



FINAL REPORT
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Subterranean Survey of Fort Bliss, New Mexico and Texas

A report on the bat survey of 19 caves and abandoned mine features located on Fort Bliss Army Post, New Mexico and Texas.



A report submitted to Kenneth Stabinsky, Ft. Bliss

By
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Fieldwork was conducted by our experienced team of bat surveyors including Anthony Smith, and Steve Willsey.

Acknowledgements

This project would not have existed without the forethought and direction of senior wildlife biologist Trish Cutler of the White Sand Missile Range. Further support was offered by the Kenneth Stabinsky of Fort Bliss.

The photo documentation for this project has been a team effort and everyone deserves credit for these informative images. For this reason each image does not contain a specific photographer credit.

Project Overview

The primary mission of the work on Fort Bliss Army Post was to locate and survey all subterranean features that could provide habitat for bats. The majority of these sites included caves and abandoned mine features. While conducting these surveys, our team produced an inventory of nearly all cave and mine features located on the fort.

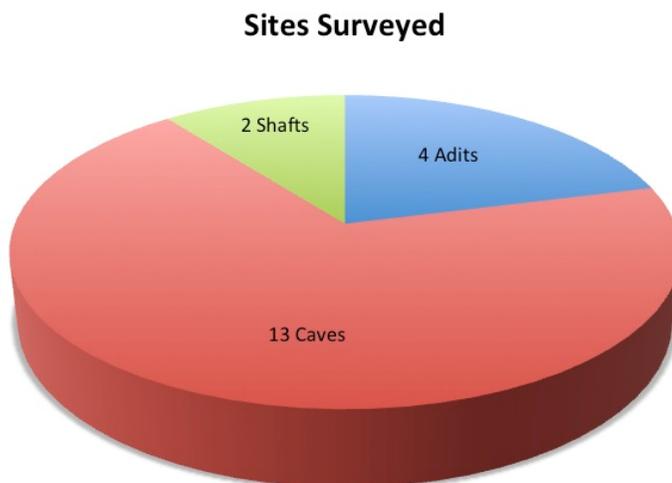
Fieldwork for the project began by working with the Fort Bliss wildlife biologist Kenneth Stabinsky to locate and visit all known sites. From these visits a database of 19 caves and mines was created. Fieldwork for this project consisted of conducting underground surveys of each of the sites. Accessing many of the sites was difficult due to a variety of challenges including remoteness of sites, long hikes, steep terrain, non-passable mining roads, extreme temperatures (both hot and cold), secure areas, and many other factors.

As the survey team located each specific feature, an area safety inspection was conducted looking at local site risks. Once the site risks were mitigated, the team would continue the inventory and assign a unique ID in the form of a two-letter area acronym and the sequential number of the feature. For example, the nine cave features located near Hueco Mountains were denoted as “HC01” thru “HC09”. This unique ID was recorded in the field GPS unit for later download into our GIS mapping software. The type of feature and optional mine name was then added to this unique ID, such as “HC07 Cave (Ceremonial Cave)”.

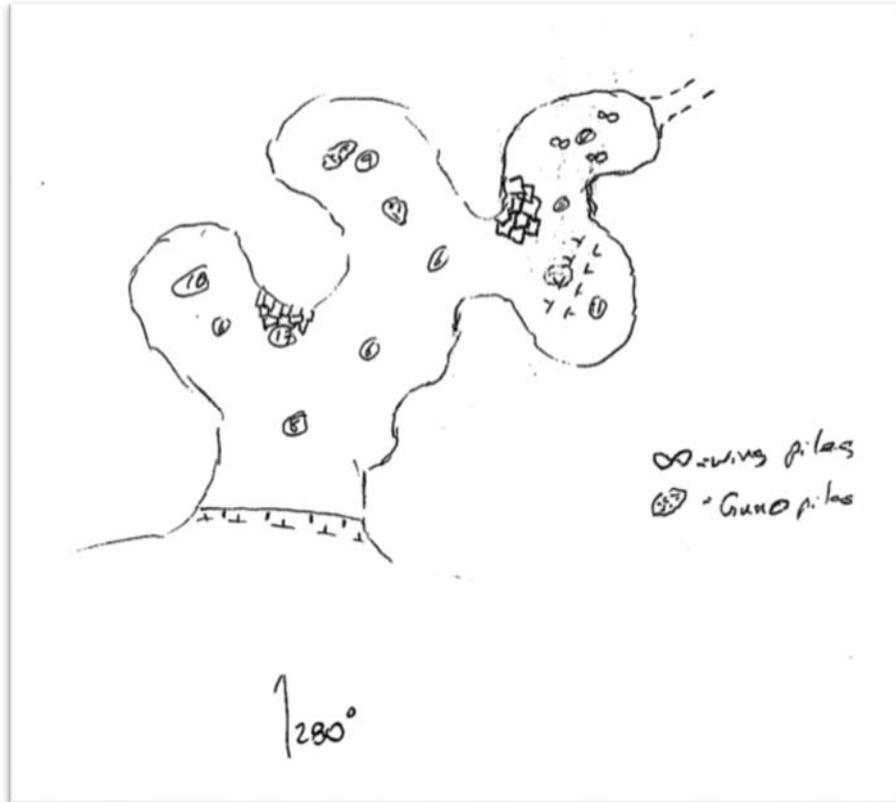
All of the surveyed features were categorized into one of the following three designations:

- Adit - A horizontal mine passageway.
- Cave - A naturally formed void in the ground.
- Shaft - A vertically oriented mine passage that exceeds six feet in depth.

A breakdown of the number and types of sites surveyed is represented in this graph. Note that caves are the most common feature on Fort Bliss.



With the location recorded, the survey team would take an entrance photo of the site. The survey team would then initiate a “quick search” for bats to see if the site was an active roost. The goal of the “quick search” was to locate and possibly photograph the bats in case they were disturbed during our full survey and moved to another roost site. Once the “quick search” process was complete, the team conducted a methodical survey of the feature looking for bats and bat sign. Temperature, humidity, site dimensions and other data was then collected and entered into the Bat Survey Form. Following is an example of a Bat Survey Form site sketch, and Bat Survey Form data sheet from HC05 Cave (Feather Cave).



