Bats Associated with Inactive Mine Features in Southeastern Arizona

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Background - Laws and Regulations

Bats in Arizona, and 26 other states, protected by state and federal laws and regulations

- Endangered Species Act
- Federal land management agencies sensitive bat species
- Arizona

Photo credit: Matt Villaneva, SWCA

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Background - Status of Bats

- Bat populations declining worldwide
- Challenges to bat conservation
- Bats frequently overlooked or ignored
- Few publications on mammals, especially bats, in Arizona

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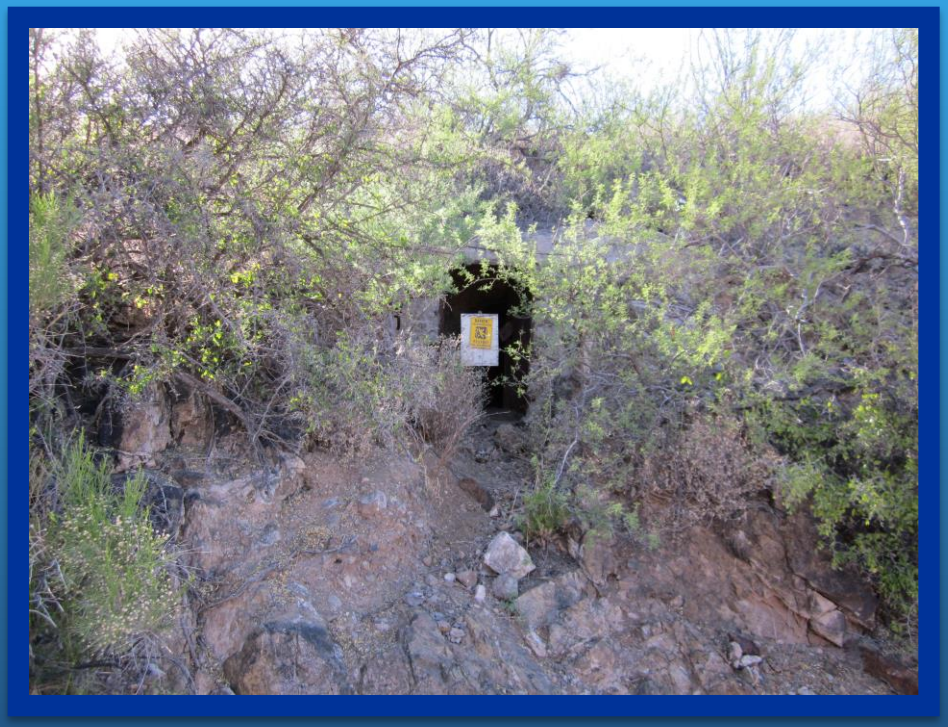
Background - Bat Habitat in the Southwest



- Essential habitat components
- 19 of the 28 bat species in Arizona known to roost in mines

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Bats That Rely on Inactive Mine Features in Arizona

- Lesser long-nosed bat (*Leptonycteris Curasoae yerbabuenae)*
- Cave myotis (*Myotis velifer*)
- Yuma myotis (*Myotis yumanensis*)
- Big brown bat *(Eptesicus fuscus*)
- Pallid bat (*Antrozous pallidus*)
- Townsend's big-eared bat (*Corynorhinus townsendii*)

Photo credit: John Durham, SWCA

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Bats That Rely on Inactive Mine Features in Arizona (cont'd)

MEXICAN FREE-TAILED BAT

- Allen's big-eared bat (*Idionycteris phyllotis*)
- Mexican long-tongued bat (*Choeronycteris mexicana*)
- Mexican free-tailed bat (*Tadarida brasiliensis*)
- California leaf-nosed bat (*Macrotus californicus*)

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Other Bats that May Roost in Mines in Arizona

- California myotis (*Myotis californicus*)
- Western small-footed myotis (*Myotis ciliolabrum*)
- Fringed myotis (*Myotis thysanodes*)
- Long-legged myotis (*Myotis volans*)
- Canyon bat (*Parastrellus hesperus*)
- Ghost-faced bat (*Mormoops megalophylla*)

