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

Strawberry Fire Burned Area Rehabilitation and Restoration

By Meg Horner, Biologist

Native lupine growing after the Strawberry Fire.

The lightning-ignited Strawberry Fire was reported on August 8, 2016 in upper Strawberry Creek in Great Basin National Park. Aided by strong winds, the fire quickly grew, burning a large portion of the canyon and pushing the fire down-canyon onto BLM and private lands. The fire was declared controlled on August 23, 2016 after 4,656 acres burned, with 2,790 acres on NPS and 1,769 acres on Bureau of Land Management lands. The fire consumed a mix of habitat types. The dominant plant communities impacted in the park were montane sagebrush steppe (1,148 acres), pinyon-juniper (667 acres), aspen (597 acres), mountain mahogany (209 acres) and montane riparian (42 acres).

After the fire, resource management staff prepared a Burned Area Rehabilitation (BAR) plan to address and mitigate natural resource issues created or exacerbated by the fire. Plan objectives were 1) prevent the establishment of non-native invasive plants to enable the restoration and establishment of a healthy, stable ecosystem 2) revegetate lands unlikely to recover naturally post-fire and 3) replace minor infrastructure destroyed by the fire.

The park selected several strategies to meet BAR plan objectives for native vegetation recovery including aerial seeding and invasive plant management. Preventing the establishment of invasive forbs and annual grasses, mainly cheatgrass (*Bromus tectorum)*, following fire is critical to protect and maintain healthy, resilient plant communities. Cheatgrass invades recently burned sites, particularly pinyon-juniper woodlands and sagebrush-steppe, and can maintain dominance for decades. Not only does this compromise native plant recovery, but it also adversely affects soil stabilization and fire return intervals. Non-native invasive forbs such as bull thistle (*Cirsium vulgare*), spotted knapweed (*Centaurea stoebe*), and whitetop (*Cardaria draba*) exploit soil and vegetation disturbances following wildfires and fire suppression activities. They can then outcompete native vegetation for limited resources, negatively affect soils and discourage use by wildlife. A total of 894 acres in the park were determined to be at-risk of invasion and recommended for aerial seeding.

Aerial seeding was completed on February 12 -13, 2017 with support from the Nevada Department of
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Strawberry Fire Rehabilitation and Restoration (continued)

Wildlife, BLM, and Great Basin National Park staff. Seed was flown onto 811 acres of park lands and 1,157 acres on the BLM by Reeder Flying Service. Sourcing locally adapted seed was a priority for both the BLM and the park. Native grass, forb, and shrub species were part of the seed mix including basin wildrye (*Leymus cinereus)*, bluebunch wheatgrass (*Pseudoroegneria spicata)*, mountain big sagebrush (*Artemisia tridentata)*, redroot buckwheat (*Eriogonum racemosum)*, arrowleaf balsamroot (*Balsamorhiza sagittata)*, and firecracker penstemon (*Penstemon eatonii)*. Over 5,500 pounds of bulk seed were ordered and mixed for the park by the BLM's regional seed warehouse in Ely, NV. Once on site, seed mix was loaded into large hoppers, picked up by the helicopter, and flown onto burned areas at a rate of seven bulk pounds/acre on NPS-managed lands and 13 bulk pounds/acre on BLM-managed lands.

Aerial seeding objectives supported those outlined in the BAR plan focusing on the restoration of native plant communities and minimizing the establishment of invasive forbs and annual grasses. Restoring a

NPS Photo by Julie Long

Bags of seed for restoration in the Ely Seed Warehouse.

diverse, native plant community will benefit park- and BLM-managed lands along with private landowners by stabilizing soils, slowing runoff after precipitation events, preventing the establishment of invasive plants, and providing forage and habitat for wildlife. Establishing native species is a more cost effective strategy than trying to restore native plant communities from annual grass monocultures or sites dominated by invasive forbs.

Restoration and monitoring will continue for the next several years. Additional seeding efforts may be needed depending on establishment success and persistence of native plants seeded this winter. In arid regions, precipitation is highly variable, causing uncertainty and high failure rates in germination and seedling establishment. Recent reviews of the factors limiting seeding success have recommended a "bet hedging" strategy (Madsen et al. 2016). Rather than applying seed at high rates during a single fall seeding, seed is applied at lower rates, with multiple seedings at varying times of year. With multiple seedings, native species have more opportunity to utilize soil moisture conditions maximizing the probability of establishment.