Example Plan Sketch from HC05 Cave (Feather Cave).

Bats in Mines Internal Survey Form

Mine name (if known): HC05 CAVE (FEATHER CAVE) Elevation: 4521

Location: 31.90611 106.14086

Township: _____ Range: _____ Section: _____ Mine is signed: Yes No

Observers: ANTHONY SMITH, STEVE WILSON

Date: 3.25.11 Time: 1:50 Temperature (outside in shade): _____

Human disturbance is: Low Moderate Heavy Mine is fenced: Yes No

Mine is: Single-level Multilevel Simple Moderate Complex Unknown

Percent of mine included in survey: 100% Air movement: Yes No

Number of entrances: 1 Height of largest: 17.8 FT Width of largest: 22.5 FT.

Mine length is: < 50 ft 50-100 ft 100-200 ft 200-500 ft

500-1000 ft 1000-5000 ft > 5000 ft Unknown

Dimensions of largest passage: Length 79.1 FT. Height 9.3 FT. Width 24.5 FT

Dimensions of largest room: Length N/A Height N/A Width N/A

Mine is: dry damp contains standing water flooded Bad air: Yes No

Temperature in warmest area: 66° Temperature in coolest area: 61°

Bat droppings are: Scattered In piles Splattered Not present Unknown
(Humidity: 16%)

Total number of guano deposits observed: _____ Measurements of four largest guano deposits:

1. Length <u>12 IN</u>	Width <u>12 IN</u>	Depth <u>1/2 IN</u>	<u>OLD PILE</u>
2. Length <u>1.5 IN</u>	Width <u>6 IN</u>	Depth <u>1/2 IN</u>	
3. Length <u>8 IN</u>	Width <u>3 IN</u>	Depth <u>LIGHT</u>	<u>DISPERSED</u>
4. Length <u>1 FT</u>	Width <u>6 IN</u>	Depth <u>LIGHT</u>	

Number of individual bats counted: 1 or total area covered by clusters: _____

Total estimated number of bats in mine (by species if known): 1 MAY BE TOWNSEND

Comments: ROPE CLIMB TO ENTRANCE, INSECT WINDS AT BACK NOT BY GUANO. RINGTOLL SCAT, PEAR CANIS, CONDOR WAX, FEATHERS

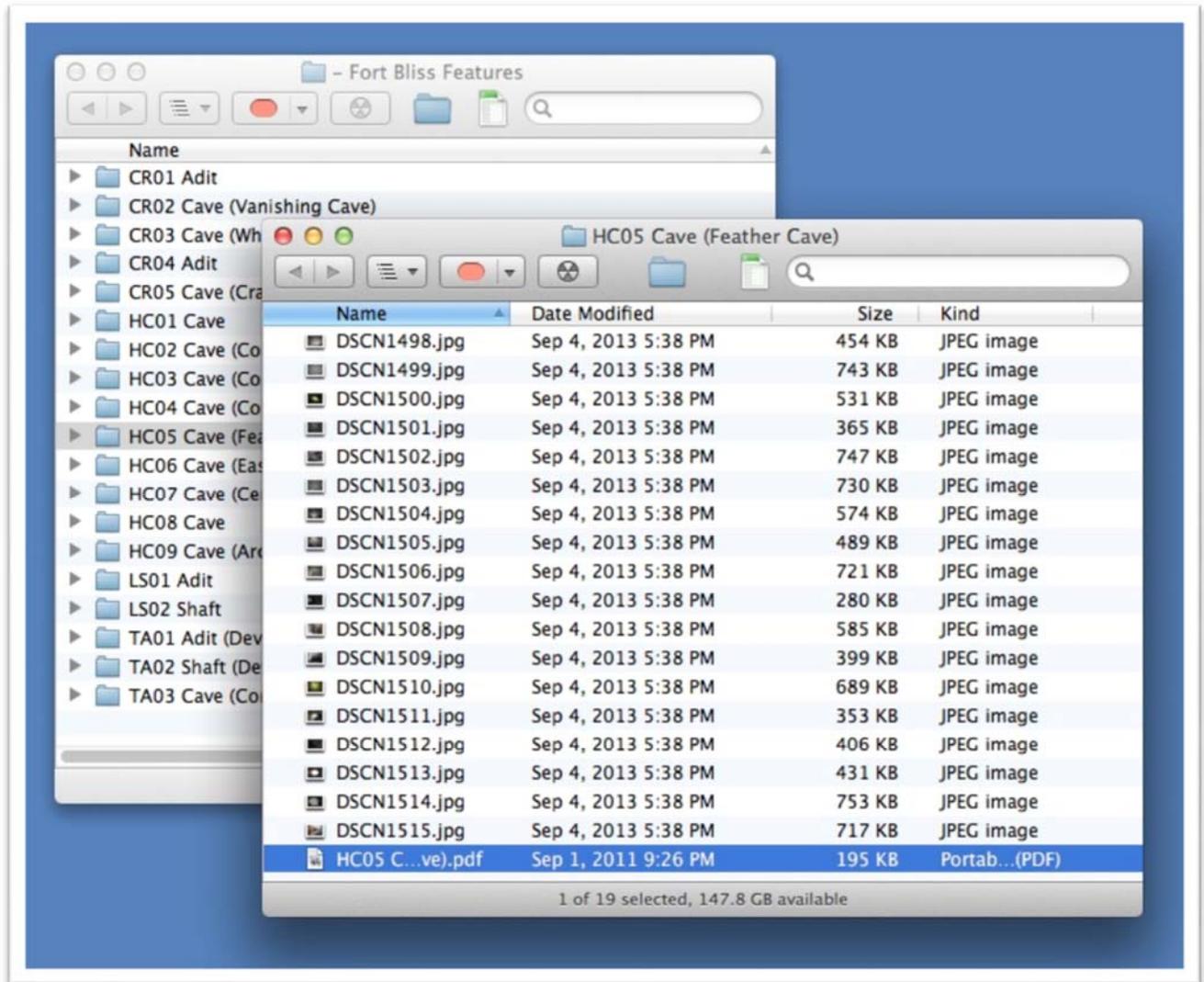
PHOTO 1498 - 1515

*Map of workings on reverse

Scanned on _____ by _____

Example Bat Survey Form from HC05 Cave (Feather Cave).