CANYON BAT

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Threats to Mine-Roosting Bats

- Roost disturbance and destruction
  - Can be devastating
  - Has led to loss of maternity colonies and population declines
- Loss of foraging areas and adequate water resources

BCI workshop, May 2012

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Introduction and Analysis Area

Purpose of study

- Conduct baseline study to determine use of analysis area by bats as part of long-range planning effort

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Introduction and Analysis Area

- Privately owned and Bureau of Land Management (BLM)-administered lands in Pima County, Arizona
- Semidesert Grassland and Arizona Upland subdivision of Sonoran Desertscrub biotic communities
- Elevations 3,400 to 3,800 feet above mean sea level
- Santa Cruz River Valley

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Methods

- External surveys vs. internal surveys
  - External – bats usually emerge nightly to feed
  - Internal – can determine past and current use

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Methods - External Surveys

Two primary reasons for conducting external surveys

1. Human safety
2. Bat health

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Methods - External Surveys

Completed assessment with passive external portal survey techniques

- Pre-survey screening
- Acoustic surveys
- Visual surveys

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Methods - External Pre-Screening Surveys

- External pre-screening surveys of 60 inactive mine features in March 2012

- Mine features had
  - low potential
  - moderate potential
  - presence of bats

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Methods - External Pre-Screening Surveys

- 23 sites determined to have a moderate potential for bats, or presence of bats was confirmed
- Remaining 37 sites determined to have low to no potential to serve as bat roosts

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Methods - Timing and Frequency of Acoustic and Visual Surveys

- Mine sites may be used by bats at different times of year based on biological requirements of different bat species
- Several factors can affect bat activity
- Surveys conducted at different times of year to adequately evaluate potential for a inactive mine to provide roosting habitat for various species of bats:
  - spring
  - summer
  - fall

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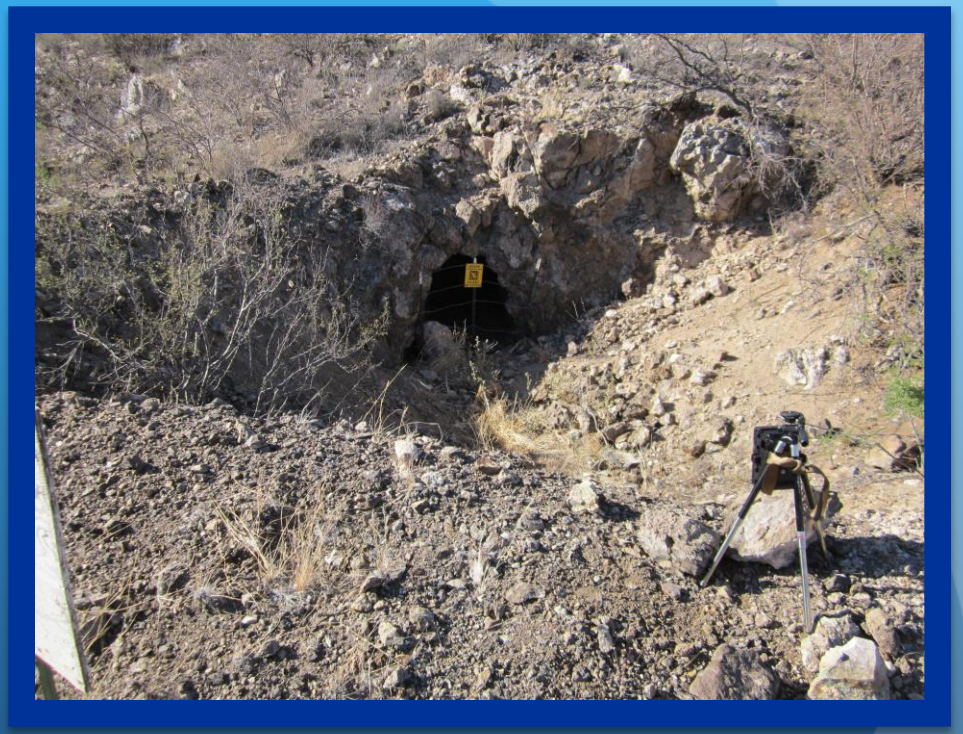
Methods - Acoustic Surveys