NPS Photo by Margaret Horner

Helicopter returning with empty hopper after seeding.

Both the park and BLM will be monitoring vegetation to document post-fire recovery and the success of revegetation efforts. The BLM has partnered with the USDA Agriculture Resource Service to monitor biological soil crusts and dust flux (particles/m^2/second). Portable weather stations have also been installed on NPS and BLM lands to measure precipitation, temperature, soil moisture, and wind. Invasive plant surveys and treatments are already underway. Restoration efforts will aid the recovery of native plant species and limit the establishment of undesirable species improving soil stability, wildlife habitat, and the stability and resilience of the Strawberry Creek watershed.

NPS Photo by Bryan Hamilton

Hopper used to distribute seed over burned area.

Literature Cited:

Madsen M.D., K.W. Davies, C.S. Boyd, J.D. Kerby, and T.J. Svejcar. 2016. Emerging seed enhancement technologies for overcoming barriers to restoration. Restoration Ecology, 24:S77-S84. doi:10.1111/rec.12332

Steps to BCT Recovery on Snake Creek

By Jonathan Reynolds, Fisheries Biologist

In August of 2016 Great Basin National Park, in collaboration with Nevada Department of Wildlife (NDOW) and staff from other NPS units, conducted a rotenone treatment on Snake Creek. The goal of the treatment was to eradicate all non-native fish in the section of Snake Creek that is located within the park boundary. This will allow the park to reintroduce Bonneville cutthroat trout (BCT) into the largest South Snake Range stream identified as a BCT conservation population in the 2006 *Conservation Agreement and Conservation Strategy for Bonneville Cutthroat Trout in the State of Nevada*.

This summer, the fisheries crew will conduct electrofishing validation surveys to ensure the treatment was successful. The entire length of the treatment area will be electrofished twice by a three-person crew. After the validation surveys are completed, an extensive eDNA analysis of Snake Creek will be conducted. This fairly new, but rapidly evolving technology, allows fish biologists to detect fish species by simply testing the stream water for their DNA. Using the protocol provided by the United States Forest Service, samples will be collected by filtering five liters of stream water. The filters will then be sent to the Rocky Mountain Research Station where Forest Service scientists will test them for brook trout, brown trout, and rainbow trout DNA. A total of 74 sites (one site for every 200 meters of stream) will be sampled in order to thoroughly cover the entire watershed. If fish are not encountered during the validation surveys and fish DNA is not detected during the eDNA analysis, then Snake Creek will be ready for the reintroduction of BCT.

Great Basin National Park will work closely with NDOW to determine which Snake Range BCT population will be the source for the reintroduction. NDOW will also assist with collecting BCT from the source population, transporting them to Snake Creek, and releasing them into predetermined locations. If everything goes as planned, the reintroduction will occur in June of 2018.

NPS Photo by Nathan Cullen

Filtering stream water to test for fish DNA.

NPS Photo by Nathan Cullen

Electrofishing Snake Creek to relocate native fish before treating the creek with rotenone.

Free Booklets about Plants, Wildlife, and Ecosystems

The Utah Master Naturalist program provides great classes on a variety of topics for those who would like to learn more about Utah's great places. They even venture a little farther sometimes, including coming to Great Basin National Park last fall, with another visit slated for this fall. To see their schedule, check out: http://extension.usu.edu/utahmasternaturalist/htm/schedule

They have also written free downloadable booklets about plants, wildlife, and ecosystems. If you'd like to learn more, check them out: https://extension.usu.edu/utahmasternaturalist/htm/learn/resources

