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

Our 15th Year of Publication!

Alpine Lichens and Climate Change on Wheeler Peak

By Nastassja Noell and Jason Hollinger, Researchers

In 1955 a lichenologist named Henry Imshaug climbed to the top of Wheeler Peak to inventory the alpine lichens. His study was part of a larger research project involving 92 alpine areas across western North America. This past autumn, we began revisiting Imshaug's sites to evaluate whether alpine lichens have responded to climate change during the past 60 years, and if so, investigate methods for using lichens as biomonitors of climate change in alpine areas.

Lichens are widely regarded as "canaries in the coal mine"; the disappearance or appearance of certain sensitive species signals significant environmental changes, forewarning ecological shifts. The US Forest Service, Bureau of Land Management, and other agencies throughout the world use lichens to monitor the quality of forests and rangelands. Most land management studies involve lichen indices to evaluate air quality, forest health, or rangeland health. Emerging research suggests that lichens may also be useful bioindicators of regional climate change.

Photo by N. Noell

Jason Hollinger documenting the alpine lichen diversity along a transect to the summit of Wheeler Peak.

Photo by N. Noell

Alpine Sunburst Lichens – *Acarospora stapfiana, Caloplaca trachyphylla, Lecanora novomexicana, Candelariella rosulans*, and *Umbilicaria virginis* – thriving together on an area the size of a notecard. Photo from Wheeler Peak.

Our study investigates lichens as bioindicators of climate change by focusing on habitats that are relatively unaffected by anthropogenic factors: alpine habitats. Over the next few years, we will revisit Imshaug's 92 baseline alpine lichen inventories, comb through tombs of his unidentified crustose lichens, and complete much of his unpublished work. Our results from Wheeler Peak suggest the endeavor is more than worthwhile.

On the summit of Wheeler Peak, the GLORIA vascular plant inventory found 15 species of plants; our preliminary survey found over 56 species of lichens. The ratio of nearly 1:4 (plants:lichens) is striking. Although this remarkable figure is reduced to 1:3 in the humid alpine habitats of the Northern Cascades, existing research suggests that lichens dominate the biodiversity of most alpine habitats in Western North America. Despite these numbers, most alpine researchers shy away from documenting lichens because of the difficulty of lichen taxonomy, a lack of local alpine lichen inventories, and a need for simple monitoring methodology. Our study aims to help close this gap.

Photo by N. Noell

Two macrolichens not found on Wheeler Peak 60 years ago – *Pseudephebe minuscula and Umbilicaria krascheninnikovii.*

In This Issue

Two SNPLMA Projects Finished

By Ben Roberts, Chief of Natural Resource Management

NPS Photo

Snake Creek is one of the creeks involved in the Bonneville cutthroat trout SNPLMA project.

Great Basin National Park successfully closed out two Southern Nevada Public Land Management Act (SNPLMA)-funded projects this spring. SNPLMA became law in October 1998 and allows the Bureau of Land Management (BLM) to sell public land within a specific boundary around Las Vegas, Nevada. The revenue derived from land sales is split between the State of Nevada General Education Fund (5%), the Southern Nevada Water Authority (10%), and a special account available to the Secretary of the Interior for:

- Parks, Trails, and Natural Areas
- Capital Improvements
- Conservation Initiatives
- Multi-Species Habitat Conservation Plan
- Environmentally Sensitive Land Acquisitions
- Hazardous Fuels Reduction and Wildfire Prevention
- Eastern Nevada Landscape Restoration Project
- Lake Tahoe Restoration Projects

The Round 11 *Conservation Agreement and Conservation Strategy for Bonneville Cutthroat Trout in the State of Nevada* (2006) (CA/CS) was funded to prevent the listing of Bonneville cutthroat trout (BCT; *Oncorhynchus clarki utah*) under the Endangered Species Act (ESA).