- Completed acoustic surveys using AnaBat acoustic detectors at 23 inactive mine features
- AnaBats deployed at each site before sunset
- Each detector programmed to run from 0.5 hour before sunset to 2 hours after sunset



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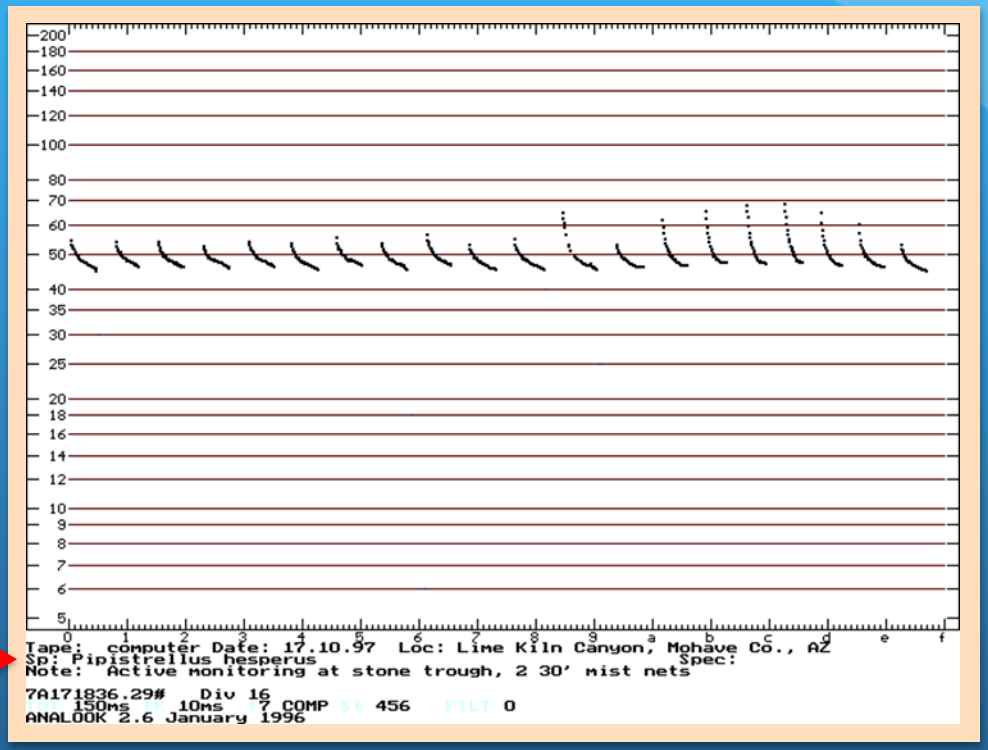
Methods - Acoustic Surveys



- AnaBats collected data files of high-frequency bat echolocation and social calls
- Files downloaded and identified to species

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Methods - Visual Surveys

- Infrared (IR) cameras deployed at each of 23 sites at least twice
- Each site visually monitored by a biologist until dark at least once

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Results - Acoustic Surveys

Table 1. Summary of Acoustic Survey Results

Season	Minutes of Bat Activity	Species Richness*
Spring 2012	355	9
Summer 2012	111	8
Fall 1 (September) 2012	66	8
Fall 2 (October) 2012	78	7
Total	**610**	**10**

* Total does not sum to 10; rather, 10 represents the total number of species identified during the surveys.