Stalagmites Show Drying of the Great Basin 8,200 Years Ago

by Elena Steponaitis, Postdoctoral Fellow, Tulane University

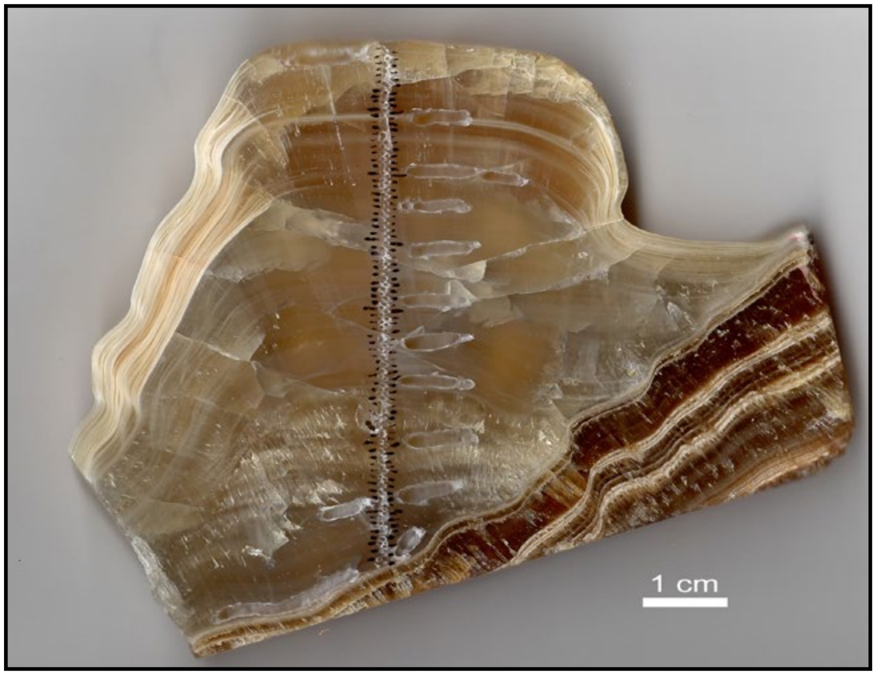


Photo by Elena Steponaitis

Photo of a stalagmite that has had samples taken from it for geochemical analysis in order to study changes in climate.

The Great Basin has experienced dramatic hydroclimate changes over the past 30,000 years and beyond. Today's dry Great Basin is very different from the much wetter conditions that prevailed over most of the last 30,000 years.

Stalagmites from caves are rich archives of past climate information. Geochemical analyses of stalagmite calcite can provide information about past conditions in and around a cave. Importantly, stalagmites can be precisely dated using a radiometric method that exploits the decay of uranium to thorium within the sample over time.

With the help of the staff at Great Basin National Park, our research group at MIT used stalagmite samples from Lehman Caves to study the timing of this drying event in the region. By studying the timing of past climate changes in the Great Basin relative to global-scale climate events, we can begin to understand what kinds of changes might be in store in the future.

Lehman Caves was an ideal location for this type of study because so many of the cave's stalagmites had been previously broken off and piled up inside the cave by late 19th and early 20th century occupants, so our work did not involve doing any additional damage to cave formations.

Over the course of several trips into the cave, our group took small samples for dating from the tops and bottoms of the already broken stalagmites in order to find samples in the age range of interest. Additionally, with the help of the park staff, we were able to conduct a cave monitoring study that helped us interpret the geochemical results we obtained from the stalagmite.

The selected stalagmites were slabbed and polished and then finely sampled down their growth axes for geochemical analyses that can be used to study changes in climate. Together, these analyses produce a time series of data points that span the amount of time between when the stalagmite started growing and when it stopped growing. Stalagmite records are very useful in part because we can sample the stalagmite for dating at multiple points along the growth axis, so we can get a very good idea of exactly when climate changes occurred in the record.

Our record from Lehman Caves suggests that the region dried rapidly after about 8,200 years ago. This is broadly consistent with existing records from many parts of the Great Basin, but the dating precision of this stalagmite record makes it particularly useful for trying to understand how the Great Basin "reacted" to known global-scale climate events. Interestingly, the timing of rapid drying of the Great Basin shown in this record is approximately coincident with the timing of the collapse of the Laurentide Ice Sheet, a large event which is visible in paleoclimate records from around the globe. Though more work needs to be done to understand the exact climactic mechanisms that caused this abrupt drying in the Great Basin, this study in Lehman Caves is an important step towards understanding when and how this drying happened.

Read more in Quaternary Science Reviews, 2015, vol 127:174-185.

