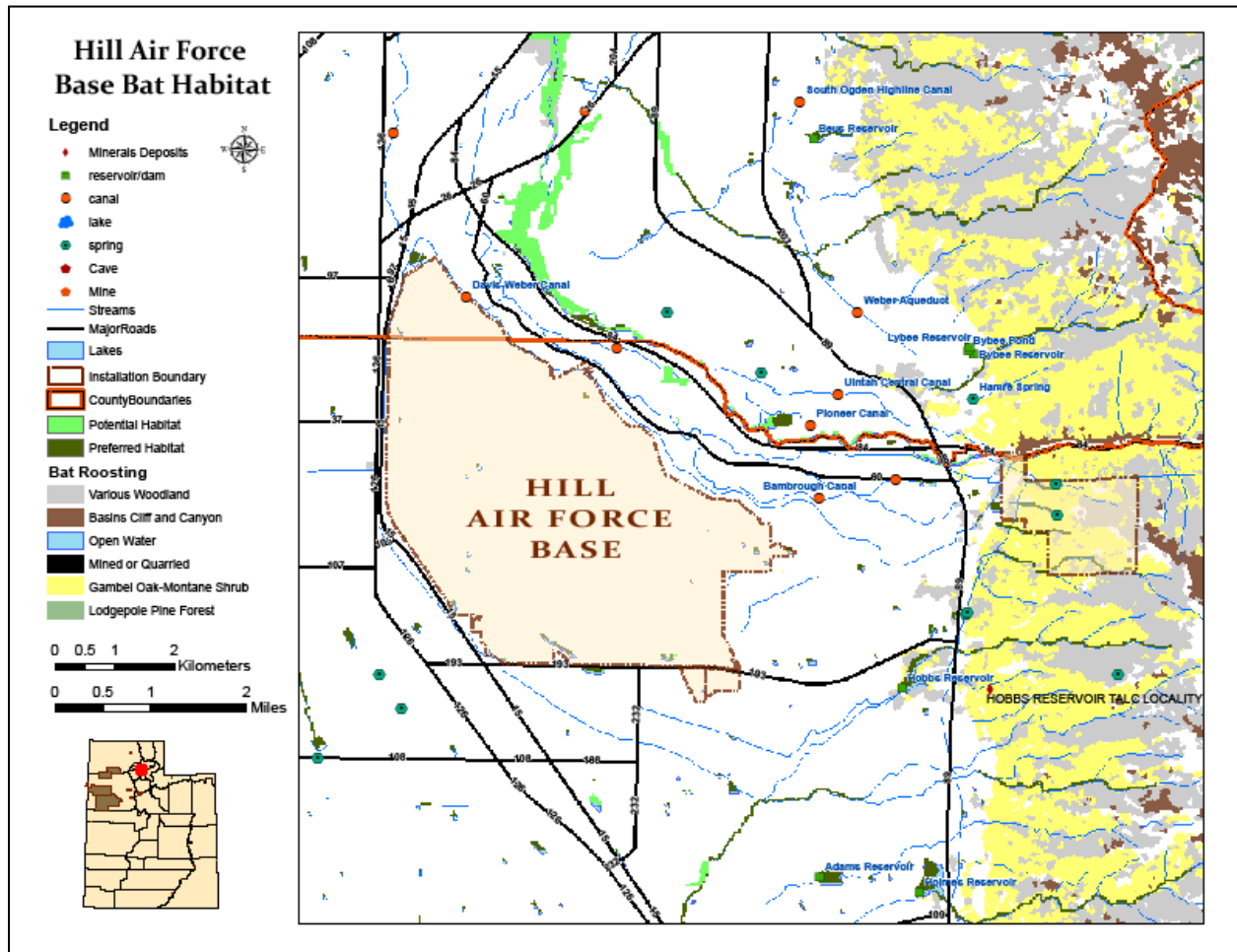
**Figure 5.** Map of Tooele Army Depot’s actual and potential bat habitat. Maps consist of Department of Defense management layers, water source layers and roosting site layers. Note that the stream layer indicates dry stream channels about 90% of the time.

### *Hill Air Force Base (HAFB), Ogden*

Potential and actual bat use was observed across HAFB. Potential roosts occur across the base. Foraging and watering activity was observed at water sites on the base and habitats adjacent to the base. No direct migration use was observed. Multiple net sets on the HAFB golf ponds provided no bat captures (Table 4), however bat activity was observed. Three acoustic surveys were completed (producing 323, 28, and 6 call files) as well but have yet to be analyzed. Building, foliage and tree roosts occur throughout the residential portion of the base. The large residential and industrial portions of the base provide a multitude of potential roosts. The adjacent interstate highway system provides abundant bridge roosts. One canal exists on the base, and the adjacent canal system provides eight more canals on the east and north border



which provide ample water. Ten natural springs exist within 4 km of the base, all of which offer foraging and watering habitat.



**Figure 6.** Map of Hill Air Force Base's (Ogden Location) actual and potential bat habitat. Maps consist of Department of Defense management layers, water source layers and roosting site layers. Note that the stream layer indicates dry stream channels about 90% of the time.