Reporting work for this project began with entering field data for each site into an Excel spreadsheet. All field GPS locations collected in field GPS units were downloaded into a GIS program. This program was used to create the section maps, and also export the location data into a location Excel spreadsheet appropriate for loading into the Fort Bliss ArcGIS program. Each of the Bat Survey Forms were scanned as pdf files and sorted into a digital folder for each feature site. Digital photos were downloaded from cameras and imported into an image management program. These images were then exported and sorted as individual files into specific site folders. An example of the digital file structure is shown below:



Inventory Form and Digital Photo file structure.

Deliverables with this report include a CD-ROM containing a cave/mine feature database in Excel format, and 19 folders including Bat Survey Forms (pdf) and site photos (jpg).

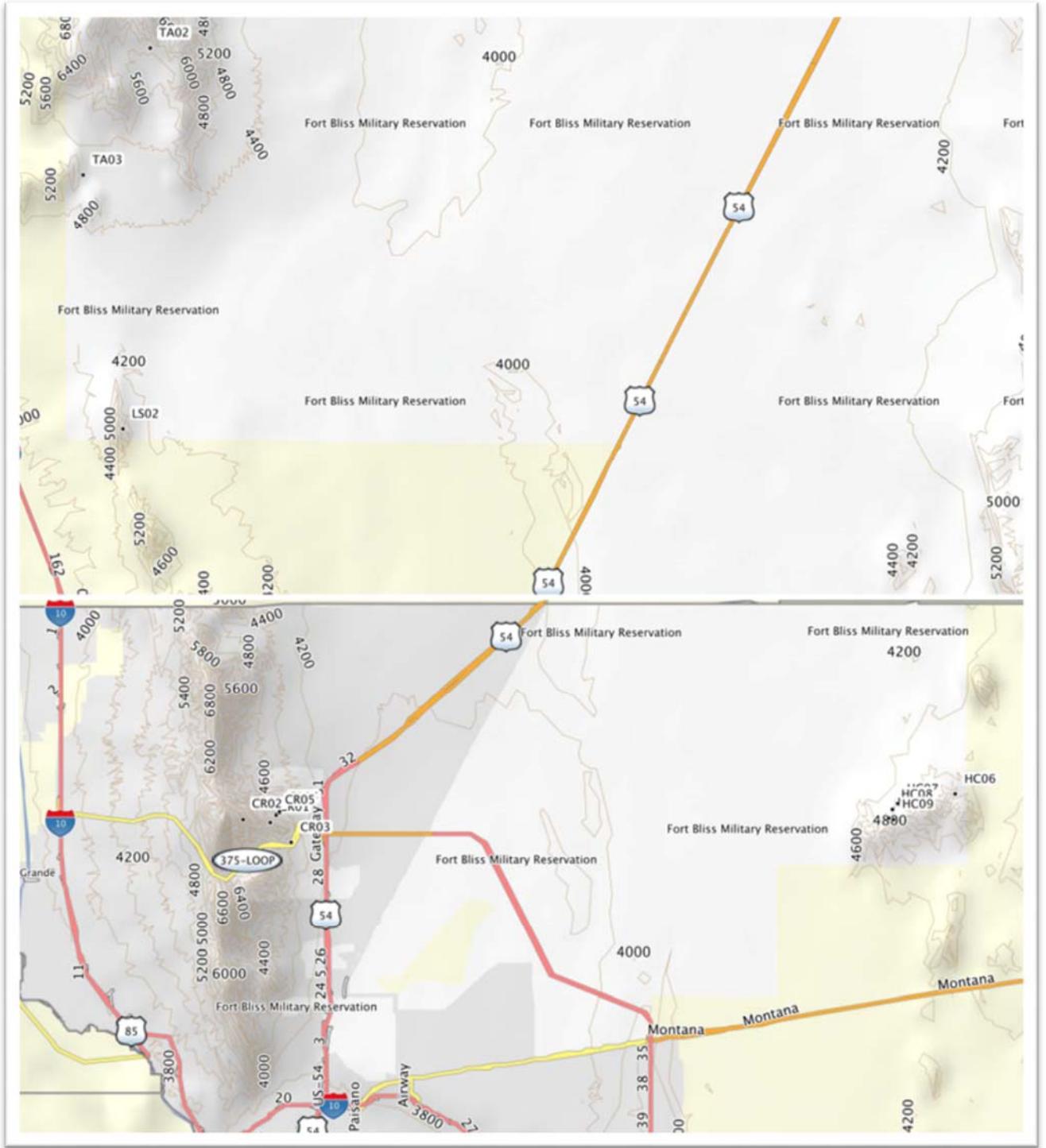
Study Area GIS

Fort Bliss is an Army post that consists of a 1,700 square mile area located in Texas and southern New Mexico. The post is situated in the southern end of the Tularosa Basin that runs north/south between two series of mountain ranges. The post is bounded by White Sands Missile Range on the north, and El Paso on the south, and is mostly located on the basin floor.

The landforms of Fort Bliss consist of typical basin and range morphology that are presented as high mountain ranges separated by low, wide, and flat valleys. Elevations in this region vary from mountain peaks of about 2700 m (8900 ft), to valley floors of about 1200 m (3900 ft). This wide elevation variance results in a large diversity of biota and environmental conditions. From dry desert scrub on the valley floor, to the pine forests of the mountaintops, there exists a wide variety of bat habitat.

The following page contains a map of the study area with black dots marking each of the 19 surveyed caves and abandoned mine sites. Note that this map is scaled to a view that results in many of the location dots overlapping on the map. The northern half of the map is in New Mexico and the southern section is Texas. Many of the mining sites were located in the mountain range, and the caves were in the low hills. The reason for mine locations in the mountains is that the near surface mineralization areas are located in the geologically active zone of uplifting mountains, and that the basin is filled with alluvium material which deeply buries potential mineral deposits. We also found that most mine sites were located at places where the miners would have access, or be able to build roads to their specific mine. If they located valuable ore, they would need to be able to transport this ore from the mine to smelters or other processing sites. The oldest mines might only have mule access along trails, but later or larger mines would need roads to transport their ore.

