Park News

Great Basin National Park
National Park Service
U.S. Department of the Interior

The Midden

The Resource Management Newsletter of Great Basin National Park

Saving Bonneville Cutthroat Trout after the Strawberry Fire

By Jonathan Reynolds, Fisheries Biologist

In August 2016, a wildfire burned the Strawberry Creek drainage, destroying much of the riparian corridor and degrading prime Bonneville cutthroat trout (*Oncorhynchus clarki utah*, BCT) habitat. Initial investigations concluded that a large portion of the BCT population was lost, most likely succumbing to increased water temperatures as the fire passed over the stream. However, survivors were found in less-intensely burned areas.

NPS Photo by G. Baker

The Strawberry Fire burned over 4,000 acres during the summer of 2016, including over the riparian zone in parts of the Strawberry Creek watershed.

Due to the threats of siltation, flash flooding, and possible changes in water chemistry, it was determined that the surviving BCT located in at-risk stretches of stream should be relocated. With the assistance of the Nevada Department of Wildlife (NDOW), a total of 251 BCT were collected in Strawberry Creek and released into Silver Creek. An additional 27 BCT were collected and transported upstream to a section of Strawberry Creek that was unaffected by the fire.

General aquatic habitat surveys were completed to document the decrease in the quality of fish habitat and serve as a baseline for Strawberry Creek's recovery over the years to come. Population surveys conducted after the fire showed BCT are currently present at only two of the eight sites that they occupied in 2011.

It will take a lot of effort and even more time to reestablish BCT throughout the stream in the numbers that they once were. However, there is light at the end of the tunnel. A viable population of BCT still exists in Strawberry Creek, and much of the riparian vegetation has already begun re-sprouting throughout the canyon.

NPS Photo

Bonneville cutthroat trout (BCT) survived in two of eight sampling sites in Strawberry Creek. Efforts have been made to save BCT by transporting them to nearby Silver Creek and the upper reaches of Strawberry Creek.

In This Issue

New Wildlife Species Added to Cave List

By Gretchen Baker, Ecologist

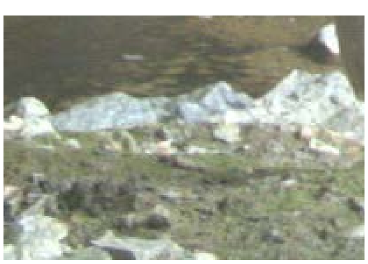
Park staff have placed wildlife cameras at the entrances to several caves to see what animals use this habitat. The cameras take a photo when they sense movement. Each photo has a date, time, and temperature stamp. During the summer of 2013, 17 taxa were recorded. Since then, wildlife cameras have continued photographing cave entrances, and additional taxa have been added to the cave list.

During the winter of 2015-16, the first Felids were observed, with mountain lions (*Puma concolor*) and bocats ((*Lynx rufus*) cruising several cave entrances. We have also added some new Mustelids to our cave entrance biota list, with sightings of weasels (*Mustela* sp.) and badgers (*Taxidea taxus*).

In addition to adding species, we also are interested in species interactions. Spotted skunks (*Spilogale gracilis*) and striped skunks (*Mephitis mephitis*) were seen in the same cave during the summer of 2016. At one cave entrance, we saw many photos of Uinta chipmunks (*Tamias umbrinus*) and rock squirrels (*Spermophilus variegatus*). Over the next weeks, gray foxes (*Urocyon cinereoargenteus*) and skunks started visiting regularly. By the end of the time period, no chipmunks or squirrels were seen. One photo of a fox jumping towards a hole adds weight to our hypothesis that some predators are finding cave entrances to be a good place to hunt.

