



Bat Hibernacula Surveys in Craters of the Moon National Monument and Preserve

2015 Status Report

Natural Resource Report NPS/UCBN/NRR—2016/1138



**ON THIS PAGE**

Wildlife Biologist Todd Stefanic exiting West Hidden Cave in February, Craters of the Moon National Monument and Preserve.

Photograph by K.Slocum.

ON THE COVER

Three Townsend's big-eared bats (*Corynorhinus townsendii*) in Arco Tunnel, Craters of the Moon National Monument and Preserve.

Photograph by Allie Konkowski.

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Abstract

Between January and March of 2015, forty-nine of Craters of the Moon National Monument and Preserve's (CRMO) 400+ known caves were surveyed for hibernating bats. This is the third year of annual bat hibernation surveys at CRMO. While only 14 caves (29%) were found to be occupied, 7 were documented as hibernacula for the first time. Thirty-three of the caves visited have been surveyed in previous years. Bats in hibernacula discovered during this season's survey were identified as Townsend's big-eared bats (*Corynorhinus townsendii*), western small-footed myotis (*Myotis ciliolabrum*), and other undifferentiated species of myotis. Temperature and humidity readings were recorded throughout caves and in the immediate space of hibernating bats. We found that Townsend's big-eared bats generally hibernated in areas with significantly lower relative humidity than undifferentiated myotis species ($p = 0.0027$). A new high count of 42 bats was recorded in Arco Tunnel, the longest monitored cave in the monument. The 2015 survey increased the total number of known hibernacula in CRMO from 8 to 17. Acoustic monitors were also deployed to assess the end of hibernation. Two Peterson D500x units were set at the mouths of Nick Cave and Arco Tunnel and the collected audio files show a strong increase in recorded activity starting on April 16th for both caves.

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Photo 1. Wildlife Biologist Todd Stefanic inspects the main intersection of lava tubes in Expedition North Cave (Photo by K. Slocum).

Introduction

Very little is known about where and how many bats hibernate in caves within Craters of the Moon National Monument and Preserve (CRMO). While CRMO has potentially thousands of caves scattered through its vast lava flows, only Arco Tunnel (first documented in 1958) had been verified as a hibernacula and surveyed occasionally prior to 2012. The first record of bats at CRMO is from a 1926 museum specimen, simply labeled as being from “Craters of the Moon National Monument,” and the first hibernating bat was recorded in 1985 in Arco Tunnel (Stefanic 2015). Though nearby locations such as the Idaho National Laboratory (INL) had frequent surveys of well-known hibernacula through the 80s and 90s, there was little impetus to survey bats at CRMO until the devastating spread of the bat fungal disease white-nose syndrome (WNS) stimulated cave surveys for bat use during winter. In 2007 bats were chosen as one of CRMO’s “vital signs,” an indicator of overall ecosystem health by the Upper Columbia Basin Network Inventory and Monitoring Program (I&M; Garrett et al. 2007). CRMO has at least one species, the little brown bat (*M. lucifigus*), which has been confirmed as susceptible to WNS (Blehert et al. 2009). This is the third year of hibernacula surveys, which are intended to give baseline knowledge of what species are present, where they choose to hibernate within the extensive cave environment, and population trends.

Increasing awareness of the threats bat populations face has shown the need for better information and proper management concerning local bat populations in recent years, particularly in the west (Miller 2001, Hendricks 2012, Whiting et al. 2015). Winter hibernation is a critical time for bats; adult mortality is typically very low during winter (Barclay and Harder 2003), and energy savings made during winter enable female bats to raise pups during summer (Adams 2003). Historically, anthropogenic disturbances from recreational cavers and researchers have caused high rates of mortality, though the disturbance to torpid bats may not be immediately apparent (Pierson et al. 1999, USGS). WNS also disrupts the typical schedule of bats’ arousal from torpor, causing starvation and dehydration (Blehert 2012). WNS is anticipated to reach Idaho in the 2020’s (Maher et al. 2012). Additional stress from accelerated climate change is also expected to affect bats across the western US as thermal profiles of caves change (Humphries et al. 2002). Finally, bat populations in southeast Idaho and other areas are seriously threatened by increasing wind-energy development, and mortality rates from wind turbines could already have lasting effects on populations (Kunz et al 2007, Cryan and Barclay 2009). All of these factors pose large threats to CRMO bat populations now and in the coming decades.