*Hill Air Force Base, Snoopy Property (Wendover, Nevada)*

Actual roosting habitat was observed in caves on the site and capture surveys resulted in bats captured while foraging. Capture surveys at the Snoopy Cave system resulted in female non-reproductive Townsend's big-eared bat. Reproductive pallid bats were also observed in this cave roost (Table 4). Thus Snoopy Cave is a documented Townsend's big-eared bat roost and maternity site for pallid bats (Table 4). Oak forests and woodlands to the east provide foliage and tree roosts. Cliff and canyon habitat east of the Snoopy Property also provides crevice and



cliff roosting habitat. The urban location of this base provides a multitude of foraging and watering habitat for bats. Eight small reservoirs are located within 4km of the Snoopy Property.

**Table 4. Bat Capture Locations on Hill Air Force Base Properties across Three Sample Periods in 2009.**

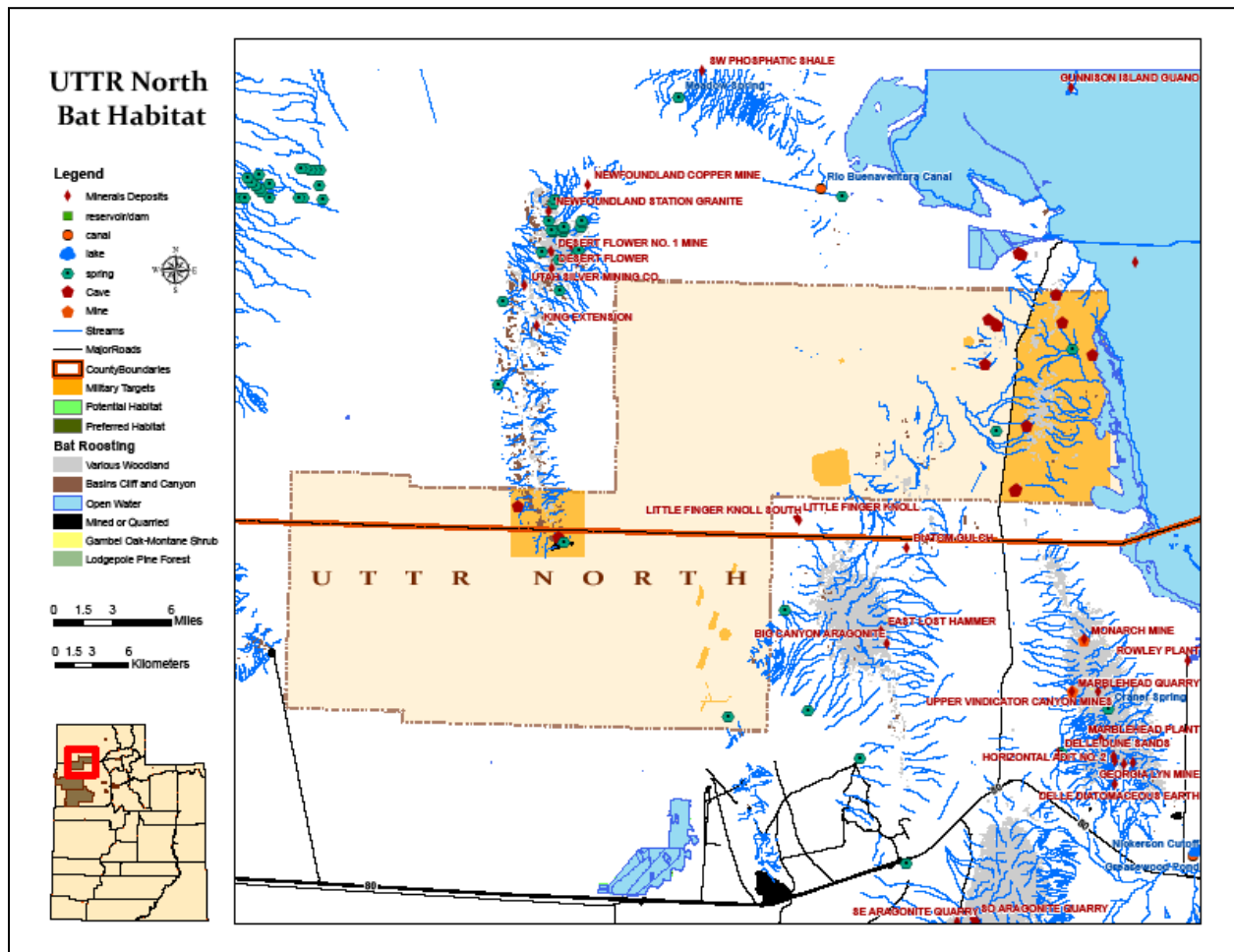
Capture across six demographic types; AM=adult male non-reproductive, AM repro=adult male reproductive, AF=adult female non-reproductive, AF repro=adult female reproductive, SM=sub-adult male, and SF=sub-adult female. Four species were observed on these properties; MYCI=western small-footed bat, ANPA= pallid bat, COTO=Townsend’s big-eared bat, and MYCA=California myotis.