One cave entrance has a perennial pool of water at it. We suspected that it attracted a lot of wildlife, but when we downloaded the camera and found over 5,000 photos on it for a four-month period, we were a bit overwhelmed. While squirrels, chipmunks, and desert woodrats (*Neotoma lepida*) dominate, this entrance also plays an important role for many bird species. These include Black-billed Magpie (*Pica hudsonia*), Dark-eyed Junco (*Junco hyemalis*), Mourning Dove (*Zenaida macroura*), Steller's Jay (*Cyanocitta stelleri*), Northern Flicker (*Colaptes auratus*), Woodhouse's Scrub-jay (*Aphelocoma woodhouseii*; formerly Western Scrub Jay), Clark's Nutcracker (*Nucifraga columbiana*), Cassin's Finch (*Haemorhous cassinii*), and at least a couple unidentified bird species.

This non-invasive sampling technique has helped park staff better understand what animals use cave entrances and at what times of day and year. It has also helped provide many more glimpses into the lives of some animals that are rarely seen in the park.



Wildlife cameras documented additional wildlife species using cave entrances. Photos from top left and going clockwise: Mountain lion, bobcat, Steller's Jay, and mourning dove.

New Wildlife Species Added to Cave List (continued)

Additional photos of wildlife in caves, taken by wildlife cameras triggered with movement. From top left and going clockwise: mountain lion closeup, spotted skunk, striped skunk,weasel, black-billed magpie, and gray fox.

Northern Goshawk Occupancy and Breeding Surveys

By Julie Long, Biological Science Technician

Northern goshawks (*Accipiter gentilis*) are large diurnal raptors that can be found year-round at Great Basin National Park. Although this bird of prey is a Nevada resident, it has been listed as a sensitive species by Great Basin National Park, the Bureau of Land Management, U.S. Forest Service, and the Nevada National Heritage Program. In order to better understand their ecology, habitat use, and nest and fledgling success, we conducted northern goshawk surveys in late July and early August.

NPS Photo

A northern goshawk nest in the park.

NPS Photo

A northern goshawk seen in the park this summer.

Surveys were implemented in collaboration with the Nevada Department of Wildlife (NDOW) using their northern goshawk occupancy and breeding survey protocol. Five sites were surveyed in the park: Mill Creek, South Fork Big Wash, Strawberry Creek, Can Young Canyon, and Pine Creek. A subset of these locations was last visited in 2011. Historic nest sites were located in riparian habitat in cottonwood, aspen, or aspen-mixed conifer forest. Surveys involved walking transects near previously documented northern goshawk nest locations. Call-broadcast sessions were performed every 150 meters if no goshawk activity was detected at the nest site. Data on dominant tree community, cloud cover, temperature, and DBH (diameter of breast height of the nest tree) along with nest condition were recorded.

We found occupied territories in Can Young Canyon and South Fork Big Wash. In South Fork Big Wash, two fledged juveniles were observed with some down feathers still present. In Can Young Canyon one juvenile with buffy brown streaks was heard and then later observed at a historical goshawk nest site in a dead quaking aspen. At other historical sites, intact nests were identified without any activity. Three inactive nests were documented in aspens in Pine Creek. Observations of intact nests without any goshawks present may be due to the timing of survey efforts. Fledged juveniles may have already left the nest, or the nests may have been abandoned.

Revisiting nest sites is important to document preferred nesting habitat, changes in occupancy, nesting success, and timing of nesting and fledging. These surveys give the park information on site occupancy over time and breeding behaviors. Having this knowledge will not only provide sensitive species information to management but allow them to protect habitat that goshawks favor for nesting.

Want to help the park learn more about birds? Join us for the Christmas Bird Count on December 14, 2016!

2016 Nevada Bat Blitz

By Jane Van Gunst, Nongame Biologist, Nevada Department of Wildlife

Photo by Aaron Rutlecdge, BLM-Las Vegas District

Rory Lamp (NDOW), Jen Newmark (NDOW), Kristin Szabo (Nevada Natural Heritage Project), and Julie Long (NPS, Great Basin) processing a bat in northern Grassy Canyon during the 2016 Nevada Bat Blitz.