Most of the caves were grouped together in the low hills of the Huaco Tanks area. These caves have received considerable archaeological study by Cosgrove, and are outlined in his 1947 publication "Caves of the Upper Gila and Hueco Areas in New Mexico and Texas".

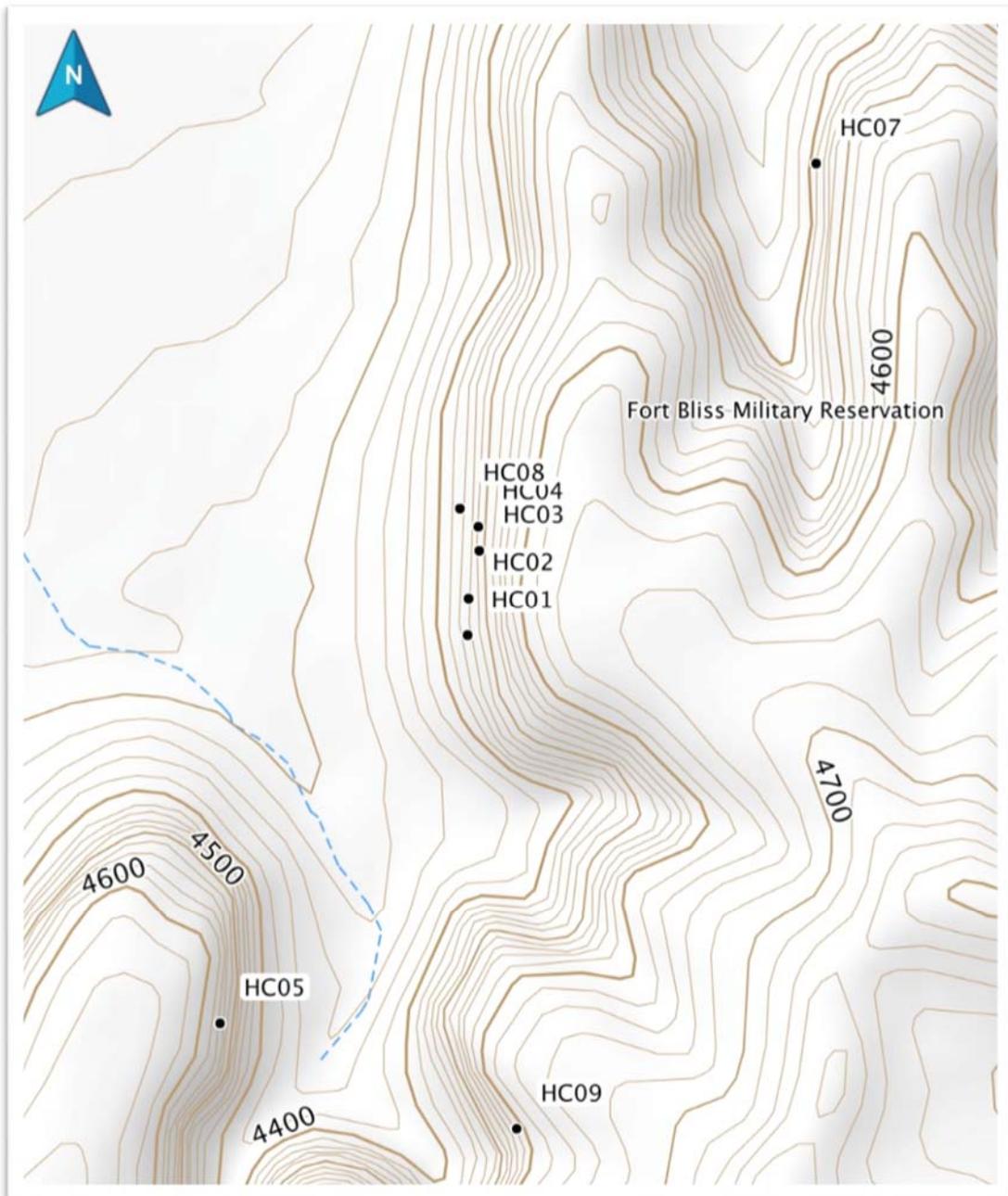


Overview map of the study area.

Mine & Cave Resources with Bat Roosts

Hueco Tanks Area

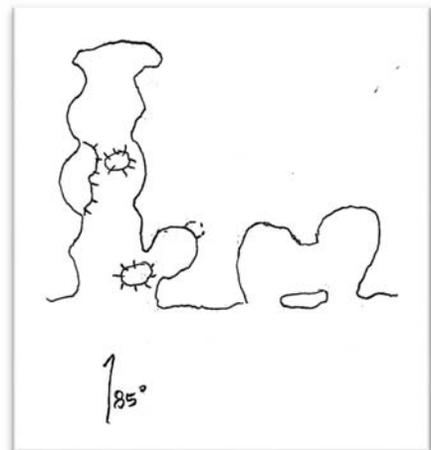
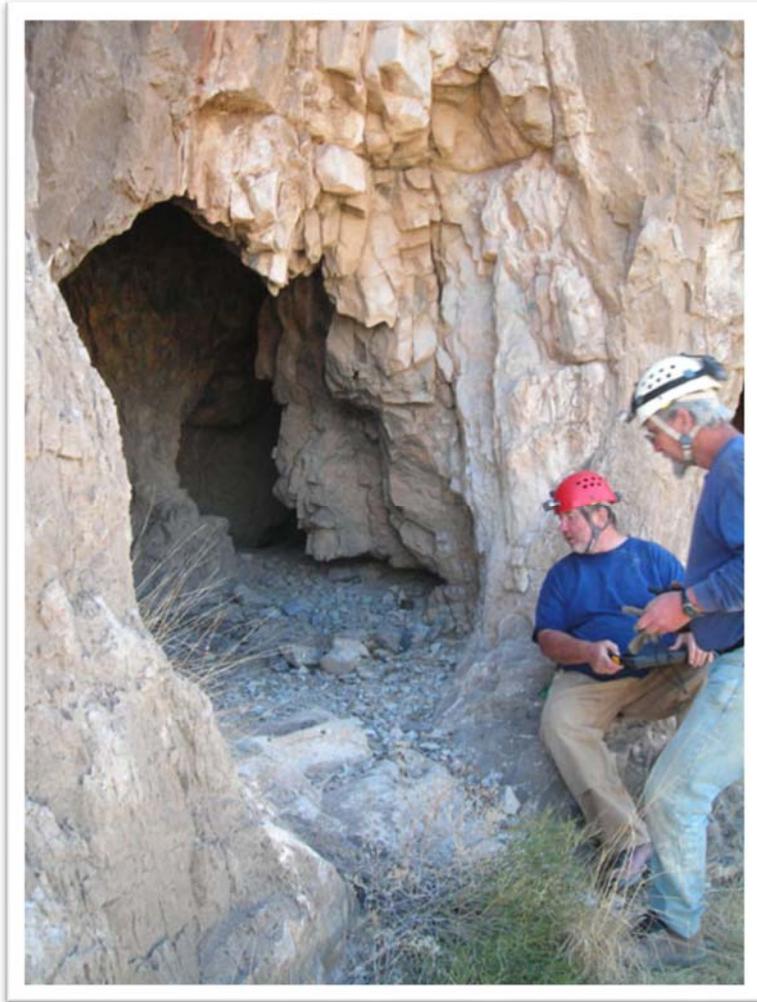
During our survey, we located three cave sites that contained roosting bats, or had sign of previous bat roosts. The cave roosts were located at HC02, HC05, and HC07. These three caves were the only sites on Fort Bliss that we were able to confirm bat usage.