Site	Period	AM	AM repro	AF	AF repro	SM	SF
HAFB cathedral cave	1						
HAFB cathedral cave	1 MYCI						
HAFB cathedral cave	2 MYCI						
HAFB cathedral cave	3						
HAFB golf pond upper	1						
HAFB golf pond upper	2						
HAFB golf pond upper	3						
HAFB snoopy cave 1	1 MYCI		ANPA	COTO			
HAFB snoopy cave 1	2 MYCA		ANPA		ANPA		
HAFB snoopy cave 1	3						
HAFB snoopy cave 3	1 MYCI		ANPA	COTO			
HAFB snoopy cave 3	2 MYCA		ANPA		ANPA		
HAFB snoopy cave 3	3						

*U.S. Air Force Utah Test and Training Range North (UTTRN)*

Potential bat activity was observed within and adjacent to UTTRN. Roosting habitat was observed within and adjacent to the base. Foraging and watering habitat also exists on the base and adjacent to it. No migratory events were recorded.

Cavern, crevice, foliage and tree roosting habitat was observed. Potential roosting habitat occurs on the base within the 11 small caves and rock shelters. While no mine roosts were observed on the base, over 30 are within 10 km. Mines to the southeast in the Lakeside Mountains provide day, night, interim and hibernacula roosts for Townsend’s big-eared bats. Pinion juniper woodlands adjacent to the base provide tree roosting opportunities. Foraging and watering habitat occurs on the base and directly adjacent. Two canals to the north provide foraging habitat. Three small lakes provide foraging and watering habitat. Four springs exist on the base and 38 within 10 km provide additional foraging and watering habitat.