In 2012, CRMO and I&M staff visited eight easily accessible caves to pilot test a winter cave survey protocol (Rodhouse et al. *forthcoming*) and to test WNS decontamination procedures (USFWS 2012). In 2013, surveys were conducted in 41 caves after an analysis of documented caves in the database (Stefanic and Rodhouse 2013); many proved to be unsuitable for hibernation. In 2014 surveys were conducted in 34 caves (25 revisits, 9 new caves), which raised the known hibernacula from 4 to 8 (Stefanic and Rodhouse 2014). The 2015 surveys (32 revisits, 17 new caves) further increased that number to 17 known hibernacula, and also located several new caves or new passages of previously documented caves. These efforts have not only expanded the Monument’s knowledge of how bats use CRMO, but also of the cryptic and under-explored landscape. Regular monitoring of

winter cave use by bats will enable CRMO staff to make more informed management decisions, and will contribute to regional knowledge of bat population trends over time. An additional benefit of these surveys is the increase in documentation of CRMO's unique geologic resources.

Study Area

Craters of the Moon National Monument and Preserve is located on the northern edge of the Snake River Plain in south central Idaho and spans portions of Blaine, Butte, Lincoln, Minidoka, and Power counties. It was designated as a national monument in 1924 to preserve the geologically unique and diverse volcanic landscape caused by the Great Rift, a 50-mile long volcanic rift zone formed from crustal extension and decompression melting. The rift is 1-5 miles wide and is expressed as a series of open cracks, fissures, cones, vents, and shield volcanoes, which have formed from periodic eruptions between 15,000 and 2,000 ya. Three distinct lava fields have been created from ~60 flows: Craters of the Moon, Kings Bowl, and the Wapi. The northern terminus of the rift starts about 6 miles into the Pioneer Mountains (7729'), and trends south to below the Wapi (5330'). The Craters of the Moon Lava Field is where all but two caves in the survey were located. Two caves, Expedition North and South, were on the Wapi. The National Park Service manages 465,047 of the 753,334-acre area, which is almost entirely comprised of the three young lava fields. The Bureau of Land Management manages the other 335,000 acres, which is also of volcanic origin, but considerably older and heavily vegetated by sagebrush steppe (National Park Service 2007, Madison et al. 2003). Summers in the region tend to be hot and dry, while the majority of precipitation falls during the cold winters and spring as snow or rain (Genter 1986, Wackenhut 1990).

There are 496 known caves in CRMO, which can be sorted into three types of volcanic caves. Lava tubes created by large pahoehoe flows originating from the rift are the most common. Two have more than a mile of connected passages (Indian Tunnel, Arco Tunnel). All other known lava tube caves are much smaller, usually under 100' total of passage. Blister caves from gas expansion and caves created from differential weathering of cinder layers are also present, but are generally not suitable for hibernation. Large lava tubes from much older volcanic activity are also found in the BLM monument, and nearby on the INL. Many of them contain large hibernation colonies, but they are not included in our study despite inclusion with CRMO caves in past survey efforts (Genter 1986).

Eleven of the 16 bats known to Idaho have been recorded as using the CRMO landscape during the year. Townsend's big-eared bat, long-eared myotis (*M. evotis*), and the western small-footed myotis (*M. cilliolabrum*) are common and also breed within the park. Other bats, such as the fringed myotis (*M. thysanodes*) and the long-legged myotis (*M. volans*) have been documented in the park but there have not been conclusive surveys to determine their residency and abundance.