HC02 Cave
Cosgrove Cave 7

Date: 10.17.12
Bat Count: 0

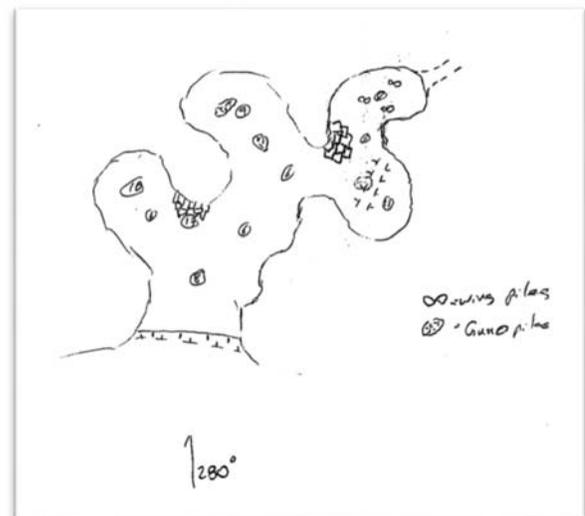
This cave consists of a small linear passage that extends into the cliff face for 44 ft. The cave averages 5 ft in height and 6.5 ft. in width. The ceiling contains several domes that offer excellent habitat for bat roosts. No bats were observed during our survey, but a small pile of guano was noted underneath one of the domes. A single bedrock mortero was noted on the floor of the cave. The photo on the left is the entrance to the cave, and the image on the right is plan view of the layout of the cave.



HC05 Cave
Feather Cave

Date: 10.17.1
Bat Count: 1

Access to this site is via a roped climb to a shelf in the limestone where the cave is located. The cave consists of a series of interconnected rooms that have ceilings festooned with cracks and crevices. The size of the cave is large enough to offer a variety of temperature / humidity micro habitats ideal for bat habitation. A single Townsend's big-eared bat (*Corynorhinus townsendii*) was noted flying in the cave during the survey, but the multiple guano piles and invertebrate parts suggest usage by multiple bats. The upper photo shows moth wings that were dropped from a bat night roost, the lower image is a basic plan sketch of the cave.