Working cooperatively, Great Basin National Park, BLM, US Fish and Wildlife Service, US Forest Service, and Nevada Department of Wildlife completed the objectives of the CA/CS which include: 1) manage for a minimum of 14 conservation populations in Nevada, and 2) eliminate the threats to BCT in Nevada that may warrant listing as a threatened or endangered species under the ESA.

As of December 2014, of the original 14 populations, nine populations are stable (Big Wash Creek, Deadman Creek, Deep Canyon Creek, Hendry's Creek, Mill Creek, Smith Creek, Goshute Creek, Pine and Ridge Creeks, and Deep Creek), three have improved (South Fork of Big Wash, South Fork of Baker Creek, and Strawberry Creek) one population has declined (Snake Creek, due to the presence of non-native brook trout) and one population has been lost (Hampton Creek, due to a fire in the summer of 2014). One additional population was discovered (Willard Creek) and one additional population will be restored in summer 2015 (Silver Creek).

Another project that was recently completed was *Sagebrush Steppe and Aspen Restoration in the South Snake Range*, a Round 11 project. The park partnered with the Schell Office of the Ely District BLM. This project met multiple objectives of the SNPLMA Strategic Plan Goal 2: *Conserve and Restore the Quality of the Outdoor Environment by Preserving Natural and Cultural Resources and Enhancing Recreational Opportunities*. The park successfully treated 250 acres of upland habitat, treated 25 acres of riparian habitat, and inventoried 690 acres of total habitat. The park also surveyed 1,713 acres for cultural resources. In addition, the park treated 164 acres of non-Wildland Urban Interface (WUI) hazardous fuels and 111 of acres of WUI hazardous fuels to meet Sub-objective 2.4.1 - *Reduce the risk of catastrophic wildfire*.

Park Partners with NDOW to Restore Native Fish

By Jonathan Reynolds, Biological Science Technician

NPS Photo

The future for Bonneville cutthroat trout in eastern Nevada looks brighter due to a partnership between Nevada Department of Wildlife and Great Basin National Park.

Bonneville cutthroat trout (BCT) are relicts from ancient Lake Bonneville. When the lake was at its fullest, about 15,000 years ago, its shores were only a few miles from the eastern slopes of the Snake Range. As Lake Bonneville receded, the BCT had no choice but to take refuge in the perennial streams that flowed into the diminishing lake. BCT persisted in these mountain streams for thousands of years until settlers began to stock them with non-native brook, brown, and rainbow trout. These non-native species quickly outcompeted and hybridized with most of the BCT populations in the Snake Range.

In the early 1990s the Nevada Department of Wildlife (NDOW) started an aggressive BCT restoration program on BLM and Forest Service lands in the North Snake Range. They removed all of the non-native trout and reintroduced BCT in Smith, Deadman, Deep Canyon, Hampton, and Hendry's Creeks. Currently, Silver Creek is the only North Snake Range stream within the BCT's native range that has not been restored as a native fishery. However NDOW, with a little assistance from Great Basin National Park, has already made great strides to remedy this.

In 2012, NDOW constructed a rock gabion fish barrier on Silver Creek ensuring that any non-native fish existing downstream could not migrate upstream into the future BCT restoration area. In August of 2013, Great Basin National Park staff assisted NDOW to execute their carefully planned chemical renovation of the Silver Creek drainage. The four day treatment utilized 30 drip stations, several spray/sanding crews, and one johnboat to eradicate all non-native fish from Silver Creek and its reservoir. Shortly after, sterile tiger trout were released into the reservoir to provide the public with a recreational fishery until BCT become established in the system. The following summer, Park staff assisted NDOW with their validation surveys to ensure the treatment was 100% successful. Over several weeks, three to four person electrofishing crews surveyed Silver Creek and all of its tributaries and confirmed that no living fish (with the exception of the tiger trout) remained in the drainage.