Caves of Craters of the Moon

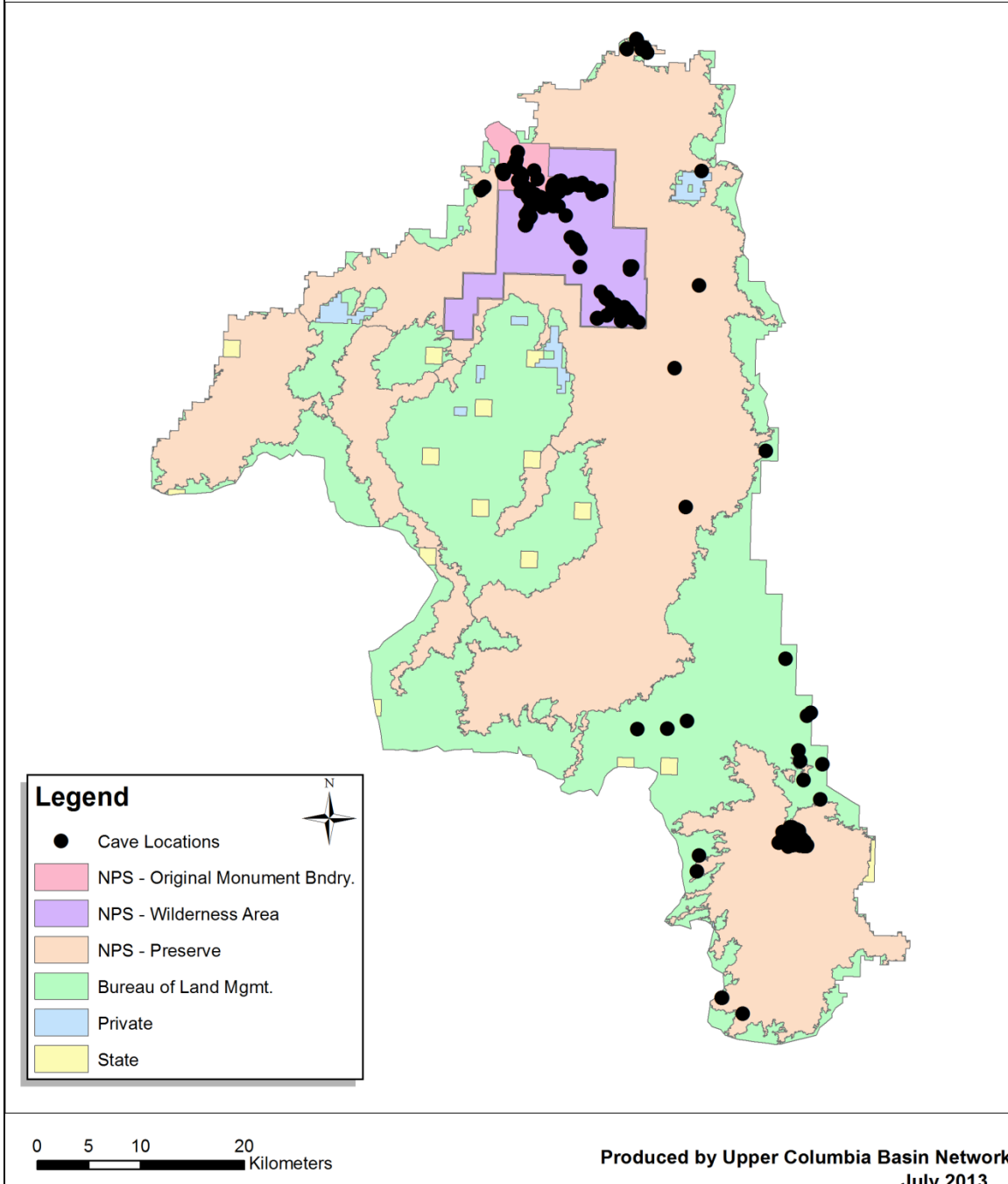


Figure 1. Map of the known caves and land ownership in Craters of the Moon National Monument and Preserve.

Selection of Caves to Survey

There have been relatively few studies on bat ecology at CRMO, and what caves provide suitable habitat during different seasons is not well understood. To select caves to be surveyed, the CRMO cave database and paper files were searched to find caves that might have the necessary elements of proximity, safe access, and suitability for hibernation. Caves that were considered for survey had to be close enough to survey and return to the office within a workday. Caves were excluded if they require specialized skills or equipment for safe entry. This eliminated vast areas of CRMO from consideration as well as known hibernacula on the Wapi Flow, such as South Grotto, Creon's Ice Cave, and Crystal Ice Cave (Earle and Earle 2002) due to their unstable and hazardous pit entrances. All caves surveyed were within 5 miles of the nearest vehicular access.

Cave morphology and environmental characteristics were also considered. Caves needed to be of sufficient length to provide a dark zone (generally not less than 100 feet), with limited skylights. Caves with small entrances or a constriction that separates the interior environment of the cave from outside climate were preferred. Some caves without these features are still surveyed due to their proximity to known/suspected hibernacula. Due to incomplete or inaccurate cave data and maps, some selected caves have proved to be wholly unsuitable for hibernation. Following the recommendation of the 2012-2013 report, caves are surveyed in the summer to determine their suitability for winter bat use before including them in winter survey efforts.