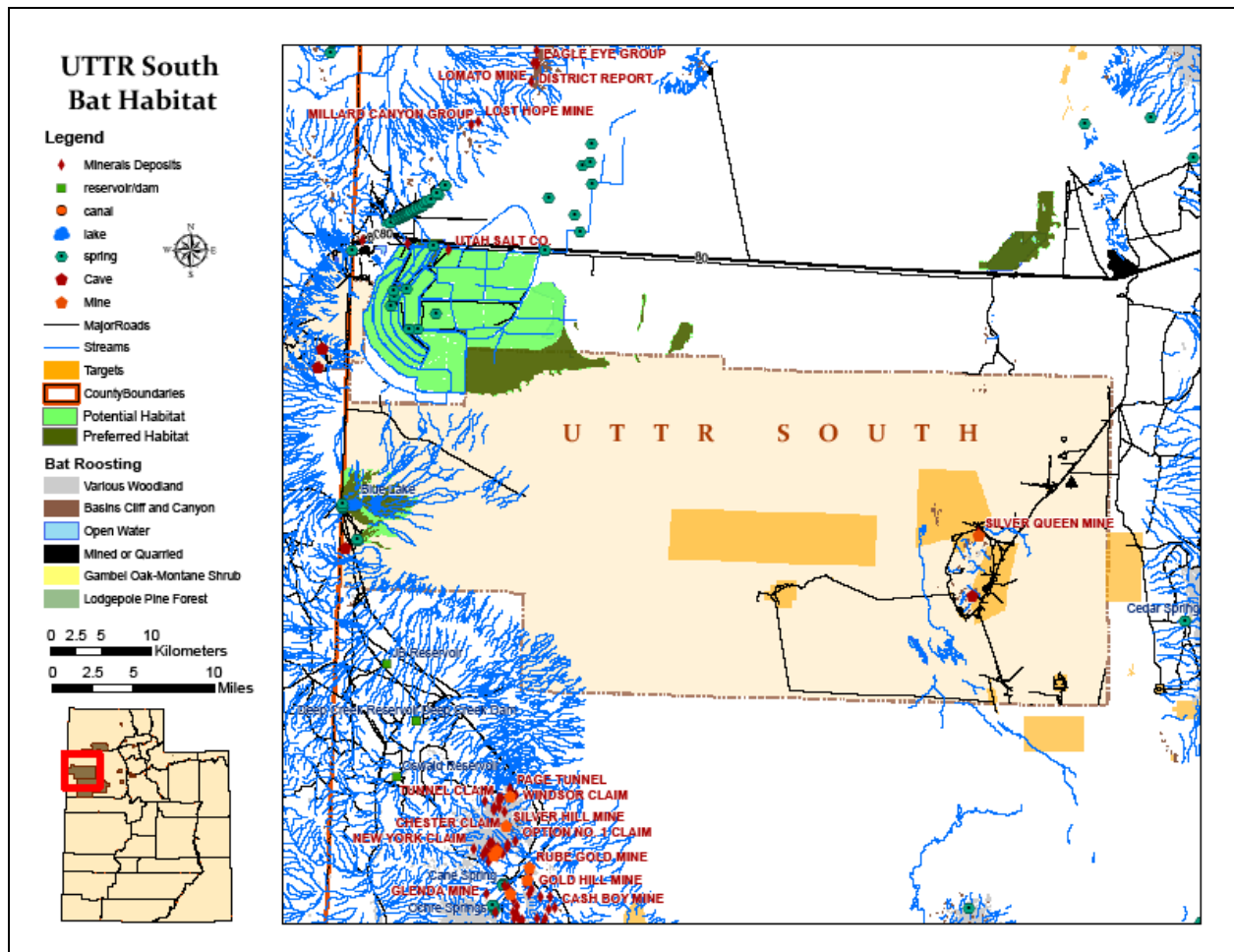


**Figure 7.** Map of Utah Test and Training Range North’s actual and potential bat habitat. Maps consist of Department of Defense management layers, water source layers and roosting site layers. Note that the stream layer indicates dry stream channels about 90% of the time.

### *U.S. Air Force Utah Test and Training Range South (UTTRS)*

Potential bat activity was observed within and adjacent to UTTRS. Roosting habitat was observed within and adjacent to the base. Foraging and watering habitat also exists on the base and adjacent to it. No migratory events were recorded.

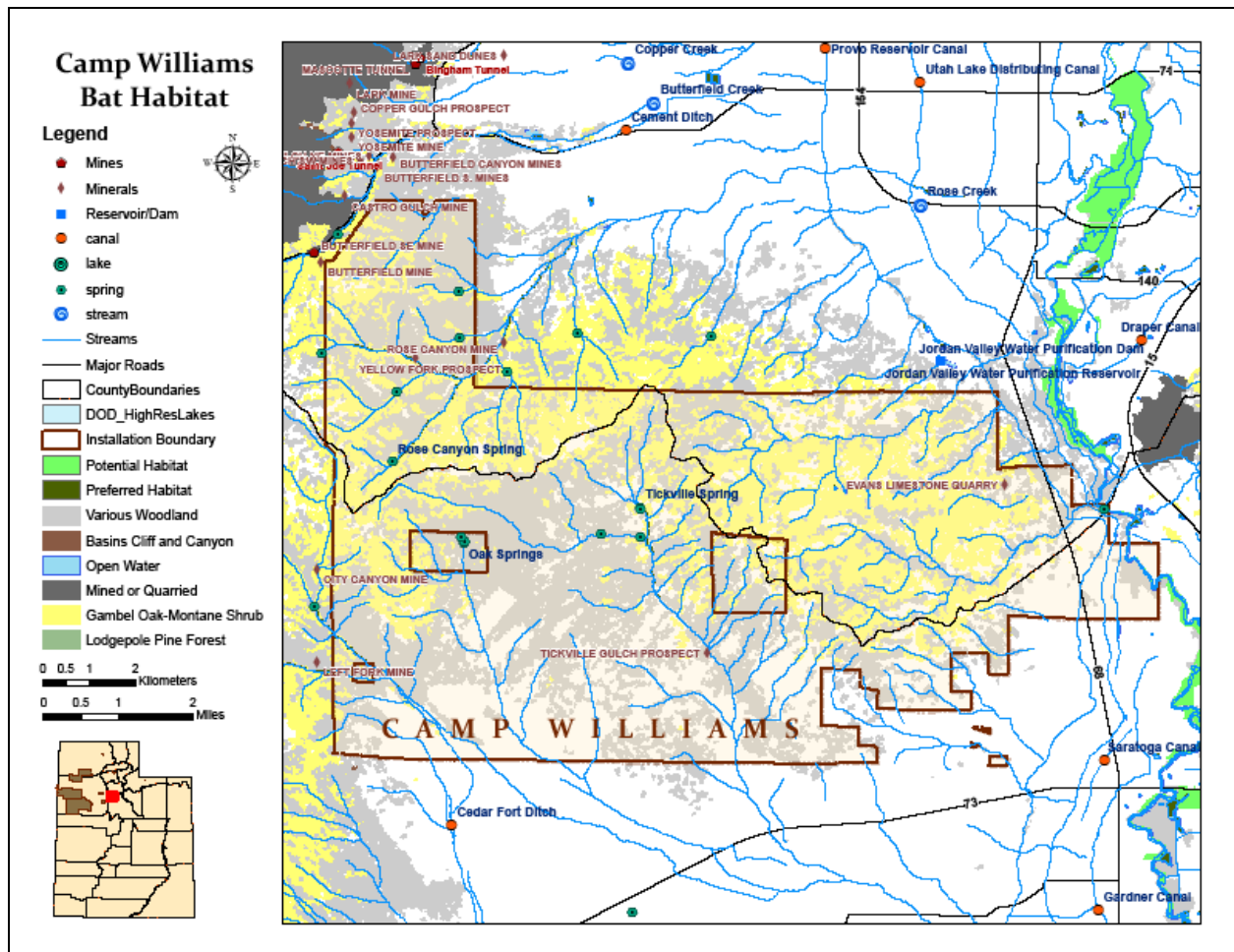
Two small caves and a single mine provide cavern roosting habitat. Within 10 km of the base, more than 60 mines also provide potential habitat. Mines in the Goldhill area southwest of the base provide day, night, interim, hibernation and maternity roosts for Townsend’s big-eared bats. Three springs on UTTRS provide foraging and watering habitat as does the single small pond. Within 20 km, three reservoirs and over 50 springs provide foraging and watering habitat.