With the treatment confirmed to be a success, NDOW is now excited to reintroduce native BCT back into Silver Creek. In June of 2015, NDOW and the Park's Resource Management Department will work together to collect as many BCT as possible from Snake Creek. The BCT will be loaded into insulated tanks equipped with aerators and oxygen gas, transported to the Silver Creek drainage, and then released at predetermined locations. In the years following the reintroduction, the BCT population in Silver Creek will be closely monitored to ensure that it is growing at a satisfactory rate. Population augmentations can be performed using BCT from other North Snake Range streams if necessary. A few years from now, BCT should be distributed throughout the Silver Creek drainage, establishing another conservation population and providing the public with a productive native fishery.

Over the last decade, Great Basin National Park and NDOW have formed a strong partnership to achieve their common goal of restoring BCT throughout their native range and protecting them for future generations to enjoy. The Park is proud to have played a role in restoring BCT to the Silver Creek drainage and is excited to continue working closely with NDOW in the future.

Wild Turkeys Present Study in Wildlife Management

By Bryan Hamilton, Wildlife Biologist

National Parks have a clear and explicit mission to preserve resources unimpaired for future generations. However executing that mission can be more ambiguous. As a case in point, consider the wild turkey, a non-native game bird now well established in the park.

In 2003, one-hundred Merriam's turkeys were released outside the park by the Nevada Department of Wildlife (NDOW). Their goals were to increase hunting and wildlife viewing opportunities by establishing a harvestable turkey population. The introduction was very successful and the turkeys have multiplied and moved into the park, where hunting is illegal. Last year, turkeys began roosting in trees near the Lehman Caves Visitors Center. Turkey feces created a mess on the lawns and sidewalks.

Park employees were able to haze the birds away and clean up, but the maintenance issue raised concerns about the impact of turkeys on natural resources.

Turkeys are a large, non-native bird.

NPS Photo

Wild turkeys, non-native to the park, make for an interesting management challenge.

Although omnivorous, turkeys feed primarily on vegetation and insects. Predation on vertebrates rarely occurs. Foraging turkeys disturb soils by scratching, and turkeys could disperse non-native species such as cheatgrass and thistles. Turkeys can also inhibit restoration projects by feeding on young, newly-established vegetation.

Turkeys are preyed on by mountain lions, bobcats, coyotes, foxes, and hawks. Turkey impacts could cascade to other prey species indirectly via increased predator abundance. Although there is little in the literature to indicate that turkeys will have negative impacts, park specific research on the home ranges, food habits, distribution, survival of turkeys, and impacts of turkeys on natural resources is warranted.

Wild turkeys in Great Basin National Park present a classic resource management dilemma. Wildlife do not respect jurisdictional boundaries, and most parks are simply not large enough to manage intact populations. So to meet the park mission, management is by necessity a cooperative endeavor between parks, neighboring land managers, private land owners, and wildlife management agencies. This is true with many species such as bighorn sheep, Bonneville cutthroat trout, elk, rattlesnakes, bats, mountain lions, and wild turkeys. Park solutions to turkey issues could include targeted hazing, trap and removal, or lethal methods. However without cooperation between other stakeholders and partners and active science-based management, these actions would be short term.

In the age of the Anthropocene, human impacts on park resource will continue to increase. More than ever parks will need to work cooperatively with partners and stakeholders and prioritize resource management actions to meet the NPS mission.

Recent Publications about Great Basin National Park

Baker, G. M., S. J. Taylor, S. Thomas, K. Lavoie, R. Olson, H. Barton, M. Denn, S. C. Thomas, R. Ohms. K. L. Helf, J. Despain, J. Kennedy, and D. Larson. 2015. Cave ecology inventory and monitoring framework. Natural Resource Report NPS/NRPC/NRR—2015/948. National Park Service, Fort Collins, Colorado. Link

Hamilton, B. T., B. L. Roeder, K. A. Hatch, D. L. Eggett, and D. Tingey 2015. Why is small mammal diversity higher in riparian areas than in uplands? Journal of Arid Environments 119:41-50. Link

Wright, G., M. S. Gustin, P. Weiss-Penzias, and M. B. Miller. 2014. Investigation of mercury deposition and potential sources at six sites from the Pacific Coast to the Great Basin, USA. Science of the Total Environment 470:1099-1113.