Measuring Fuels in Bristlecone Pine Communities

By Curtis Gray, Ecologist, Utah State University

Great Basin bristlecone pines (*Pinus longaeva*) are among the oldest organisms on earth, an icon of western forests. Bristlecone pines grow at the highest elevations in mountain ranges of the Great Basin in the western United States, and many park visitors have seen the ancient groves.

Bristlecone pines also grow in mid elevation mixed conifer forests, and sometimes even in low elevation forests.

Growing mostly high on mountain peaks, Great Basin bristlecone pine ecosystems are naturally fragmented. Fires are infrequent in high elevation bristlecone pine forests due to sparse fuels, and little was previously known about fuels in these forests. However, recent fire activity in Great Basin bristlecone pine forests (e.g., the Phillips Ranch Fire, 2000; Amos Canyon Fire, 2009; and the Carpenter 1 Fire, 2013) have burned many ancient trees. When fires do occur at high elevations, they are usually small, low-severity, surface fires.

Our recent research has increased understanding of Great Basin bristlecone pine ecology by examining how fire regimes may change with warming air temperatures. Our objective was to measure discontinuous wildland fuels across changing environmental gradients in bristlecone pine stands. Environmental gradients describe changes in conditions such as elevation, temperature, humidity, and water availability.

Measuring litter under bristlecone pine trees to better understand how fire spreads in those ecosystems.

Forest composition usually changes along environmental gradients in predictable ways. For example, elevation is a surrogate to approximate changes in temperature and moisture. Understanding how fuel structure and composition varies throughout the Great Basin is useful to predict how fire frequency and intensity may change at high elevations with a changing climate.

We measured changes in fuels from the lowest elevations to the alpine treeline at several locations, including two in Great Basin National Park. Different fuel classes (the down dead vegetation) were tallied from the forest floor and converted to fuel loads. Fine woody debris (sticks, twigs, and pine needles) are the class of fuels that typically allow a wildfire to advance, while coarse woody debris (logs), indicate how long a fire burns at a particular site. During field data collection, we noticed that fuels accumulate directly beneath trees, which were not represented in current monitoring protocols. We measured fuels in north-east-south-west transects below tree trunks. We found that fuels predictably decrease with increasing elevation. At low elevations, fuels are heavy and in close proximity to ignition sources, while becoming too sparse to carry fire at high elevations. With climate change, we might expect high elevation stands to resemble current low and mid elevation stands with an increased risk of forest fires.

For decades, fire suppression has contributed to increases in woody fuels, canopy cover, and fuel continuity, which in turn, leads to larger fires that are more severe as fuels increase and become more connected. Interestingly, however, fire suppression, which produced unnatural fuel accumulations throughout the American West, was not used in high elevation pine forests, where bristlecone pine are located. Although large fires that burn entire bristlecone pine stands are rare, our more precise measurements and analysis identifies elevations that are the most susceptible to fire.

Managing bristlecone pine stands might be unprecedented, but fuels management could have large impacts on preventing large fires in these highly prized communities. The greatest fire threat to bristlecone pines located on high peaks are fires that are ignited at lower elevations on hot, windy days that move into the upper forests. Improved fire and fuels models would help describe the discontinuous fuels for these iconic and fragmented species.

Gray, C.A. and Jenkins, M.J. 2017. Climate warming alters fuels across elevational gradients in Great Basin bristlecone pine-dominated sky island forests. Forest Ecology and Management, 392:125-136.

Results of the 2016 Centennial Bird BioBlitz

By Gretchen Baker, Ecologist, GRBA and Kelly Colegrove, Biologist, Great Basin Bird Observatory

Photo by Annette Hansen

Numerous field trips were held during the Centennial Bird BioBlitz.

To celebrate the 2016 Centennial of the National Park Service, Great Basin National Park held a Bird BioBlitz on May 20-22, 2016. During the 2.5 day event, over 1,500 volunteer hours were spent looking for birds. We recorded 1,843 birds representing 73 species. The most common were Mountain Chickadees, Clark's Nutcrackers, and Pine Siskins (Figure 1).

Locations with over 30 species found included Grey Cliffs Campground, Snake Creek, Rowland Springs and the Sewage Lagoons, Strawberry Creek Road, and Upper Lehman Creek. A total of 18 field trips went to these locations and others, including some to remote locations that located species not found anywhere else.