Survey Methods

All surveys were conducted between January 7 and March 13 in 2015. In order to document a cave's microenvironment, caves of sufficient length were divided into zones based on natural divisions in the cave. Air temperature, humidity, and cave ceiling/wall temperature were recorded one to three times per zone. Air temperature and humidity were measured with Kestrel 3000 Pocket Weather Meters. Ceiling/wall temperatures were taken using a UEI INF 156 Infrared thermometer. Temperature and humidity data was not taken if it was deemed to be unsuitable for hibernacula, which was typically due to a lack of dark zone. When bats were found, temperatures were taken as close to the bats as possible without disturbing them.

Each survey was conducted with a crew leader and one or more assistants. Crew leaders were professional wildlife biologists, one of whom has been surveying since 2012. Surveyors used flashlights to locate bats, which were then identified and recorded by the crew leader and assistant, respectively. Bats were not handled during the survey, which limited disturbance but also the accuracy of identifying myotis species. All bats were photographed to aid identification and counting bats in clusters, but some myotis species were still left undifferentiated. This has also been a challenge encountered by similarly designed bat projects elsewhere (Hendricks 2012). It is also assumed that some myotis bats were overlooked due to their selection of small cracks and crevices to hibernate in, making them less visible than Townsend's big-eared bats and easier to miss (Genter 1986, Wackenhut 1990, Whiting et al. 2015). To simplify data visualization in this paper, all myotis species have been labelled by their genus only.

White-nose Syndrome Decontamination

The National White-nose Syndrome Decontamination Protocol version 06.25.2012 (USFWS 2012) was followed with the exception of the requirement to decontaminate after every cave visit. Craters of the Moon has a unique situation where multiple cave entrances can be within very short distances, sometimes within the same breakdown pit. With the high and increasing number of caves surveyed within a season in an extreme and challenging environment, decontamination after every cave visit was seen as excessive and unwarranted. These concerns were discussed on a National WNS conference call when the protocols were initially changed from the 10 mile rule to every cave visit in winter 2012. There were no objections from the USFWS or other biologists to having CRMO modify its decontamination procedures to better suit the environment. Thus, CRMO procedures allow for multiple cave visits without decontamination if the entrances are within a 1 mile radius.

Tyvek suits were used initially in 2012 and 2013, but were abandoned for heavy-duty coveralls in 2014 due to the tight and extremely sharp nature of many caves. Formula 409 All-Purpose Cleaner was used to decontaminate shoes before putting on snowshoes, as snowshoes are neither submersible nor easily wiped down with disinfectant. Other gear brought into the caves was put into a garbage bag until returning to the office where all gear could be properly decontaminated (USFWS 2012, Shelley et al. 2013).

Acoustic Monitoring

Two Petterson D500X units were placed in the field, one at the entrance of Arco Tunnel and one at the entrance of Nick Cave. These sites were chosen because of their relatively easy accessibility and because they were known to contain Townsend's big-eared bats and one or more species of myotis. Nick Cave is also the only cave in the survey that contained only myotis species. The detectors were deployed on March 3 through April 23, and the collected calls were processed and filtered with Sonobat 3.1.4 Great Basin. Species that were identified by the software were tallied if they had a discriminant probability of 0.97 or greater, though were not vetted for further accuracy and cannot be considered as a fully positive identification. All species were crosschecked with the 2006 CRMO mammal inventory, which positively identified bats using mist and harp netting (Madison et al. 2003).

CRMO is also contributing acoustic monitoring data to two regional projects, NABat and the Southeast Idaho Bat Working Group. The pilot survey season was timed in order to capture bat activity after young bats became volant. Four stationary Anabat SD2 devices were deployed in July and August in 10 km² grids that were selected by NABat representatives, based on a sampling pattern of the western US. Monitors were deployed for at least 4 nights, and the data was submitted to the project organizers. Mobile surveys were conducted for the second season for the Southeast Idaho Bat Working group, which conducts monthly driving transects from May through October on ~30 routes throughout SE Idaho. Routes are 40-60 km, and CRMO is responsible for two that pass through the monument. Data was collected and submitted to Becky Abel at the Idaho Department of Fish and Game for analysis. If these surveys continue, the goal would be to detect migratory bats and their possible pathways.