Park Prepares for 2015 Bat Surveys

By Bryan Hamilton, Wildlife Biologist, and Margaret Horner, Biological Science Technician

White-nose syndrome (WNS) is a serious disease affecting North American bats. It is caused by the fungus *Pseudogymnoascus destructans* and has resulted in the death of millions of bats in the United States and Canada. Bats are crucial to ecosystem function and provide billions of dollars per year to agriculture in insect suppression services alone. Despite efforts to contain it, WNS continues to spread. The National Park Service (NPS) has funded a proactive effort to minimize the impacts of white-nose syndrome on bats.

Part of the NPS effort focuses on education and outreach. Visitors to Lehman Caves are screened to determine if clothing, shoes, or equipment have been in caves or mines. If so, visitors are required to change or disinfect these items before entering the cave. The other part of the NPS effort focuses on inventory and monitoring. Park biologists, in cooperation with Nevada Department of Wildlife, are collecting baseline data on bat communities, using a combination of survey methods including mist netting, acoustic surveys, radio telemetry, and Passive Integrated Transponder (PIT) tagging. These methods address questions related to species diversity, habitat use, survival, abundance, and home ranges.

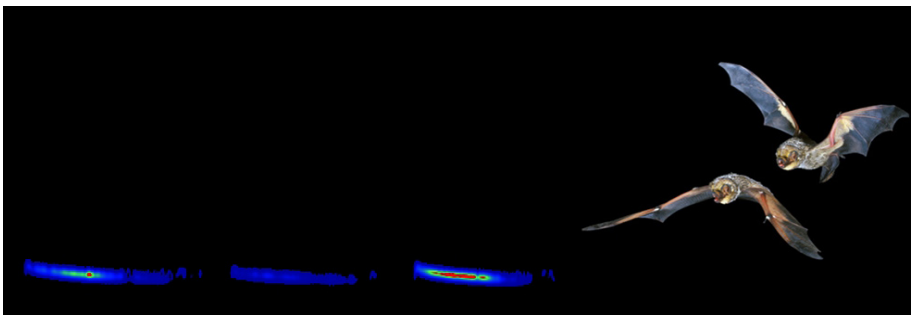
Acoustic monitoring allows bats to be identified to species based on their distinctive echolocation calls. While this technology has limitations, it is a very promising technique for bat monitoring. Bat calls are distinguishable based on several quantifiable aspects such as time, frequency, amplitude, and slope.

An exciting find from last year's bat surveys was the capture of 34 bats exiting Lehman Caves. Townsend's big eared bats are obligate cave and mine dwellers. They use specific microclimates in caves and mines for hibernation, parturition, and rearing their young. The high proportion of females and juveniles captured at Lehman Caves suggests this cave is a maternity colony. With over 30,000 visitors passing through Lehman Caves, more information is needed to better manage visitation and protect bats.

Park biologists will travel to Colorado to learn PIT tagging techniques from Colorado Parks and Wildlife biologists. These techniques will be used to better understand bat survival, home range, and seasonal activity patterns. This data will be used to inform cave management decisions, minimizing the impacts of visitation on bats. Bats will be tagged and monitors set up at cave entrances. When a bat enters or exits the cave, their unique identification number, date, and time will be recorded. Nevada Department of Wildlife biologists will assist with radio telemetry studies. This will allow individual bats to be tracked, documenting their foraging patterns, home range, and roost locations.

If you are interested in bats, the park needs your help. We will hold two bat surveys open to the public. These will be held at Lehman Cave (July 21) and Upper Pictograph Cave (August 1). You are welcome to attend to see bats first hand and learn about the importance of bats in our ecosystems. Biologists will be conducting mist net and acoustic surveys. For more information contact Bryan Hamilton at775-234-7563 or bryan_hamilton@nps.gov.