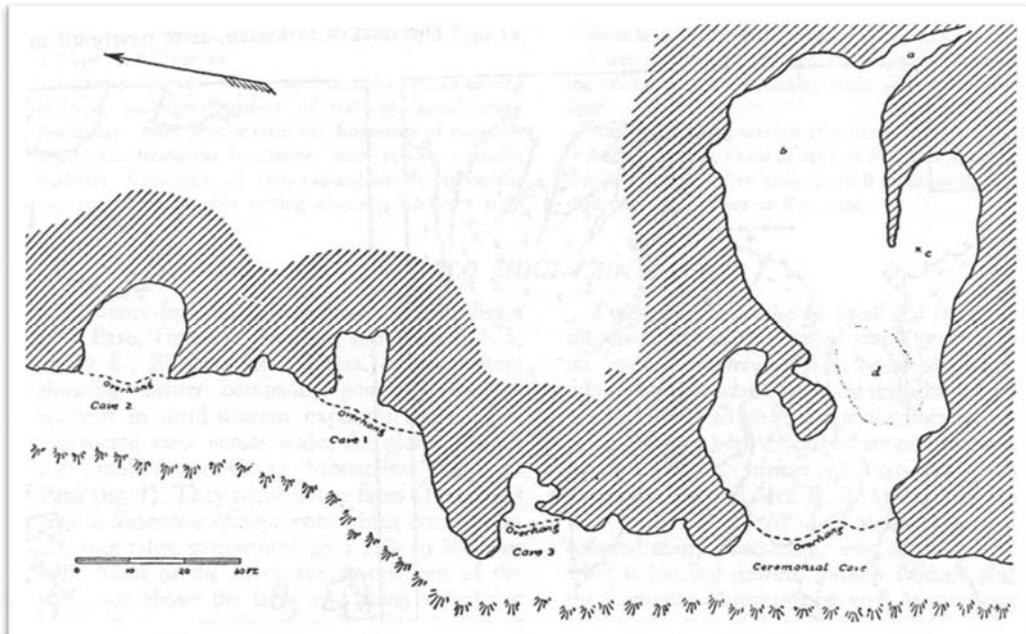
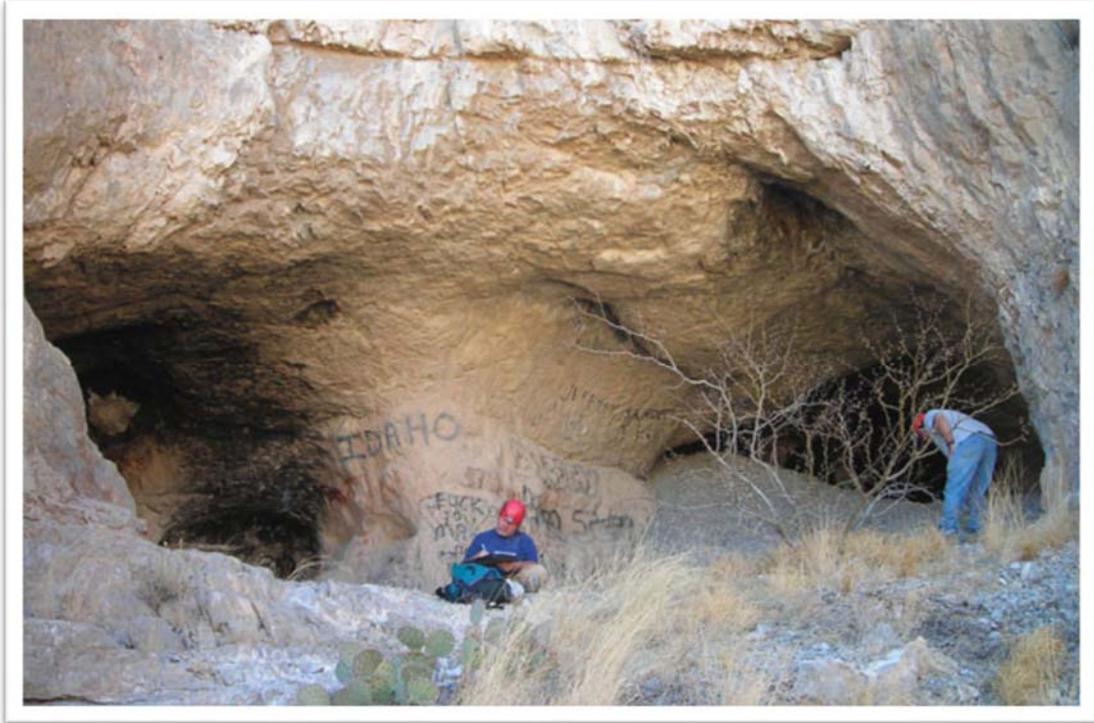


HC07 Cave
Ceremonial Cave

Date: 3.24.11

Bat Count: 1

This cave is major archaeological site that was first studied by C B Cosgrove in 1947. Our survey identified a single Townsend's big-eared bat (*Corynorhinus townsendii*), and noted a single guano pile that would confirm summer roost usage. Ceiling staining and insect parts from feeding bats also signify bat roosting.



Subterranean Biological Resources

During this project, our team inventoried 19 Fort Bliss cave and mine features, including 3 sites with bat usage. Two (2) sites contained bats during specific site surveys. Following is a list of the positive bat usage sites:

Site	Feature Name	Type	Elevation	Roost Type	Bats Count	Species Count	Date
Fort Bliss	HC02 Cave (Cosgrove Cave 7)	Cave	4465 ft	Summer Roost	0	-	10/17/12
Fort Bliss	HC05 Cave (Feather Cave)	Cave	4521 ft	Winter Hibernaculum	1	1 <i>Corynorhinus townsendii</i>	10/17/12
Fort Bliss	HC07 Cave (Ceremonial Cave)	Cave	4422 ft	Winter Hibernaculum	1	1 <i>Corynorhinus townsendii</i>	3/24/11

Note that all sites that have bat usage were natural caves, and none of the mining adits and shafts showed any bat sign. The only species we noted was the *Corynorhinus townsendii* (Townsend's big-eared bat). This species of bat is commonly found roosting in the caves and mines of the desert southwest. It is common to find this species roosting singly, often with a single bat per feature. A cluster of *Corynorhinus townsendii* is normally associated with a maternity colony, but no such occurrence of this was noted during our survey. The elevation of the roost sites are all located at expected elevations common to *Corynorhinus townsendii*.



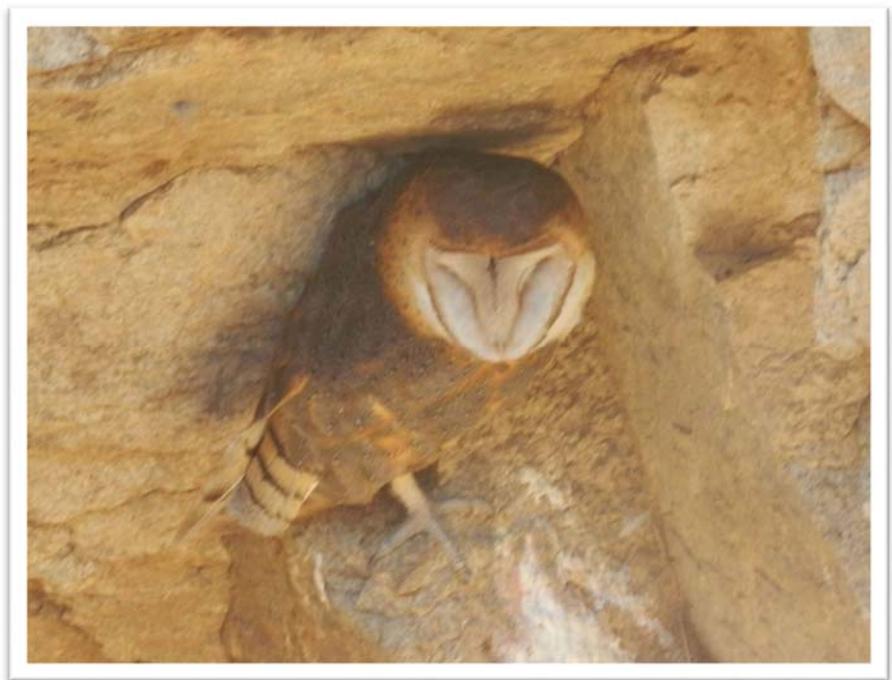
Townsend's big-eared bat
(*Corynorhinus townsendii*)

Other Vertebrate Species

While conducting field surveys of the mines and other subterranean features, our team encountered a variety of animals or animal sign using these sites. Following is a list of the most common non-bat vertebrates that we directly observed, or noticed sign of in the caves and mines.