Results

Between January 7 and March 13 forty-nine caves were surveyed. A total of 84 bats were found occupying 14 caves: 58 Townsend's big-eared bats and 26 undifferentiated species of myotis (Table 1). There was not a significant difference in mean air temperature between Townsend's big-eared bats and myotis species ($p=0.31$, Figure 2). However, we found that Townsend's big-eared bats selected significantly less humid locations than myotis species ($p=0.0027$, Figure 3). This is also true for the 2013 and 2014 surveys ($p=0.01631$, $p=0.0009$, Figure 3). Bats were found hibernating individually, except for 12 that were found in 5 clusters. A cluster was defined as bats having physical contact with one another. Four of the 5 clusters were comprised of entirely of myotis species; the last was a cluster of 3 Townsend's big-eared bats.

Table 1. Cave conditions associated with bats found during the 2015 survey season by cave. Abbreviations of scientific names were used (Townsend's big-eared bats: COTO, undifferentiated myotis species: MYSP).

Cave Name	Bat Species	# of bats	Temp (°C)	Rel. Hum.(%)	Bats found within light zone
Arco Tunnel	COTO	24	-2 to 1.3	74.2 - 92.9	0
	MYSP	18	3.6 - 6.6	72 - 87.3	0
Bloody Knees	COTO	6	5.5	70	6 (COTO)
Expedition Cave (South)	COTO	5	5.1 - 6.2	84 - 88.1	0
	MYCI	1	6	79.6	0
First Chance	COTO	1	2.6	86	1 (COTO)
Indian Tunnel	MYSP	1	-1.4	78	1 (MYCI)
Lava River	COTO	1	4.8	61	0
Low Tide Cave	COTO	1	8.9	59.1	1 (COTO)
Needles Cave	COTO	6	2.3 - 5.5	Malfunctioning Kestrel Unit	1 (COTO)
	MYSP	1	5.8		0
Nick Cave	MYSP	5	2.7	72.7	0
One More Chance	COTO	2	3	57.4	0
Rio Grand	COTO	4	2.8-5.2	52 - 56	0
Screaming Jaws of Death	COTO	1 (flying)	11.1	67	1 (COTO)
Two-Step	COTO	1	6.8	66.8	0
Wile E. Coyote	COTO	6	3	60	2 (COTO)

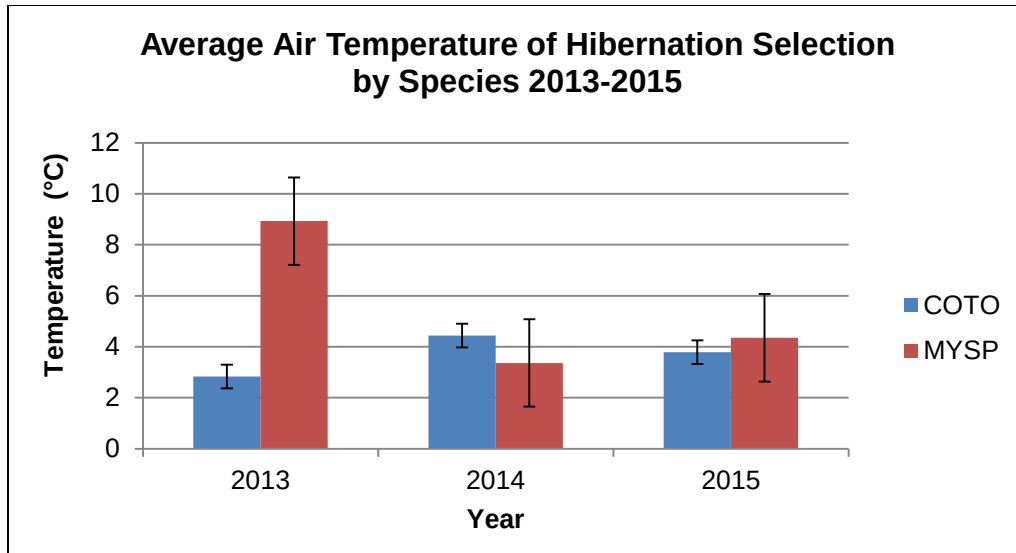


Figure 2. Graph showing the average temperature and standard deviation in the immediate space of hibernating bats by species between 2013-2015. No significant differences in temperature selection by species has been observed ($t = -1.00$, $df = 79$, $p = 0.31$).