The BioBlitz also included 11 presentations, two bird illustrating workshops, two live bird demos, and one live reptile demo. Over 150 participants (including 35 school kids) attended, with at least 11 states represented (NV, UT, WI, CO, MS, OR, MD, AZ, WA, MT, CA). Numerous bird photos were taken as vouchers to document the birds that occur in the park.

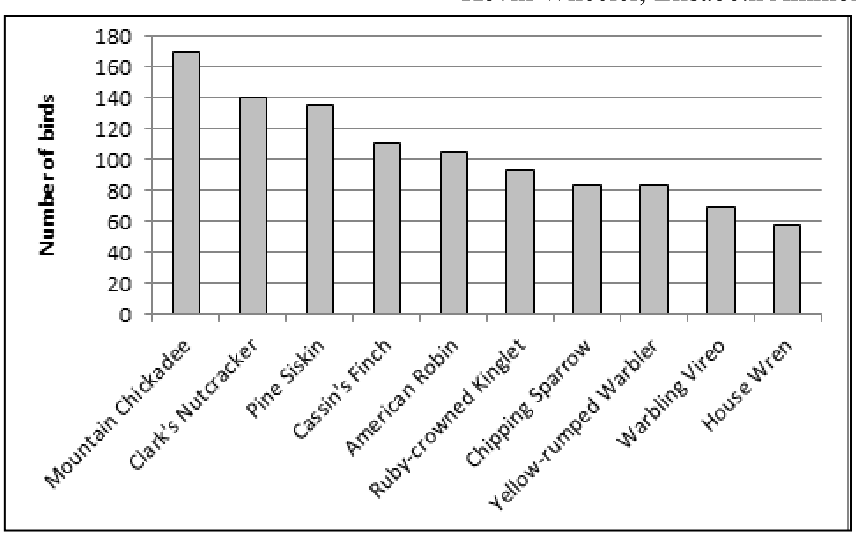


Figure 1. Most common bird species found during the 2016 Centennial Bird BioBlitz at Great Basin National Park. A total of 1,843 birds representing 73 species were seen during the 2.5-day event, attended by 150 participants.

Special thanks to:
* All of our field trip leaders (Lois and Mark Ports, Dave Henderson, John B. Free, Melissa Renfro, Janice Gardner, Neil Paprocki, Kevin Wheeler, Elisabeth Ammon, Kelly Colegrove)
*All of the presenters (Joe Doucette, Kevin Wheeler, Mark Kirtley, Neil Paprocki, Evan Buechley, Bryan Hamilton, Elisabeth Ammon, Martin Tyner, Gretchen Baker, Mark Ports)
* Artists-in-Residence (Miki Harder and Kristin Gjerdset)
* Great Basin National Park Foundation for lunch
* Western National Parks Association for raffle prizes
* Elisabeth Ammon and Kevin Wheeler for helping with planning
* Beth Cristobal for registration
* Kelly Colegrove for data analysis
* ALL the Participants!!!

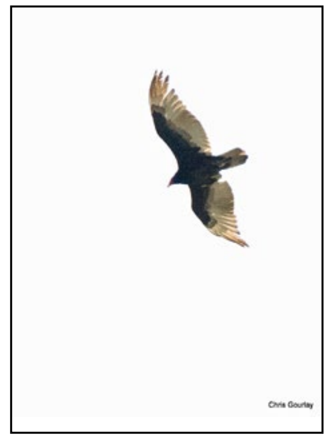
Following the BioBlitz, Great Basin Bird Observatory did data analysis on all the park's bird data. This resulted in an increase of 15 species to the park's Bird Checklist. Nomenclature and abundance and occurrence rates were also updated. This checklist is available at park visitor centers and the park website.

In addition, following the BioBlitz and data mining, NPSpecies was updated with an additional 33 bird species!

Bird BioBlitz Results (continued)







Photos from the 2016 Centennial BioBlitz: top row- Cedar Waxwings (John Dickson), Cassin's Finch (John Dickson), Green-tailed Towhee (Evan Buechley); bottom row - Black-headed Grosbeak (Evan Buechley), MacGillivray's Warbler (Annette Hansen), Turkey Vulture (Chris Gourlay).