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Results - Acoustic Surveys

Table 2. Bat Species Identified through Acoustic Surveys

Scientific Name	Common Name	Species Code	Listing Status	
Family Vespertilionidae			**ESA**	**BLM**
Antrozous pallidus	Pallid bat	ANTPAL		
Corynorhinus townsendii	Townsend's big-eared bat	CORTOW	SC*	S
Eptesicus fuscus	Big brown bat	EPTFUS		
Myotis californicus	California myotis	MYOCAL		
Myotis ciliolabrum	Western small-footed myotis	MYOCIL	SC	
Myotis velifer	Cave myotis	MYOVEL	SC	S
Myotis yumanensis	Yuma myotis	MYOYUM	SC	
Parastrellus hesperus	Canyon bat	PARHES		
Family Mollosidae				
Nyctinomops femorasaccus	Pocketed free-tailed bat	NYCFEM		
Tadarida brasiliensis	Mexican free-tailed bat	TADBRA		

Source: AGFD (2010).

Note: SC = ESA Species of Concern; S = BLM Sensitive Species.

* Pale Townsend's big-eared bat (*Corynorhinus townsendii pallescens*) is SC; however, this subspecies cannot be acoustically differentiated from Townsend's big-eared bat (*C. townsendii*).

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Results - Acoustic Surveys

Table 3. Percent Activity of Bat Species for all Sites by Season

Scientific Name	Common Name	Spring	Summer	Fall (Sept.)	Fall (Oct.)	Total†
Parastrellus hesperus	Canyon bat	22	61	41	50	**35**
Tadarida brasiliensis	Mexican free-tailed bat	31	26	6	6	**24**
Myotis ciliolabrum	Western small-footed myotis	24	0*	23	0*	**17**
Eptesicus fuscus	Big brown bat	15	2	5	0*	**10**
Nyctinomops femorasaccus	Pocketed free-tailed bat	2	3	3	24	**5**
Myotis californicus	California myotis	1	5	12	3	**3**
Corynorhinus townsendii	Townsend's big-eared bat	2	1	8	4	**2**
Myotis velifer	Cave myotis	2	2	0*	5	**2**
Myotis yumanensis	Yuma myotis	0*	0*	0*	8	**1**
Antrozous pallidus	Pallid bat	0*	1	3	0*	**1**

* Accounts for less than 1% of data.

† This column is not the sum of the percent of bat activity per season for each species; rather, it represents the total percent of bat activity during all surveys per species.