Barn Owl
(*Tyto alba*)

Often vertical shafts would contain Barn Owl roosts, and our team found many instances of owl eggs at the very bottom of these shafts. Bats are rarely found in sites with Barn Owls as clearly owl predation influences bat roost site selection.



Turkey Vulture
(*Cathartes aura*)

These large birds often nest in caves and mines and our team would often find the large speckled eggs of this species. The adult birds will normally fly away on approaching a mine feature. Note that this species will vomit as a defense mechanism, so field surveyors should give these birds a wide berth.

Black-tailed
Rattlesnake
(*Crotalus molossus*)

This species is fairly common to many caves mines of the southwest. If the mine is cool and the snake is given a wide berth, this species will not even rattle its tail as you pass the snake.



Western Diamond-
backed Rattlesnake
(*Crotalus atrox*)

Another common rattlesnake found in mine and caves.

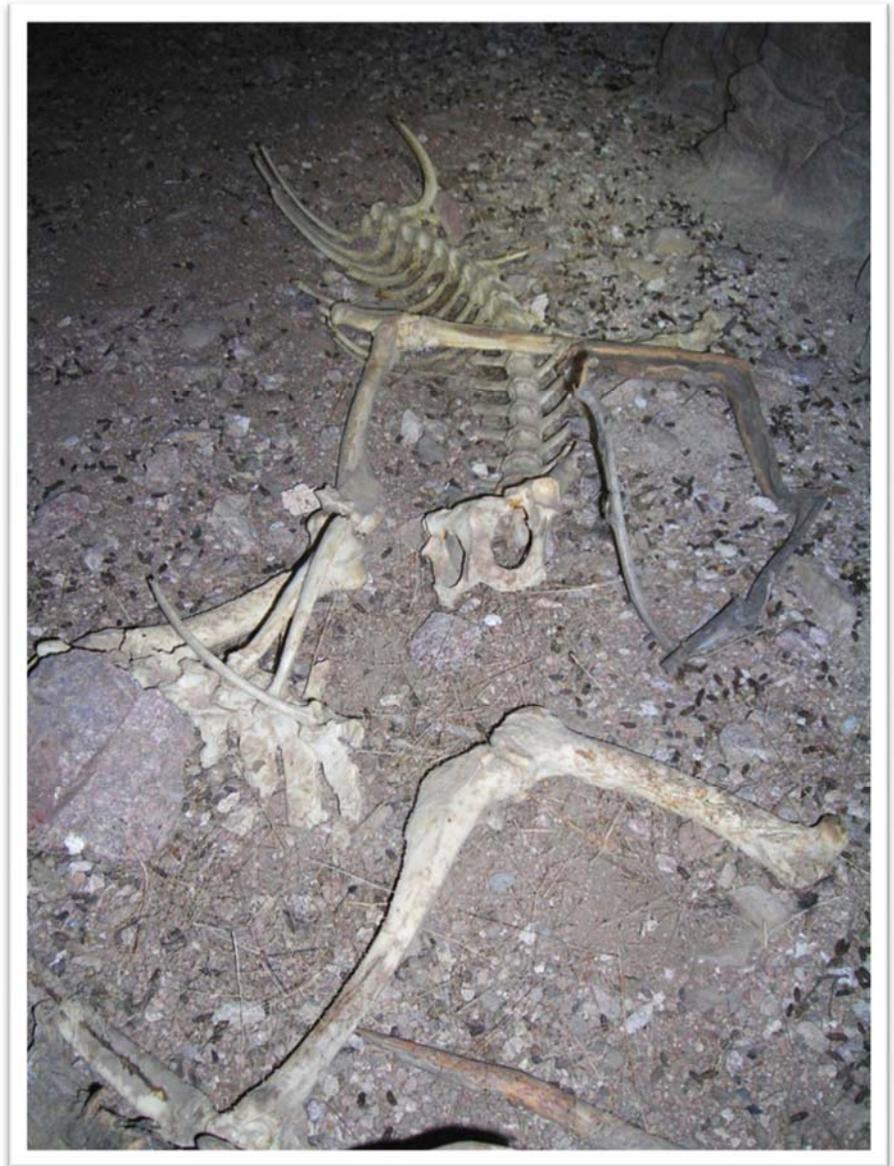


Mountain Lion
(*Felis concolor*)

Mountain lion track and scat are often found in the caves and mines of the SW. Our survey team has encountered mountain lions at subterranean features on two separate occasions.

Mule Deer
(*Odocoileus hemionus*)

Mule deer remains are often found in cave and mine sites normally as kill remains from mountain lions, but sometimes as victims of falling down mine shafts.



Oryx
(*Oryx gazelle*)

This African ungulate is an odd species to observe in the desert southwest, and we have found them shading in multiple underground sites in the area.



Ringtail Cat
(*Bassariscus astutus*)

Many of the caves and mine features of Fort Bliss contain Ringtail scat, but it is rare to see this animal due to their elusive behavior.



Pack Rat
(*Neotoma species?*)

Pack Rats or Wood Rats are very common in the mines, but they are rarely seen. Their fur nests can be found in most mines, as well as their stick middens, urine trails, and extensive amounts of scat.



Mouse
(*Peromyscus species?*)

Mice are also very common in mines, but also rarely seen. Their scat is very similar in size to bat guano, but can easily be tested via the “crush test”. Squeeze a small pellet between your fingers and if it does not crush it is probably mouse scat. If it crushes easily and sparkles of insect parts, it is bat guano.

A variety of other vertebrates certainly use the mines as is evident from their sign (scat, hair, nests, etc.), but were not physically identified during our survey. Peccary or Javelina (*Pecari tajacu*), Grey Fox (*Urocyon cinereoagenteus*), and Bobcat (*Lynx rufus*) sign were all noted at Fort Bliss caves and mines.