The Diversity Division of the Nevada Department of Wildlife (NDOW), along with other partners (including National Park Service (NPS), Bureau of Land Management (BLM), Friends of the High Rock-Black Rock, University of Nevada, Reno, and Humboldt State University), held the annual Nevada Bat Blitz in northwestern Washoe County, in and around the High Rock Wilderness area on August 8-12, 2016.

Sixteen sites were surveyed over four nights. Surveys used a combination of passive acoustic monitoring and active trapping with standard and triple high mist net arrays. Pettersson's detectors were used to collect most acoustic data, along with Anabats deployed at two sites. Acoustic data analysis using Sonobat, Kaleidoscope, and Analook software is currently ongoing. Mist net arrays were deployed over a mix of both developed and natural waters and nearby meadow habitat.

Overall, 11 species of bats were captured and more may be detected once acoustic samples are fully analyzed. The long-eared myotis (*Myotis evotis)* was common across the survey area with lesser numbers of the long-legged myotis (*Myotis volans),* big brown bat (*Eptesicus fuscus),* Townsend's big-eared bat (*Corynorhinus townsendii),* pallid bat (*Antrozous pallidus),* and western pipistrelle or canyon bat (*Parastrellus hesperus)* captured at sites around the High Rock region. Sites within High Rock Canyon were among the most diverse of the study area. Western pipistrelle bats and pallid bats were captured only in this wilderness area and preliminary analysis of acoustic data shows a relatively high index of activity by spotted bats (*Euderma maculatum*) in this area.

The Nevada Bat Blitz is sponsored every year by NDOW and partnering agencies to gain a better understanding of local or regional bat populations via area inventories or targeted research projects. Close to 40 participants helped to make this effort a success in conducting the first bat surveys of this region. In particular, we thank National Park Service biologists for deploying acoustic detectors and analyzing acoustic data; and BLM, Lassen-Applegate District, and Friends of High Rock-Black Rock for immense help in providing logistical support and equipment.

Photo by Daniel James, BLM, Lassen-Applegate

Mike Myers (Friends of High Rock-Black Rock), Bryan Hamilton (NPS, Great Basin NP) and Ross Haley (NPS, Lake Mead NRA) setting up nets in High Rock Canyon.

Bat Research in Great Basin National Park: A Year in Review

Dylan Rhea-Fournier, Great Basin Institute Intern

Introduction

Several threats to the populations of North American bats have been identified in the recent decade, mainly White Nose Syndrome, wind turbines, and habitat loss. Bats in the Great Basin region are insectivores, many of which can eat up to their own body weight in insects in a single night. This provides the valuable ecosystem service of suppressing agricultural pests, estimated to be billions of dollars a year in value. Due to the difficulties in studying a small, volant, nocturnal animal, and the wide-spread misinformation in the past concerning how important bats are in functioning ecosystems, very little is known about their ecology, population sizes, and habitat use. Recently, efforts have been made to obtain baseline data on bat populations and to clarify aspects of their ecology before the consequences of these aforementioned threats manifest. Relatively intact ecosystems, such as those found on protected public lands, offer an ideal landscape for such studies.

Acoustic Monitoring

Recording the echolocation calls of bats is a useful tool that requires less effort than captures. Variation between species in call characteristics and frequencies allow biologists to determine species richness and habitat utilization. We continued acoustic monitoring initiated in 2015 for a second year, surveying stationary sites along transects in Lehman Creek and Snake Creek. This project was designed to survey the full elevational gradient available, from Baker, NV and Garrison, UT (ca 5,300 ft) to Wheeler Peak (13,063 ft), with replicate sites at each elevational increment.

NPS Photo

A Townsend's big-eared bat

We surveyed a total of 32 transect sites this year, for a minimum of seven nights each. In addition, we monitored several opportunistic foraging sites (lakes and springs). This data will be incorporated into an occupancy model that will provide probabilistic distribution of bats in the park relative to elevation and vegetative communities.