Townsend's big eared bat (*Corynorhinus townsendii*) and full spectrum call pattern.



Hoary bats (*Lasiurus cinereus*) and full spectrum call pattern.

Sign In: The Writing on the Wall

By David Harwood, Researcher

Tens of thousands of visitors come to Great Basin National Park every year, many attracted to the lure of underground adventure to be found in Lehman Cave. While the cave's natural beauty and geologic wonders frequently inspire awe, few visitors realize that almost every room and tunnel contain signatures from visitors since Absalom Lehman opened the caves to the public roughly 130 years ago. While Lehman encouraged visitors to sign their names in the cave, the same behavior today would result in serious legal consequences! That said, any signature over 50 years old is generally considered historically significant.

NPS Photo

A signature in Lehman Cave dating from 1885. This signature is by E. W. Meecham and G. R. (George Robison).

The earliest signature that has been found in the cave is dated July 4, 1885, although newspaper accounts of the beauty of Lehman's Cave appeared as early as April 1885.

To date, nearly 2,200 signatures, initials, and other messages have been discovered within the cave, and several locations still remain undocumented. Some names appear a number of times in the cave indicating multiple visits or just the impulse to write one's name in every room explored. Information that may be gleaned from the many signatures include dates of visitation, cave exploration, numbers of visitors in the early years after discovery, visitation season, visitation groups (e.g., school field trip and friendship groupings), age, and place of residence at the time of the visit.

The names were written using four different methods. The most common was the graphite pencil, easy to carry and sharpen with a case knife as needed. The second was charcoal, used primarily in 1885. This method was also easy to carry and procure, just grab some out of your previous night's campfire. The third method was soot from a candle or oil or carbide lamp depending on the era of visitation. The fourth medium used was the rarest: writing that weathers into a purple residue with the signature itself sometimes remaining readable or disintegrating completely leaving behind only a purple blob.

The cave signatures document the explorers who entered the cave. There are more than twenty differing stories that tell how the cave was detected and several dates between 1869 and 1885 cited as the moment of its discovery. Who it was that originally explored the cave also appears open to debate. The first to go beyond the entrance to seriously examine the interior, according to E. W. Clay, are as follows:

"(A) group of us men and a boy about 10 decided to go into the cave some distance and explore around. We were the very first people to go beyond the main entrance. There were seven of us. They were myself, Edwin W. Clay: Bob Kimball, a contractor, . . . Willard Burbank; Ab Lehman; Ed Lake, who was the boy about ten years old; Sam Forman, and I have forgotten who the seventh person was."

The individual he could not remember was his wife, Laura Margaret "Margie" Clay.
The persons in this first group took charcoal with them to mark arrows on the walls to show the way out. While this group did not leave their signatures initially, they did return at a later date to do so. Of the original seven who were in that early group, only the names of Bob Kimball and Sam Forman are not found within the parts of the cave that have been searched for names.

George Thomas Baker gives another account of the cave's first exploration party. He states that the first to enter were himself, Lehman, Dan Simonson, E. W. Clay, William

Continued on Page 7

Sign In: The Writing on the Wall (continued)

Atkinson, Isaac Gandy, D. A. Gonder, Philip M. (Doc) Baker, and Philip's wife, Nettie. The earliest date found in Lehman Caves is July 4, 1885 and is associated with Dan Simonson, Doc Baker, and the initials B. M., whose identity has yet to be determined. In addition to these, more explorers were soon adding their names to the walls.

The next recorded date is two days later, July 6, 1885, left by an M. J. Fitzuel, George Robison, and E. W. Meecham.

When Absalom Lehman opened the cave for visitation in in the spring of 1885, he was still in the process of constructing ladders, ramps, and widening passageways with help of a Mr. Coburn, to provide easy access to the main parts of the cave.