Management Recommendations

Bat Habitat Protection

Many caves and mines offer important biologic habitat to bats, as well as owls, vultures, javelina and a variety of other wildlife. Choosing the correct management plan for these unique sites should be undertaken from a broad wildlife usage perspective. During our survey we located only two caves that had confirmed bat usage. These sites were fairly remote and one of the caves was further protected by its inaccessible location high on a cliff shelf. Both sites had small quantities of bats and no evidence of being a sensitive bat habitat site such as a maternity colony, or large winter hibernaculum. It is our opinion that these sites do not justify additional protections than those that are already in place such as managed access and protection under the Federal Cave Resources Protection Act of 1988. Caves should be closed for recreational purposes and basically left as-is.

Safety Closures

During the course of this survey project our team located two shafts that would be appropriate for fencing. Shafts are the most common feature to close due to fall hazard, but these two sites were very remote and most likely have little traffic to warrant the cost of a hard closure such as gating. The best option is to fence and sign each shaft.

LS02 Shaft This bald vertical shaft that descends 40 ft. to a short drift. There is no sign of bat usage at this site, and only a large 4.5 ft. western diamondback rattlesnake was noted at the bottom of the pit.

TA02 Shaft Known as Devils Canyon mine, this bald and blind shaft drops 20 feet to a decline section of passage. This site has no bat usage.



Future Site Monitoring

The limited access of Fort Bliss, and the remote locations of the few bat roosts provide strong habitat protection. Though the bat resources are small, the sites are interesting enough to warrant on-going monitoring. A main focus of this project was to locate all bat roosts and to establish baseline data for these important wildlife resource sites. During our survey of 19 sites on Fort Bliss, our team located 3 sites that had sign of bat usage, and 2 sites that had bats present. Future monitoring of these 3 sites during winter and summer periods would provide useful data in roost usage. A more detailed study of these roost sites would include long-term studies of summer and winter usage patterns.

White-nose syndrome (WNS) is a fungal infection that has killed upwards of 6.7 million bats in the eastern states. This fungus (*Pseudogymnoascus destructans*) is the cause of WNS and has been spreading westward through winter hibernaculum bat roost sites. Fortunately, WNS has only spread westward as far as Missouri. With the western migration of WNS it would be prudent to monitor the higher elevation winter bat hibernation sites that fall into the favored temperature ranges of the fungus.

Site Access Safety

All abandoned mines should be approached as being unsafe, and most federal and state agencies manage these features as being closed to entry. The common signage on many sites states, "Stay Out, Stay Alive!" but with proper training, equipment, and experience we feel that some abandoned mines can be entered safely. Our team has completed extensive underground training classes and specialized certifications, and we have safely conducted subterranean surveys of thousands of mines and caves. During our survey at Fort Bliss we noted some site-specific risks that are outlined below. Note that this list is not inclusive of all Abandoned Mine Lands (AML) safety issues, and anyone visiting these sites should also review the AML Safety Protocols that were submitted at the beginning of this project, as well as other mine safety sources.

Physical Risks

1. Is the mine site clear of unexploded ordnance (EOD)?
The fact that Fort Bliss is a military fort that has been active for over 50 years has resulted in unexploded ordnance spread throughout the entire fort. Many of the AML sites are in very remote locations that have not been cleared of possible unexploded ordnance. Survey teams must stay vigilant when traveling to these remote sites, and view any unknown manmade object as a potential bomb instead of some odd mining artifact.

2. Is the mine shoring and timbering strong enough make the mine safe to enter?
Note that most of the mines at Fort Bliss are from 70 to 120 years old. This means that most of the wooden shoring, timbering, and collar are of rotten wood that has little if any structural strength. If a miner installed shoring 50 years ago when they built the mine, this is a sign that they had ground control issues at that time. Current conditions should be assumed to be worse.
3. If a mine has no wooden shoring and is dug in hard rock, will it be safe to enter?
Many mines at Fort Bliss are dug in hard rock and may be stable for entry. If a mine has no spalling and the floor is clear from rockfall after 50 years, this mine is more stable for access than the mine with wooden timbering.
4. Does the mine have bad air?
During our survey at Fort Bliss we did not encounter any sites with bad air. It is very important that any team entering a mine have a working gas detector to measure at minimum oxygen, carbon monoxide, and hydrogen sulfide. Our team used a MSA Altair 4X Multigas Detector for our surveys. Also note that a gas detector does not identify every dangerous gas, so the survey team should also be aware of their own physiology and be ready to retreat from a site if they notice any problems.
5. Is the mine site safe from weather events?
Many of the Fort Bliss mine sites are located in steep and remote canyons. During one of our site surveys our team endured a flash flood that had traveled many miles through a steep canyon. This rain deluge had happened out of view on the other side of the mountain range, therefore our team did not notice the storm until we heard the boom of the rushing stream.

Biologic Risks

1. Did the site have a killer bee nest at the entrance?
By quietly approaching a site, a surveyor can look for bees flying in and out of the site. Normally beehives will be in cracks along vertical cliff faces, but our team has also observed hives a short distance into vertical shafts. The hives will be within daylight, but shelter under the dripline to protect from rain. Bees defending a hive will fly into surveyors and bump them before stinging ensues. Once a surveyor has been stung they now carry the pheromone that will draw other stinging bees from the hive.
2. Are rattlesnakes present at the site?
Rattlesnakes are common at abandoned mines and are usually found within 100 feet of a mine entrance, but often very near to the entrance. Rattlesnakes have a keen sense to vibrations, so stomping on the ground near an entrance will often trigger the telltale rattle of these snakes.

3. Are mountain lions present at the site?
Lion tracks, scat and deer kills are evidence of periodic usage of mines by mountain lions. Some mines contain flooded passages that offer an ideal water source for these large predators and other animals. Our team has had two encounters with mountain lions at caves and mines.

4. Are other large mammals present at the site?
Fort Bliss has oryx who occasionally seek out caves and mine adits for shade. Our team has experienced two occasions where a charging oryx has exited a mine as the survey team has approached the entrance. Other animal encounters to be wary of are javelina, bears, and vultures. Note that the turkey vulture species will vomit on the survey team as a defense mechanism.

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