Trapping and PIT tagging

Trapping efforts this summer focused on our local species of interest, the caverniculous Townsend's big-eared bat (*Corynorhinus townsendii*). We captured these bats with mist nets and harp traps at their cave roosts within and adjacent to the park, with the goal of tagging as many as possible for long term monitoring. Passive Integrated Transponder (PIT) tags utilize the same technology as the microchips used in pet dogs and cats in urban areas, or automatic key cards in some hotels. They have the

Continued on Page 7

NPS Photo

Townsend's big-eared bats roosting in a cave

Bat Research in GRBA: A Year in Review (continued)

benefit of not requiring a battery, thus are indefinite in duration of functionality. The disadvantage to this tag is that the bat must pass by an antenna or a hand-held scanner to detect the tag, unlike radio tags that can be tracked from longer distances. This remains very useful for cave-roosting bats when an antenna can be installed around the cave entrance as we have done at Lehman Cave, or if the bat is re-captured and can be scanned in hand. This project will provide novel information about the timing and fidelity of roost use by bats in the park, as well as long term data which may reveal the longevity and further life history information of this and other bat species that can live over 15 years. This year mist net trapping was conducted for 16 nights over nine sites (four foraging sites, five roosts) in and adjacent to the park. A total of 201 individuals were caught, most of which were PIT tagged, comprising six different species.

Telemetry

Many North American bats hibernate during winter months. For this they must find suitable habitat to meet the species-specific microclimate and metabolic demands for dormancy. It is in these hibernacula and dormant states that bats are the most vulnerable, especially in eastern North America, to the White Nose Syndrome causing fungus (*Pseudogymnoascus destructans*). Thus it is of high importance for park researchers to determine the over-wintering habitat for our bats.

Winter cave and mine surveys are essential for obtaining direct counts of bats in known hibernacula, however finding new winter roosts proves to be more difficult. Telemetry or radio-tracking is a method that has been employed by a wide range of wildlife biologists for decades. Radio tags used on bats weigh less than a third of a gram and are equipped with a small flexible antenna that emits a radio signal on a specific frequency. This signal is detected by the researcher with a radio receiver and an antenna in the form of an audible 'beep', which becomes louder as proximity to the tagged animal increases.

This fall we radio-tagged four Townsend's big-eared bats that were roosting at Lehman Cave, and trapped as they exited the cupola. The goal was to track them to their winter roost, if we predicted the timing correctly. However with the extremely varied topography of the park, the caverniculous behavior of this species, and dwindling availability of staff, our success rate was low. However we did track one individual on several different occasions to caves in the

NPS Photo

Silver-haired bat (*Lasionycteris noctivagans*)

Baker Creek/Grey Cliffs area of the park. Two of the other tagged individuals were detected in the same area soon after dusk; however their day-time roost locations were not determined. This indicates the importance of this cave system to Townsend's big-eared bats and that perhaps many of our bats do not travel all that far between summer and winter roosts. Further research is needed to determine where the Lehman Cave bats spend their winters.

We would like to thank everyone who assisted and/or volunteered with fieldwork this season; we could not have done it without you!

NPS Photo

Volunteers help biologists process bats at Teresa Lake.

Precipitation Record at Great Basin National Park

By Thomas R. Vale, Professor Emeritus of Geography, University of Wisconsin-Madison

Continuous precipitation data for Great Basin National Park, recorded at the Lehman Caves Visitor Center (LCVC), extend back to 1937 and are available at www.wrcc.dri.edu. In this quick look at those data, several conventions are followed. First, any month with more than five days without data are omitted from the set and recorded as "missing." Second, seasonal values are considered "missing" if any of the included months are identified as "missing." Third, the four seasons are represented by aggregated months following climatological standards: winter is December, January, and February; spring March, April, and May; summer June, July, and August; fall or autumn September, October, and November. Fourth, the years for winter seasons are identified by the years for the December months. Fifth, all values are expressed in inches.