**Figure 8.** Map of Utah Test and Training Range South’s actual and potential bat habitat. Maps consist of Department of Defense management layers, water source layers and roosting site layers. Note that the stream layer indicates dry stream channels about 90% of the time.

*Utah Army National Guard - Camp W. G. Williams (CW)*

Potential roosting, foraging, and watering habitat were observed on Camp Williams. Cavern, tree, foliage and building bat roosting habitat was observed. Watering and foraging habitat exists on and adjacent to the base. No migratory activity was observed. The two mines on the base and the greater than 20 adjacent to the base provide potential roosting habitat. Cottonwood, gamble oak, and piñon juniper woodlands and lodgepole pine forest provide potential foliage and tree roosting habitat. Two adjacent reservoirs provide foraging and watering habitat. Nine springs on the base and eight within 4 km also provide foraging and watering habitat. Three streams and six canals adjacent to the base offer potential foraging habitat.



**Figure 9.** Map of Camp William’s actual and potential bat habitat. Maps consist of Department of Defense management layers, water source layers and roosting site layers. Note that the stream layer indicates dry stream channels about 90% of the time.

Three capture and acoustic surveys were completed on the base for each of three locations: Irrigation Canal, Oak Springs, and Tickville Spring. The irrigation canal proved a very difficult spot to mist net for bats due to the large water area and adjacent riparian area and river 1 km from this location. No bats were caught or seen on survey nights however 263, 47, and 0 calls were recorded during the three acoustic surveys and will be analyzed at a later date. Oak Springs proved to be the best bat capture location. The spring has been modified using a pipe and three small troughs measuring approximately 1 foot by 3 feet each. The water flows into one of the troughs and trickles from one to the other as they are butted up against each other end to end. Overflowing water spills out and down the wash. The troughs were built some time ago and provide watering habitat for foraging goats used on base to control the gamble oak and

provide fire breaks. During the first visit, all three troughs were heavily covered with algae and other vegetation. They were cleaned out with a shovel and one bat was caught that night along with one Great Horned Owl (*Bubo virginianus*) (table 5). The troughs exist in a very small clearing of gamble oak. The second two visits yielded reproductive adult females and sub-adult long-eared myotis indicating that a maternity colony is located nearby. Sub-adult females of two additional species (western small-footed bat and long-legged myotis) were observed during the third survey period indicating that maternity colonies for these two species are also in the area. The troughs had increasing amounts of growing vegetation in them during each visit approximately one month apart and were cleaned out prior to each survey if surface water was obstructed. The Tickville Spring was heavily vegetated providing limited small open water locations. Four bat species were observed at this site: two species during period one (hoary bat and little brown bat) and two species during period three (silver-haired bat and long-eared myotis). The long-eared myotis was a sub-adult, indicating that a maternity colony is located nearby.

**Table 5. Bat Capture Locations on Camp Williams across Three Sample Periods in 2009.**

Capture across six demographic types; AM=adult male non-reproductive, AM repro=adult male reproductive, AF=adult female non-reproductive, AF repro=adult female reproductive, SM=sub-adult male, and SF=sub-adult female. Six species were observed; MYEV=long-eared myotis, LACI=hoary bat, LANO= silver-haired bat, MYLU=little brown bat, MYCI=western small-footed myotis and MYVO=long-legged myotis.

Site	Period	AM	AM repro	AF	AF repro	SM	SF
CW Irrigation Canal	1						
CW Irrigation Canal	2						
CW Irrigation Canal	3						
CW Oak Spring	1						
CW Oak Spring	2	MYEV		MYLU	MYEV	MYEV	MYEV
CW Oak Spring	3	MYEV			MYEV	MYEV	MYCI/MYEV/MYVO
CW Tickville	1	LACI		MYLU			
CW Tickville	2						
CW Tickville	3		LANO				MYEV

## **DISCUSSION and MANAGEMENT RECOMMENDATIONS**

Suitable-to-be-occupied and occupied bat habitat is prevalent across DoD land holdings in Utah. All DoD facilities had roosting, foraging and watering bat activity and habitat. While migratory activity was only observed on a subset of DoD lands, potential migratory habitat exists across facilities. Direct and indirect observations of bat habitat indicate that four of Utah's six SARs occur on or adjacent to DoD lands. Actual and potential bat habitat on DoD lands are but a portion of the ecosystem scale habitat processes. Specific management recommendations for each military base are listed below.

DPG land holdings provide a variety of roosting, foraging, watering and migratory bat habitat. Bat habitat on the base overlaps with existing and new training areas. We recommend ten management actions to maintain current and stimulate future bat habitat conservation on DPG.