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Results - Acoustic Surveys

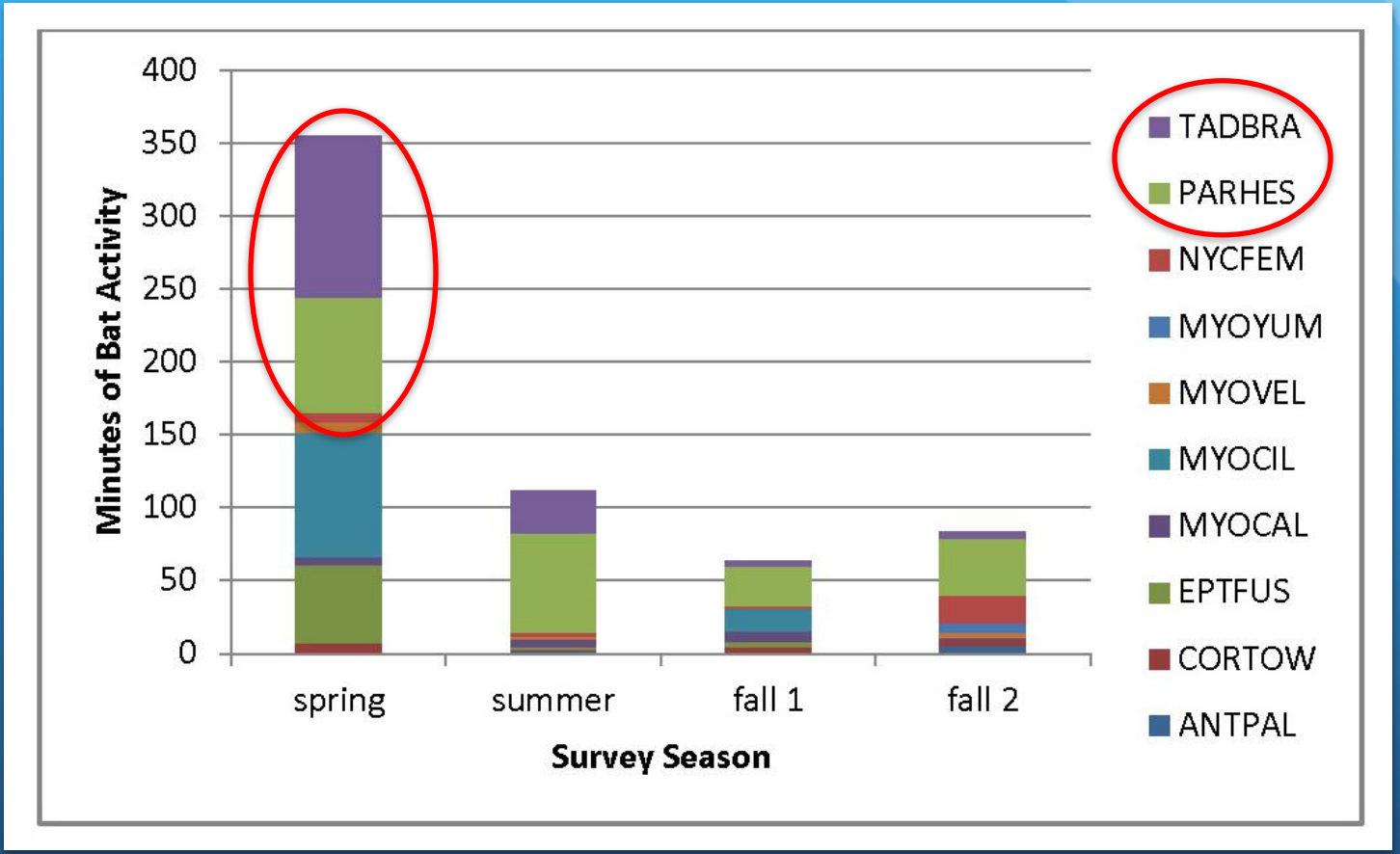

Figure 1. Minutes of bat activity by species in each survey season.

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Results - Acoustic Surveys

Table 4. Percent Bat Activity by Site and Season

Site	Type of Feature	Current Land Ownership	Spring	Summer	Fall (Sept.)	Fall (Oct.)	Total[†]
BLM 482	Adit	BLM	19	14	3	15	**16**
BLM 492	Adit	BLM	8	12	8	13	**9**
HC 1	Shaft	private	13	8	0*	0*	**9**
BLM 483	Shaft	BLM	10	1	6	5	**8**
SM 14	Adit	private	7	1	17	0*	**6**
HC 2	Shaft	BLM	9	0*	5	0*	**6**
State 3[‡]	Shaft	private	1	13	0*	23	**6**
BLM 494	Shaft	BLM	5	3	15	3	**6**
SM 23	Shaft	private	5	5	11	4	**5**
HC 3	Shaft	BLM	6	3	6	3	**5**
HC 6	Shaft	private	2	10	2	1	**3**
SM 15	Shaft	private	4	0*	2	6	**3**
SM 33	Shaft	private	3	4	0*	6	**3**
BLM 486	Adit	BLM	2	8	0*	3	**3**
TB 4	Shaft	private	1	5	9	4	**3**
BLM 496	Shaft	BLM	2	3	2	1	**2**
TB 1[§]	Shaft	private	0*	5	6	1	**2**
BLM 485	Shaft	BLM	1	3	5	1	**2**
SM 18	Shaft	private	1	1	3	3	**2**
TB 5	Shaft	private	0*	3	0*	4	**1**
SM 24	Shaft	private	0*	0*	3	0*	**0***
SM 28	Shaft	private	0*	0*	0*	3	**0***
TB 6	Shaft	private	0*	1	0*	1	**0***

* Accounts for less than 1% of data.

[†] This column is not the sum of the percent of bat activity per season for each site; rather, it represents the total percent of bat activity during all surveys per site.