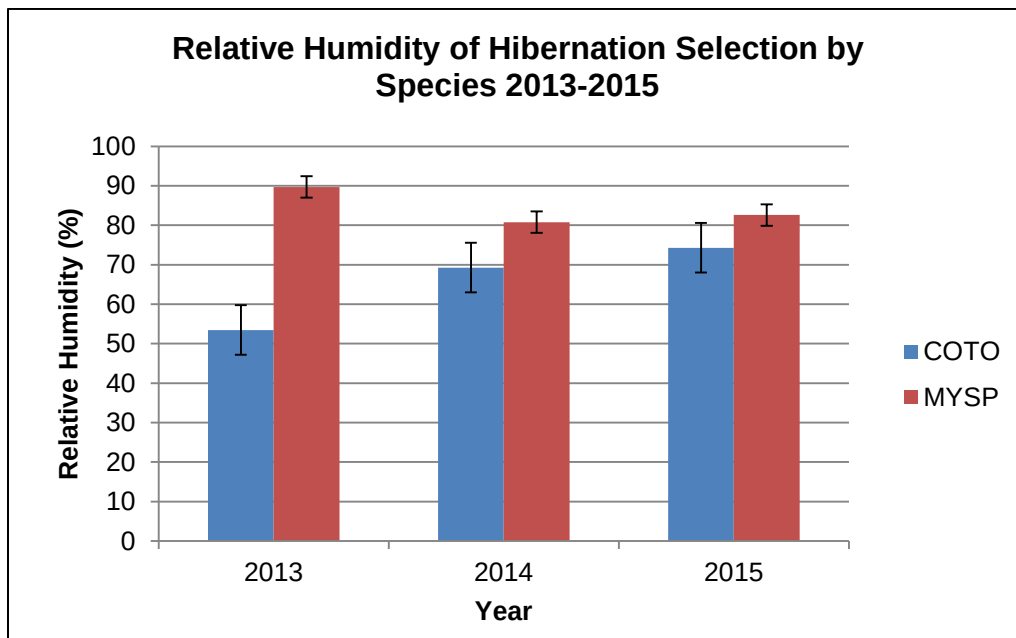


Figure 3. Graph showing average humidity and standard deviation in the immediate space of hibernating bats by species from 2013-2015. The average relative humidity near myotis bats were significantly higher in each year of surveys ($t = -4.895$, $df = 45$, $p = 0.01631$; $t = -3.57$, $df = 3$, $p = 0.0009$; $t = 3.10$, $df = 75$, $p = 0.0027$).

The Petterson D500X devices recorded a total of 24,306 bat calls for Arco Tunnel between April 4 - May 5 after filtration. The monitor recorded 13 calls in total until April 16. Starting on the 16th, the monitor captured 344 calls. The following 13 days captured between ~1,000-5,000 calls per night, with the highest being 5,531 calls on May 3. Species identified by Sonobat were primarily *M. evotis*, *M. ciliolabrum*, *C. townsendii*, and *M. lucifugus*.

There were 1,687 calls recorded between March 27 and April 23 at Nick Cave. Mild activity started on March 27 (1-20 calls/night). There were 55 calls recorded on April 16, with a steady increase in calls per night through April 23. The most active night recorded was 449 calls on April 22. Species identified by Sonobat were primarily *M. thysanodes*, *M. evotis*, *M. ciliolabrum*, *Eptesicus fuscus*, *C. townsendii*, and *M. volans*.



Photo 2. A hibernating bat in Arco Tunnel that is likely a western small-footed myotis (photo by K.Slocum).

Discussion

From the 2015 season of hibernacula surveys there is evidence of both an increase in surveyor aptitude and better knowledge of hibernating bat behavior at CRMO; the total bats found has increased each year, as well as the percentage of caves surveyed that contain bats (2013: 10%, 2014: 23%, 2015: 29%). For the completely list of caves surveyed see Appendix A. Bats at CRMO were found mostly individually and in relatively small numbers per cave, characteristic of other hibernacula in the west, particularly for Townsend's big-eared bats (Hendricks 2012, Pierson et al. 1999). We found four clusters of myotis bats (2-6 bats/cluster) and only one cluster of 3 Townsend's big-eared bats, despite finding more Townsend's big-eared bats than all myotis species combined. The addition of Nick Cave to the hibernacula surveys is noteworthy because it was populated by several myotis species during the 2015 survey season; no other cave to date has contained multiple myotis bats without the presence of Townsend's big-eared bats. If Nick Cave's populations remain consistent for future surveys, continued monitoring may help determine what characteristics make this cave more preferable to myotis species than Townsend's big-eared bats.