1. The timing of testing within the North Granite Tunnel should be conducted, when feasible, outside of critical periods of maternity (May-July) and hibernation roosting (November to March). This site is used as a low use hibernacula and potential small maternity roost for species that are not of conservation concern. By timing testing outside of these critical periods mission objectives can be accomplished within this roost while maintaining the bat populations that utilize this cavern resource. If altering the timing of testing cannot be achieved, a secondary avoidance/minimization method could be the simple exclusion of bats from the mine during critical maternity and hibernacula periods using one of several bat exclusion methods.
2. Multiple mine roosts are used by Townsend's big eared bats on the base. Given the special conservation status of this species all open abandoned mines on the base should be treated as active bat habitat and managed accordingly. If mission objectives require the exclusion of bats from an existing roost it should occur outside of maternity and hibernation periods. The loss of mine habitat on DPG could also be mitigated with the protection of roosting habitat in some of the dozens of mines adjacent to the base. This would however require a partnership with Bureau of Land Management (BLM) and mine protection measures (like bat gate funding and installation).

3. While no active foliage, tree, building or crevice roosting bat habitat was observed, the base has potential habitat for all roost types. Foliage and tree roosts exist almost exclusively on the residential portions of the base. To maintain the existing and augment potential tree and foliage roosts, large, broad leaf trees should be preserved. Older buildings could also be preserved for actual or future bat use. Crevice habitat on the mountainous portions of the base can be managed for reduced disturbance in these areas during periods of maternity and hibernacula activity.
4. Given the low amount of overlap between bat roosting habitat and active mission areas and the high amount of adjacent roosting habitat we recommend no further mitigation measures.
5. Foraging and watering habitat suitable for 4 of Utah's 6 species of concern exists on DPG. These habitats should be managed for continued persistence. The open water on the base provides a prey population and open calm locations for bat watering. Maternity activity was observed at the Eldorado mine, sewage lagoons and the White Rocks water source. These three sites specifically should be managed for continued water flow. In general we recommend that the existing open water be maintained or augmented to increase available foraging habitat. A Spring Management Project is currently under way at Dugway to implement this recommendation.
6. Water sites within mission areas should be protected against contamination and invasive weed dominance.
7. Springs and water sites within mines should also be managed as critical prey reproduction sites.
8. We also recommend that bats observed roosting on buildings from August to November be treated as migratory animals and not disturbed or harmed.
9. Even though White-Nose Syndrome (WNS) has not made it to the Western states, we recommend that DPG comply with any precautions being taken in the East (i.e. decontamination procedures), limiting access to mines and caves on base if necessary to help prevent the spread of the deadly WNS fungus. NR Managers should follow WNS developments via USFWS websites (i.e. [http://www.fws.gov/northeast/white\\_nose.html](http://www.fws.gov/northeast/white_nose.html)) and consider all recommendations made by the Western Bat Working Group, of which



Utah is a member (<http://wbwg.org/>). The UDWR plans to develop a WNS Plan for Utah in the near future as well.

10. Along with direct management recommendations above, a continued active involvement in the Utah Bat Conservation Cooperative is recommended to support bat management across agency boundaries. We also recommend that DPG continues support of the Utah Bat Monitoring Protocol which enables active monitoring of bats at a landscape scale and thus increases the potential to detect and manage population changes prior to Federal listing. Measuring population change can also help prevent Federal listing in some cases.

DCD land holdings provide primarily watering and migratory bat habitat. Bat habitat on the base overlaps with existing and new training areas. We recommend six management actions to maintain current and stimulate future bat habitat conservation on DCD.

1. We recommend that the existing roosting habitat on the base be maintained. Specifically we recommend that known building roosts be preserved and that we avoid disturbance of igloo blocks used by roosting bats during daylight hours.
2. Since the primary roosting habitat is adjacent rather than on DCD, maintenance of watering habitat is imperative to maintain these roosts. The scarcity of surface water in the area means that bats concentrate at the water sources on this base. Thus any decrease in available water sites will likely result in a decreased population using the base. Specifically, we recommend that the sewage lagoons, reservoirs, wetlands, springs and canals be maintained at the current level and if changes are made to these resources it should occur October to April when active foraging does not occur.
3. As the base is schedule for closure under BRAC, NEPA documentation should discuss the loss of watering, foraging and roosting habitat on base. Mitigation actions for the loss of these important habitat components could be the construction and erection of artificial bat roosts (bat houses) and expansion of Rainbow Reservoir. NR Managers on this base should insure that any NEPA documentation done on the removal of buildings and sewage lagoons specifically take into account bat roosting, watering, and foraging chronology and habitat needs.