[‡] This site was owned by the Arizona State Land Department when surveys began in the analysis area, but a private landowner acquired the deed for this area in September 2012.

[§] During the last fall survey at this location, water was noted at the bottom of the shaft, so this site likely did not provide roosting habitat for bats at this time.

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Results - Acoustic Surveys

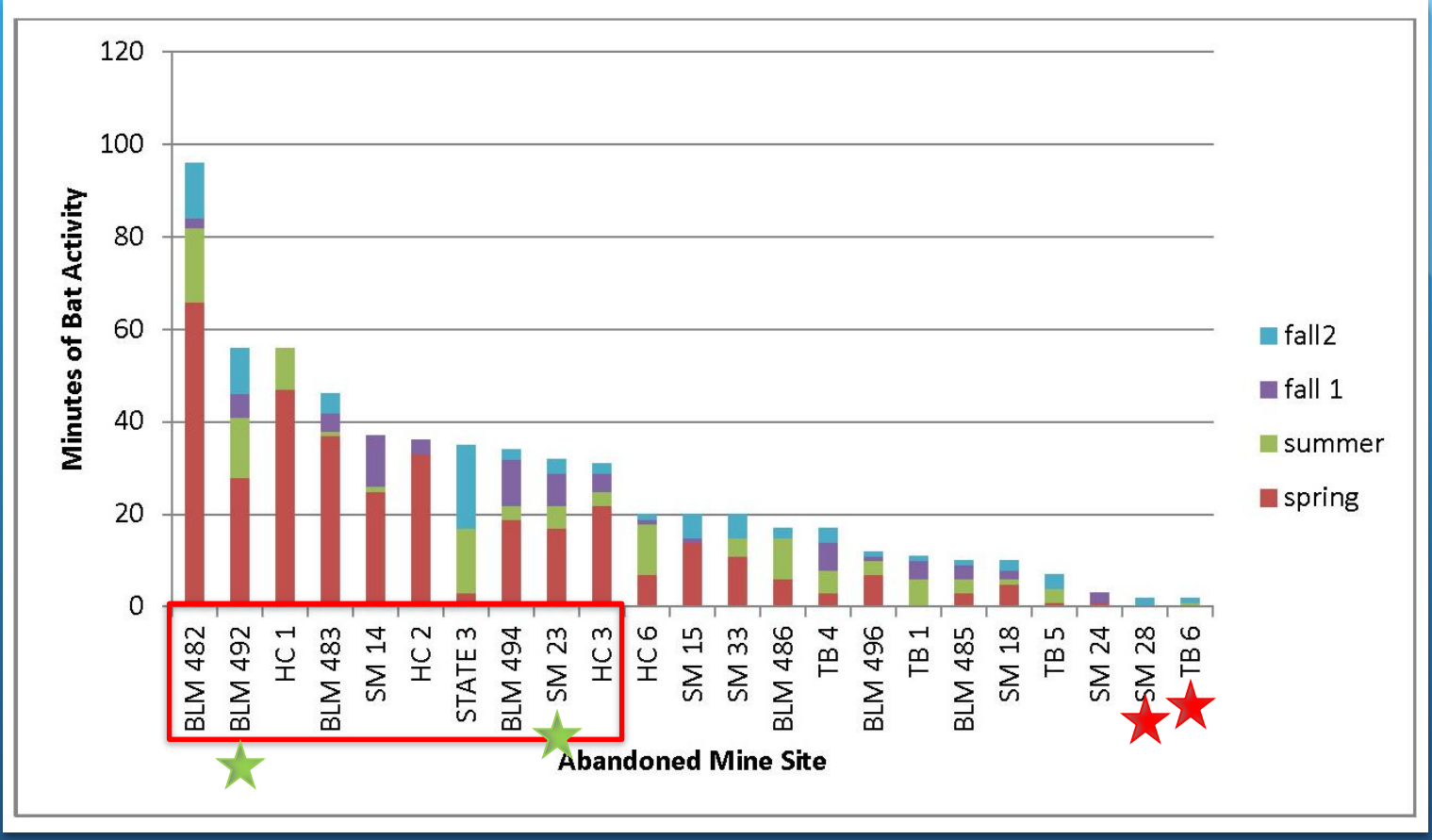

Figure 2. Minutes of bat activity by site in each survey season.