Year

The annual mean for the LCVC is 13.33 inches, although, of course, totals increase with elevation in the park and decrease downward toward valley bottoms (e.g., Baker, 7.73). Exceeded by all locations in the eastern half of the country, the value at Lehman Caves is likely similar to comparable sites throughout the Intermountain West. Also, for comparison, places with similar annual precipitation totals include locales along the southern California coast (Los Angeles, 13.15), in interior valleys of central California (Tracy, east of San Francisco, 13.13), and at the western edge of the Great Plains (Billings, Montana, 13.66, or Limon, Colorado, east of Denver, 13.85).

Seasons

If the annual mean is unremarkable, the seasonal distribution of precipitation at the LCVC is, if not unique, at least distinctive for its evenness: winter, 3.16; spring, 3.85; summer, 3.06, fall, 3.32. This similarity in the seasons reflects the location of the LCVC and the park. In winter, the park is far enough north to receive precipitation when the westerly winds aloft are expanded into the middle latitudes and strongest in intensity (e.g., Boise: winter 3.74; spring 3.98; summer 1.26; fall 2.68). The park lies within the northern interior west, an area noted for a spring precipitation maximum, explained by the extension of waves in the still active Westerlies southward over the continent at a time when high pressure is building over the eastern Pacific Ocean (e.g., Boise; also, Ely winter 2.79; spring 3.94; summer 1.97, fall 2.68). The park is sufficiently east and south to experience the Southwestern Monsoon, when moisture streams northward, particularly aloft, from the subtropics (e.g., Tucson: winter 2.98; spring 1.38; summer 4.45; winter 3.11). Finally, the fall season may see either a continuation of the summer monsoon or an early onset of winter storms, or both. This evenness in precipitation through the year is particularly unusual for a place in the American West, where wet winters and dry summers are the norm.

Snowfall

The mean snowfall is 73.8 inches, with every month except July and August averaging some snow. The year-to-year variability is high; the highest snowfall year was 1951-1952 with 188.7 inches, the lowest was the following year, 1952-1953, with 24.2 inches (Figure 1).

Trends

Evenness in mean seasonal precipitation seems echoed in annual seasonal precipitation over the period of record. However, the winters of the 1970s and 1980s seem dry (eighteen years below the mean); but in thirteen of those

Continued on Page 9

NPS Photo by G. Baker

Snowfall totals have varied from 24 to 188 inches near the Lehman Caves Visitor Center from 1937 to the present.

Precipitation Record (continued)

years the spring precipitation was above average. Also, during the 1970s both summer and fall precipitation appears low. The drought of the most recent years (famously, in California) also appear in the record at Great Basin (note, by contrast, that the summer of 2014 is the wettest on record, with 8.96 inches).

Perspective

Studies of Holocene paleoclimate in the Great Basin identify a positive relationship between warm temperatures and low precipitation, a linkage most likely related to cool season conditions. Yet, the record at Great Basin National Park seems ambiguous, judging by the mean temperature for the winter season: During the six driest winters, the mean seasonal temperatures were above average in only three of the years (1952, 1969, 1976), and three were colder (1945, 1960, 1990). The snowfall record is a little more clear: the six highest snow years were all colder than average (1951, 1961, 1972, 2000, 2009, 2010), but the six lowest snow years included four years of colder than average temperatures (1950, 1952, 1990, 2011) and only two with temperatures above the seasonal mean (1956, 1977). Perhaps the particular years since 1937 cannot be taken as analogues for the periods of warm dry winters in the more-distant past. Recent climate warming might replicate those positive relationships, however, and create future climates unknown in the historical record.