4. We also recommend that bats observed roosting on buildings from August to November be treated as migratory animals and not molested.
5. Even though White-Nose Syndrome (WNS) has not made it to the Western states, we recommend that DCD comply with precautions being taken in the East (i.e. decontamination procedures), limiting access to mines and caves on base if necessary to help prevent the spread of the deadly WNS fungus. NR Managers should follow WNS developments via USFWS websites (i.e. [http://www.fws.gov/northeast/white\\_nose.html](http://www.fws.gov/northeast/white_nose.html)) and consider all recommendations made by the Western Bat Working Group, of which Utah is a member (<http://wbwg.org/>). The UDWR plans to develop a WNS Plan for Utah in the near future as well.
6. Along with direct management recommendations above a continued active involvement in the Utah Bat Conservation Cooperative is recommended to support bat management across agency boundaries. We also recommend that DCD continues support of the Utah Bat Monitoring Protocol which enables active monitoring of bats at a landscape scale and thus increases the potential to detect and manage population changes prior to federal listing. Measuring population change can also help prevent Federal listing in some cases.

HAFB land holdings provide roosting, foraging, watering and migratory bat habitat. Bat habitat on the base overlaps with existing and new training areas. We recommend five management actions to maintain current and stimulate future bat habitat conservation on HAFB.

1. We recommend that cavern, foliage, tree and building roosts be retained. Specifically, the Snoopy Cave system which serves as a maternity roosting site for pallid bats and as a day roost for Townsend's big-eared bats, thus human disturbance in these sites should be limited between May and September. Tree and foliage roosts should be managed for retention of large broad leafed trees in the residential areas of the base. Adjacent foliage and tree roosts in the oak and pinion juniper woodlands to the east can be managed to reduce fire risk and catastrophic loss of habitat through wildfire spread. While no known building roosts were observed the potential for roosts exist in the multitude of industrial and residential buildings on the base. Dilapidated buildings not in use should be maintained to provide future bat roosting opportunities on the base.

2. Watering and foraging habitat is available in abundance on and adjacent to HAFB. The golf ponds, small reservoirs, springs, canals and sewage lagoons on and adjacent to HAFB provide reproductive locations for an arthropod prey base and an abundant water source. Given that foraging and watering habitat is in excess on and near HAFB we recommend no direct management of these resources on HAFB.
3. We also recommend that bats observed roosting on buildings from August to November be treated as migratory animals and not molested.
4. Even though White-Nose Syndrome (WNS) has not made it to the Western states, we recommend that HAFB comply with precautions being taken in the East (i.e. decontamination procedures), limiting access to mines and caves on base if necessary to help prevent the spread of the deadly WNS fungus. NR Managers should follow WNS developments via USFWS websites (i.e. [http://www.fws.gov/northeast/white\\_nose.html](http://www.fws.gov/northeast/white_nose.html)) and consider all recommendations made by the Western Bat Working Group, of which Utah is a member (<http://wbwg.org/>). The UDWR plans to develop a WNS Plan for Utah in the near future as well.
5. Along with direct management recommendations above a continued active involvement in the Utah Bat Conservation Cooperative is recommended to support bat management across agency boundaries. We also recommend that HAFB continues support of the Utah Bat Monitoring Protocol which enables active monitoring of bats at a landscape scale and thus increases the potential to detect and manage population changes prior to federal listing. Measuring population change can also help prevent Federal listing in some cases.

UTTRN land holdings provide roosting and watering bat habitat. Bat habitat on the base overlaps with existing and new training areas. We recommend five management actions to maintain current and stimulate future bat habitat conservation on UTTRN.

1. We recommend that the mines located on the southern tip of the Newfoundland Mountains be managed as bat habitat. If the mines must be closed due to Mission requirements, we recommend that active mines in adjacent areas be protected as a mitigation measure.

2. Foraging and watering habitat on UTTRN is relatively limited. Several springs occur within mission areas and can be viewed as habitat no longer available. The abundant adjacent watering and foraging habitat serves as mitigation for these losses of habitat.
3. We also recommend that bats observed roosting on buildings from August to November be treated as migratory animals and not molested.
4. Even though White-Nose Syndrome (WNS) has not made it to the Western states, we recommend that UTTRN comply with precautions being taken in the East (i.e. decontamination procedures), limiting access to mines and caves on base if necessary to help prevent the spread of the deadly WNS fungus. NR Managers should follow WNS developments via USFWS websites (i.e. [http://www.fws.gov/northeast/white\\_nose.html](http://www.fws.gov/northeast/white_nose.html)) and consider all recommendations made by the Western Bat Working Group, of which Utah is a member (<http://wbwg.org/>). The UDWR plans to develop a WNS Plan for Utah in the near future as well.
5. Along with direct management recommendations above a continued active involvement in the Utah Bat Conservation Cooperative is recommended to support bat management across agency boundaries. We also recommend that UTTRN continue support of the Utah Bat Monitoring Protocol which enables active monitoring of bats at a landscape scale and thus increases the potential to detect and manage population changes prior to federal listing. Measuring population change can also help prevent Federal listing in some cases.

UTTRS land holdings provide roosting and watering bat habitat. Bat habitat on the base overlaps with existing and new training areas. We recommend five management actions to maintain current and stimulate future bat habitat conservation on UTTRS.