While there have been different standards for temperature and humidity readings for each of the three years of data, we have observed Townsend's big-eared bats choose relatively less humid locations than myotis bats. This is true for 2013 and 2014 data as well, though humidity readings weren't regularly taken until halfway through the 2014 season. The only other information on humidity and temperature selection of hibernating bats in CRMO is from Genter (1986). Genter's information is from 8 caves on the INL, but also includes the first survey of Arco Tunnel in which he only found 3 western small-footed bats (documented as *M. leibii*, now considered *M. ciliolabrum*). Genter found that western small-footed bats occupied a slightly smaller, but not significantly different range of humidity than Townsend's big-eared bats. Our data show that Townsend's may occupy a wider range of humidity (52-97% for Townsend's, 72-87.3% for myotis bats), but also that the average humidity selected by the species was significantly lower. Genter also found that Townsend's big-eared bats occupied warmer regions of caves than western small-footed bats, but our data on this are still inconclusive on this point. This may be due to differences in surveying methods, or naturally occurring inter-regional differences in hibernacula preference. The typical temperature range of hibernacula on the INL is -1.6°C to 3°C (Whiting 2013, using UEI INF 156 Infrared thermometer). Both CRMO's and INL's lower limits are colder than reported by Perry (2013) for most temperate vespertilionid bats in North America, which select caves with temperatures between 2 and 10 °C. Despite temperature discrepancies, the WNS-causing fungus *Pseudogymnoascus destructans* is known to thrive best between 5°C and 14°C (Blehert et al. 2009) and at relatively high levels of humidity (Grieneisen 2011). Our data preliminarily suggest that CRMO and surrounding cave environments are able to host *P. destructans* and also contain susceptible bat populations.

In 2013 only Kestrel 3000 Pocket Weather meters were employed to collect air temperature, and later humidity. Starting in 2014 CRMO acquired UEI INF 156 Infrared thermometers, which is the sole instrument used in regional surveys done by the INL and Idaho Fish and Game (Whiting 2013). The instant infrared thermometers, which measure surface temperature, were used alongside the Kestrel units in all 2015 surveys. However, there were discrepancies in temperature readings between the

two units, which could be as much as 20°C different when measuring temperature at a single point. At first this was attributed to user error, but studies on Hawaiian basalts have shown that depending on the porosity, amount of fracturing, and the medium that fills cavities, basalt can range from being slightly insulating to being very insulating (Robertson and Peck 1974, Watts 1975), which could explain the gap between air and rock surface temperatures. This property of basalt could potentially influence the suitability of a cave for hibernation, as CRMO has over 60 different basaltic flows with varying physical and compositional characteristics.

Twelve Townsend's big-eared bats and 1 myotis bat were found hibernating within the light or twilight zone of 6 caves (Photo 4, Figure 1). There was not an apparent pattern to this seemingly unfavorable hibernacula selection. It could be that these bats were subjected to the changes in snowpack depth throughout the season. This year at CRMO snow depth varied between 0-30 cm from December through February, and was gone by the 1st of March, well before the assumed end of hibernation. Entrances that were sealed by snow could open during hibernation, potentially changing the cave climate. This, combined with the thermal conductivity differences in CRMO basalts could suggest that CRMO caves have relatively more dynamic and mercurial environmental conditions than caves on the INL and BLM Monument, which could have more stable climates due to the insulation of soil, vegetation, and their large size. These factors could speak to why some CRMO caves have varying occupancy, though studies from the INL shows that cave fidelity could be variable for regional caves as well; Wackenhut found 14-60% of banded Townsend's big-eared bats returned the following winter to their banding cave on the INL, and 11-52% in nearby counties (1990).