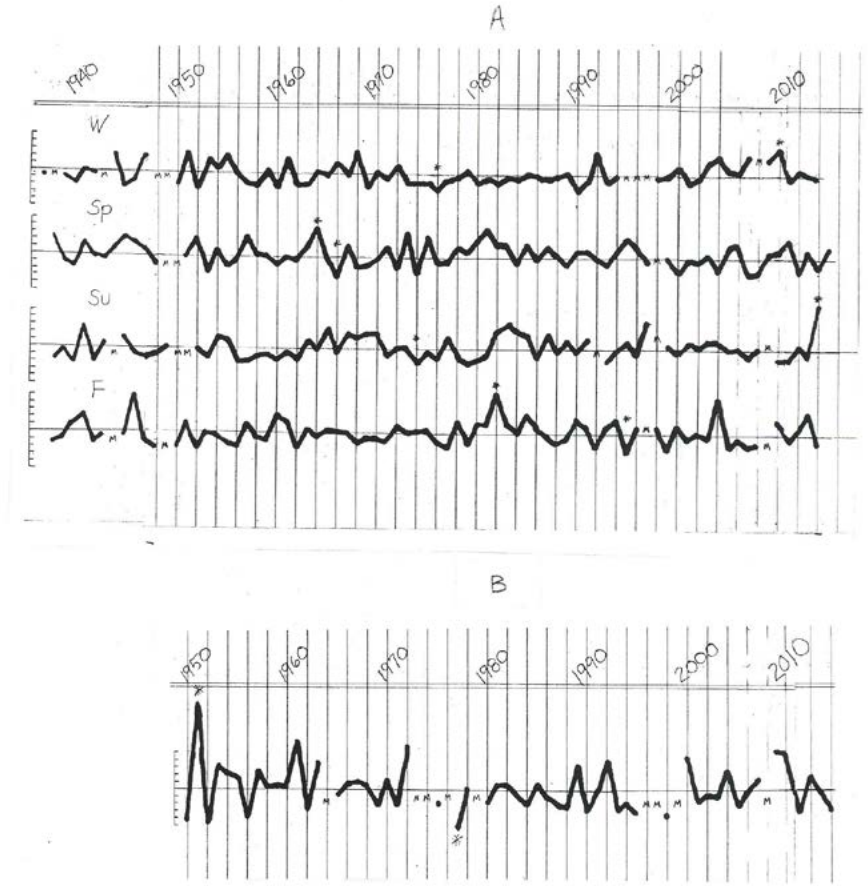


Figure 1. A. Trends in seasonal precipitation. W is winter, Sp spring, Su summer, F autumn or fall. Vertical scale in one-inch increments. B. Trend in snowfall, by water year (July-June) identified by year for Decembers of the water years. Vertical scale in ten-inch increments. For both A and B: Horizontal line is mean value. M identifies years with missing data. Asterisks indicate extreme values.

Recent Publications

Blake, D. B., T. E. Guensburg, and B. Lefebvre. 2016. New early Paleozoic *Asterozoa* (*Echinodermata*) from the Armorican Massif, France, and the western United States. Annales de Paléontologie 102 (3): 161-181.

Lachniet, M. S. 2016. A speleothem record of Great Basin paleoclimate: The Leviathan chronology, Nevada, *in* Oviatt, C. G. and Shroder, Jr., J. F., Eds. Lake Bonneville: A scientific update. p. 551-569.

Tweet, J. S., V. L. Santucci, and T. Connors. 2016. Paleontological resource inventory and monitoring: Mojave Desert Network. Natural Resource Report NPS/MOJN/NRR—2016/1209. National Park Service, Fort Collins, Colorado.

National Park Service
U.S. Department of the Interior

The Midden is the Resource Management newsletter for Great Basin National Park.

A spring/summer and fall/winter issue are printed each year. *The Midden* is also available on the Park's website at www.nps.gov/grba.

We welcome submissions of articles or drawings relating to natural and cultural resource management and research in the park. They can be sent to:
Resource Management,
Great Basin National Park,
Baker, NV 89311
Or call us at: (775) 234-7331

Superintendent
Steven Mietz

Chief of Resource Management
Tod Williams

Editor & Layout
Gretchen Baker

What's a midden?