1. The loss of two cavern roosts and a watering and foraging site is mitigated by adjacent bat habitats. The more than 100 mines located on Mountain Ranges which flank the base provide ample cavern habitat.
2. Foliage, tree and crevice habitat is lacking on the base and abundant on surrounding lands. As with roosting habitat, watering and foraging habitat is abundant on lands adjacent to UTTRS. The loss of several potential roosts and a watering site are very

minor on a landscape scale as the majority of habitat occurs outside of the base boundaries.

3. We also recommend that bats observed roosting on buildings from August to November be treated as migratory animals and not molested.
4. Even though White-Nose Syndrome (WNS) has not made it to the Western states, we recommend that UTTRS comply with precautions being taken in the East (i.e. decontamination procedures), limiting access to mines and caves on base if necessary to help prevent the spread of the deadly WNS fungus. NR Managers should follow WNS developments via USFWS websites (i.e. [http://www.fws.gov/northeast/white\\_nose.html](http://www.fws.gov/northeast/white_nose.html)) and consider all recommendations made by the Western Bat Working Group, of which Utah is a member (<http://wbwg.org/>). The UDWR plans to develop a WNS Plan for Utah in the near future as well.
5. Along with direct management recommendations above a continued active involvement in the Utah Bat Conservation Cooperative is recommended to support bat management across agency boundaries. We also recommend that UTTRS continues support of the Utah Bat Monitoring Protocol which enables active monitoring of bats at a landscape scale and thus increases the potential to detect and manage population changes prior to federal listing. Measuring population change can also help prevent Federal listing in some cases.

Camp Williams land holdings provide roosting and watering bat habitat. Bat habitat on the base overlaps with existing and new training areas. We recommend eight management actions to maintain current and stimulate future bat habitat conservation on Camp Williams.

1. Building and cavern roosts on the base should be preserved for the existing habitat.
2. The oak, maple and pinion juniper woodlands on base and the bat habitat they provide should be managed to reduce loss of habitat due to wildfire.
3. Foraging and watering habitat on the base was limited to springs on the base and adjacent springs, a reservoir and several canals adjacent to the base. We recommend preservation of the springs on the base to allow continued foraging and watering habitat for bat species.

4. Oak Spring serves as a watering source for maternity colonies for long-eared myotis, western small-footed myotis, and long-legged myotis. Water flows should be maintained to conserve these colonies. Specifically, open water at these troughs should be maintained by removing excess vegetation and algae build up within the system. We recommend a visit monthly in June, July, August, and September to maintain open water.
5. The Tickville Spring should be maintained as a watering site to sustain the adjacent maternity colony of long-eared myotis. We recommend taking management action to create more open water in this location by reducing the amount of vegetative cover.
6. We also recommend that bats observed roosting on buildings from August to November be treated as migratory animals and not molested.
7. Even though White-Nose Syndrome (WNS) has not made it to the Western states, we recommend that Camp Williams comply with precautions being taken in the East (i.e. decontamination procedures), limiting access to mines and caves on base if necessary to help prevent the spread of the deadly WNS fungus. NR Managers should follow WNS developments via USFWS websites (i.e. [http://www.fws.gov/northeast/white\\_nose.html](http://www.fws.gov/northeast/white_nose.html)) and consider all recommendations made by the Western Bat Working Group, of which Utah is a member (<http://wbwg.org/>). The UDWR plans to develop a WNS Plan for Utah in the near future as well.
8. Along with direct management recommendations above a continued active involvement in the Utah Bat Conservation Cooperative is recommended to support bat management across agency boundaries. We also recommend that Camp Williams continues support of the Utah Bat Monitoring Protocol which enables active monitoring of bats at a landscape scale and thus increases the potential to detect and manage population changes prior to federal listing.

Bat records and this habitat analysis indicate that DoD facilities provide habitat for Townsend's big-eared bat, fringed myotis, big free-tailed bat and spotted bat. Townsend's big-eared bat and the fringed myotis habitat consist primarily of cavern roosts (mines) and the foraging and watering areas described above. Thus, the above recommendation will benefit these species. The big-free-tailed bat is a crevice rooster and protection of crevice habitat and cliff and canyon habitat will benefit this species. The very limited records of the spotted bat on

DoD lands indicate that this species is utilizing the foraging and watering areas described above. The active management of roosting, foraging, watering and migratory habitat will aid in the long term sustainability of bat populations on DoD lands in Utah.

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#### **USEFUL LINKS FOR WHITE-NOSE SYNDROME**

Western Bat Working Group: <http://wbwg.org/conservation/whitenosesyndrome/whitenose.html>

U.S. Geological Survey: [http://www.nwhc.usgs.gov/disease\\_information/white-nose\\_syndrome/](http://www.nwhc.usgs.gov/disease_information/white-nose_syndrome/)

Bat Conservation International: <http://www.batcon.org/index.php/what-we-do/white-nose-syndrome.html>

National Speleological Society: <http://www.caves.org/WNS/>

U.S. Fish and Wildlife Service: [http://www.fws.gov/northeast/white\\_nose.html](http://www.fws.gov/northeast/white_nose.html)