Anecdotal reports suggest there may be other large hibernacula in Crystal Ice Cave, South Grotto, and Creon's cave in the King's Bowl complex (Earle and Earle 2002). While these caves have been entered regularly in the last decade for mapping, they have not been surveyed by park staff or affiliates due to remoteness, unstable and frequent rock fall in the rift zone, as well as specialized skills required for entering these caves. There are preliminary plans for them to be acoustically surveyed in the future.



Photo 3. Wildlife biologist Todd Stefanic takes temperature and humidity readings with a Kestrel unit in the immediate space of a hibernating Townsend's big-eared bat in Needles Cave. At that time, the bat was within the light zone, about 6' from the entrance, which is above the snow pile on the left side of the frame.

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Appendix A

Table 2. Comprehensive list of caves surveyed by year, suitability status, and associated species.

Cave	Bats Per Year Surveyed			Suitable for Hibernacula	Species Found
	2013	2014	2015		
Antelope	0			No - too light	
Arched Pit	0			No - too light	
Arco Tunnel	33	38	42	Confirmed	COTO, MYCI, MYYU, MYSP, UNKN
Baker Cave III		3		Possible	
Beauty	2	0	0	Confirmed	COTO
Big Craters Tunnel	0			No - too light	
Bloody Knees	0	0	6	Confirmed	COTO
Boy Scout	0	0	0	Unlikely - too light	
Buffalo Caves		0	0	Possible	
Cathedral	0		0	No - too light	
Chapel	0	0	0	Possible	
Chimney	0	0	0	Possible	
Dewdrop	0			No - too light	
East Hidden		0	0	Possible	
East Teepee	0	0	0	Possible	
Expedition (North)			0	Unlikely- too warm	
Expedition (South)			6	Confirmed	COTO, MYCI
Fire-Ring	0	0	0	Possible	
First Chance	0	1	1	Confirmed	COTO
Fool Killer		0		No - too light	
Freaky Steam			0	Possible	
Girl Scout	0			No - too light	
Green Crystal	0			No - too light	

Table 2 (continued). Comprehensive list of caves surveyed by year, suitability status, and associated species.

Cave	Bats Per Year Surveyed			Suitable for Hibernacula	Species Found
	2013	2014	2015		
Guano		0	0	Possible	
Hidden	0	0	0	Possible	
Hidden II	0	0	0	Unlikely- too light	
Hornito Cone Moat		0	0	Unlikely - to light	
Ice Lake	0	1	0	Confirmed	MYSP
Incognito			0	Possible	
Indian Tunnel (west passage)	0	0	1	Confirmed	MYCI
Karate	0			No - too light	
Lariat	6			Confirmed	COTO
Last Chance	0	0	0	Possible	
Lava River			1	Confirmed	COTO
Lava River Natural Bridge	0	0	0	Possible	
Lobe 1	0			No- too light	
Lobe 2	0			No- too light	
Lost Light			0	Possible	
Low Bridge Tunnel			0	Possible	
Low Tide	0	2	1	Confirmed	COTO, MYCI
Needles	1	3	7	Confirmed	COTO, MYCI
Nick Cave			5	Confirmed	MYSP
One More Chance	2	1	2	Confirmed	COTO
Open Dome	0	0	0	Unlikely – too light	
Painful Snack			0	Possible	
Pond				No - too light	

Table 2 (continued). Comprehensive list of caves surveyed by year, suitability status, and associated species.

Cave	Bats Per Year Surveyed			Suitable for Hibernacula	Species Found
	2013	2014	2015		
Prickly Pear	0			Unlikely – too light	
Rio Grande		4	4	Confirmed	COTO
Rope Floor	0			No - too light	
Sand Trap	0	0	0	Possible	
Screaming Jaws of Death	0	0	1	Confirmed	COTO
Skelebat	0	0	0	Possible	
Sky-Bridge Hollow			0	Possible	
Snowball's Chance			0	Possible	
Snowball's Little Friend			0	No- too light	
Sorcerer Cavern			0	Possible	
Spongy Floor	0	0	0	Possible	
Surprise	0	0	0	Possible	
Surprise Bat			0	Unlikely- too light	
Three Room	0			No - too light	
Tom Thumb	0			No – too light	
Two-Step	0	0	1	Confirmed	COTO
Watchman		0	0	Possible	
West Hidden		0	0	No - too light	
West Teepee		0	0	Possible	
Wile E. Coyote			6	Confirmed	COTO

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

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