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Results - Acoustic Surveys

PALLID BAT

- No threatened or endangered bat species observed
- Two species identified as species of concern under ESA
- Two BLM-sensitive species
- Remaining six species not afforded any protection by ESA or BLM

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Results - Visual Surveys

- No bats detected in any IR photos or videos
- Only one bat seen exiting an inactive mine feature
- Townsend's big-eared bats seen roosting in two BLM adits during fall
- Other vertebrates and invertebrates also present at several locations

TOWNSEND'S BIG-EARED BAT IN INACTIVE MINE ADIT

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Discussion and Conclusions

- 10 species detected
- Most bat species detected use analysis area as a spring roost during migration
- Ten sites accounted for more than 75% of all bat activity
- Proximity to good foraging habitat may have influenced bat activity

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Discussion and Conclusions

- Canyon bat
  - common in analysis area
  - likely uses analysis area all year
- Mexican free-tailed bat
  - common in analysis area
  - primarily uses analysis area in spring and summer
  - some migrate

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Discussion and Conclusions

- Bat activity detected at all 23 sites
- Likely that many bats detected were using mines
- No information regarding hibernation roosts
- If bats using inactive mine features in 2012, it was likely in small numbers
- Results are a snapshot of bat use in analysis area in 2012

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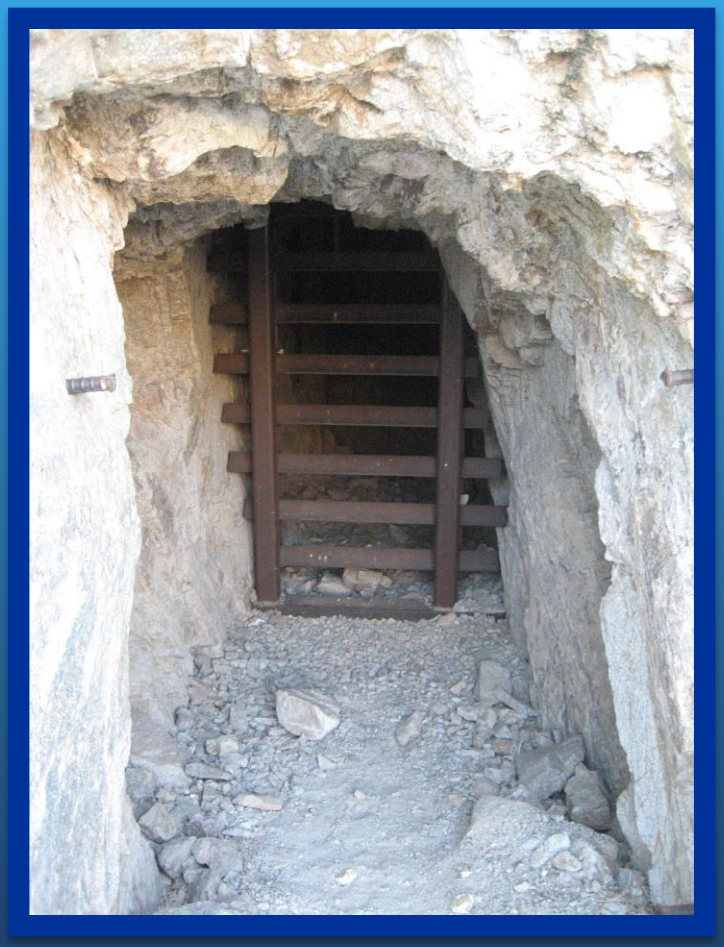
Recommendations



- Timing of reclamation activities or closures
- Perform final assessment of bat presence/absence prior to closures or reclamation activities
- If a maternity roost or hibernacula of bats detected using site, postpone closure

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Photo credit: Jeremy Doschka, SWCA