It was during this time that reports began to appear in newspapers announcing the discovery of "Lehman's Wonderful Cave." While it may seem that the first description of Lehman Caves would have appeared in *The Southern Utah Times* because its name is written in large letters in the Talus Room in the back of the cave associated with early 1885 dates, the first surviving documented mention of the cave is in the *White Pine Reflex* as described in the *White Pine News* (both newspapers published in Taylor, Nevada at the time) on April 25, 1885. *The White Pine News* published a description of "Lehman's Cave" in October 3, 1885.

While signatures are found throughout the cave, there are several areas of concentration. One such location is found through a side passage into the Crystal Palace, which would have been considered a turn around point by tours lead by Absalom Lehman and most others from 1885 to 1892. In this room Lehman constructed a platform several feet up one side of the passage in order to provide visitors access to a smooth portion of the cave wall upon which to write their names.

NPS Photo

A concentration of signatures in the Talus Room of Lehman Cave.

Another concentrated signature area is found in Nichol's Annex off of the Sunken Gardens. Two other locations where numerous names are found together is the Skating Rink (Inscription Room) and the Talus Room. These may be obvious areas, but rarely does anyone notice the two dozen or so names as they are ascending the stairs located in the Music Room.

Editor's Note: More on these cave signatures and the history of these early visitors to the cave will be found in the next issue of The Midden.

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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:
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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

Two Winter Lint Camps Freshen Cave

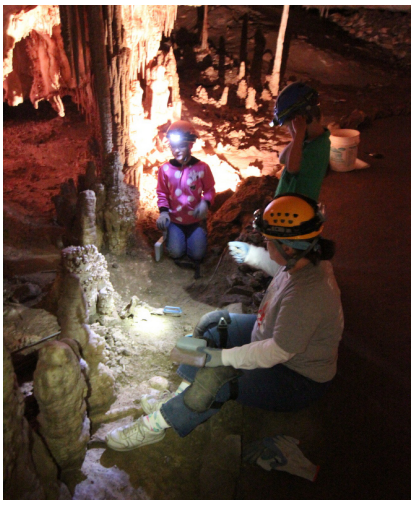
By Gretchen Baker, Ecologist

Due to high interest in the Lehman Cave Lint and Restoration Camp last year, the park planned two camps for the winter of 2015: February 6-8 and March 3-4. During these five days, 46 volunteers spent nearly 500 hours cleaning numerous sections of Lehman Cave.

Teams worked in different parts of the cave. Some picked lint off formations high above the Music Room, while others removed hairballs and trash from staircases and along the edges of the trail. In the Inscription Room, teams uncovered rimstone dams and flowstone that have been buried by old debris for decades. They removed over 3,000 pounds of debris and sand originally brought in for old trails and trail-making activities. They also found items of archeological interest,

NPS Photo by Gretchen Baker

This young lint camp volunteer helped dust off a dusty cave wall.



NPS Photo by Gretchen Baker

Volunteers find the real cave floor in the Inscription Room, buried under sand.

such as a coin from a pool hall in Milford, Utah.

Volunteers of all ages participated and were able to meet the National Park Service centennial goal to connect with and create the next generation of park visitors, supporters, and advocates. Many of the participants laid claim to a certain part of the cave and look forward to returning to it to finish cleaning there.

The lint camps have attracted extensive media interest, including stories in National Parks Magazine and in the Los Angeles Times.

Upcoming Events:

July 21 BatBlitz Learn what bats use Lehman Cave during the summer. Contact Bryan_Hamilton@nps.gov for details.

August 1 BatBlitz Learn what bats use Upper Pictograph Cave during the summer. Contact Bryan_Hamilton@nps.gov for details.

September 10-12 Astronomy Festival Peer into the dark night skies above Great Basin National Park through various telescopes. Check the park website for more information. http://www.nps.gov/grba/planyourvisit/greatbasinastronomyfestival.htm

Astronomy Programs every Tuesday, Thursday, and Saturday night through Labor Day weekend