A midden is a fancy name for a pile of trash, often left by pack rats. Pack rats leave middens near their nests, which may be continuously occupied for hundreds, or even thousands, of years. Each layer of trash contains twigs, seeds, animal bones and other material, which is cemented together by urine. Over time, the midden becomes a treasure trove of information for plant ecologists, climate change scientists and others who want to learn about past climatic conditions and vegetation patterns dating back as far as 25,000 years. Great Basin National Park contains numerous middens.

Great Basin National Park

Bristlecone Cave Climate Studies

By Gretchen Baker, Ecologist

In August 2016, three dataloggers were downloaded in the difficult-to-access Bristlecone Cave, located above 10,000 feet. These dataloggers had been programmed in 2011 to record temperatures every two hours and were placed in various locations: the top, about 10 feet below the entrance; Pendulum Pit, about 90 feet down; and the Side Passage, about 80 feet down.

Two dataloggers recorded temperature data for just over three years, while the third datalogger, the one in the Side Passage, recorded temperature data for five years (Figure 1). The data shows the middle part of the cave has annual temperature fluctuations, varying from about -2°C to 4.5°C in the Side Passage and Pendulum Pit. The datalogger closer to the entrance recorded much larger temperature changes, from -8°C to 14°C. The lag in the temperature warming in Pendulum Pit as compared to the Side Passage may be due to snow collecting in the pit. More data analysis is underway.

Four new climate dataloggers were installed in the cave and one in the bristlecone pine at the entrance. About 17 caves in the park now have dataloggers in them to help understand the temperature and humidity of these caves at different elevations.

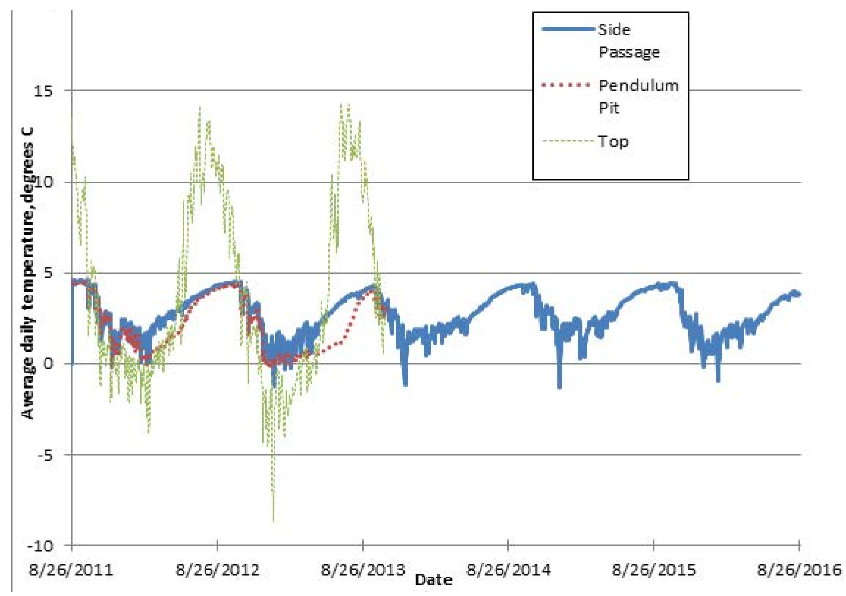


Figure 1. Temperature data in Bristlecone Cave. The solid blue line indicates five years of data from Side Passage in the cave; the dotted red line shows three years of data from Pendulum Pit, and the dashed green line shows data near the entrance.

Upcoming Events:

December 14: Snake Valley Christmas Bird Count Help count birds in the longest-running citizen science project. We welcome volunteers of all experience levels. Contact Gretchen_Baker@nps.gov.

December 15: Ely Christmas Bird Count Although Ely doesn't get as many bird species as the Snake Valley CBC, it's a fun count in need of volunteers! Contact Nancy Herms at nherms@blm.gov

January 10-12, 2017: Lehman Caves Lint and Restoration Camp Spend time uncovering the beauty in Lehman Caves. This project is very rewarding, and spots fill up fast. Contact GRBA_Lint_Camp@nps.gov for more info.