Recent Publications about Great Basin National Park

Bruening, Jamis M., Tyler J. Tran, Andrew G. Bunn, Stuart B. Weiss, and Matthew W. Salzer. 2017. Fine-scale modeling of bristlecone pine treeline position in the Great Basin, USA. Environmental Research Letters 12(1):014008. https://doi.org/10.1088/1748-9326/aa5432

Gray, Curtis A., and Michael J. Jenkins. 2017. Climate warming alters fuels across elevational gradients in Great Basin bristlecone pine-dominated sky island forests. Forest Ecology and Management 392:125-136.

Hyde, Joshua C.; Blades, Jarod; Hall, Troy; Ottmar, Roger D.; Smith, Alistair. 2016. Smoke management photographic guide: a visual aid for communicating impacts. Gen. Tech. Rep. PNW-GTR-925. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 59 p. https://www.fs.fed.us/pnw/pubs/pnw_gtr925.pdf

Steponaitis, Elena Anne. 2016. Deep-lake carbonates and speleothems as high-resolution archives of paleohydrology in the Bonneville Basin, UT." PhD diss., Massachusetts Institute of Technology. https://dspace.mit.edu/handle/1721.1/103248

Wu, Rui, Chao Chen, Sajjad Ahmad, John M. Volk, Cristina Luca, Frederick C. Harris, and Sergiu M. Dascalu. 2016. A real-time web-based wildfire simulation system. *In* Industrial Electronics Society, IECON 2016-42nd Annual Conference of the IEEE, pp. 4964-4969. https://www.cse.unr.edu/~fredh/papers/conf/167-artwbwss/paper.pdf

Rare Species Find Reaffirms Importance of Long-Term Research

By Kathleen Slocum, Biological Science Technician

NPS Photo

Recently found Ringneck snake.

A seemingly small but important victory for long-term ecological research was accomplished when the presence of a ringneck snake (*Diadophis punctatus*) was documented for the first time within a 100-mile stretch of this region. It is a vital piece of the natural history of these highly cryptic snakes that would likely have stayed missing longer if not for someone visiting the same spot in the desert every year, 10 times a year, for 18 years.

A study in the March edition of BioScience found long-term ecological research (LTER) studies had significantly larger impacts on environmental policy and ecologic advancement than shorter-term ecological research. This supports recent ecological literature reviews, including a November review of almost 20 years of NPS Inventory and Monitoring Division-based research in the journal *Ecosphere*.

While there are many definitions, "long-term" here means five to ten years or more of continuous data. LTER investigates foundational ecological processes and the relationships between them, and helps document rare events or unanticipated ecological surprises. Comprehensive datasets are necessary for assessing complex problems, such as changes in land-use, species invasions, and climate change. For managers, LTER informs how to create and prioritize conservation strategies, and helps assess the effects of previous strategies. LTER is necessary for discerning if changes are the result of anomalous short-term events or large-scale pattern shifts. As LTER yields site-specific ecological trends, these findings can then be used to test hypothesis-driven short-term studies, which ideally are translated into effective place-based management decisions. Quality LTER is applicable to outside of its own discipline; large, comprehensive studies promote interdisciplinary research, such as understanding how rodent population changes affect disease vectors to humans (e.g., Hanta virus), or providing background data for relating ground water pumping to upland stream ecosystem health.

Long-term research needs to be statistically credible, cost-effective, and address the needs of stakeholders. However, it is generally difficult to start LTER programs because of high start-up costs, the inherent time delay in obtaining results, and difficulty in recognizing or quantifying benefits (e.g., the monetary value of documenting a rare species). LTER requires careful planning of all study aspects from data collection to interpretation, particularly in situations with interagency cooperation, frequent staff turnover, and shifting budgets. Having data be easily discoverable is an increasingly important aspect of LTER efforts; for Great Basin N.P. and other federal projects, government transparency and archival regulations ensure data is publicly accessible.

Great Basin N.P. participates in and manages multiple long-term data sets. Annual snake and small mammal surveys are in their 18th year. Continuous precipitation data has been recorded at Lehman Caves Visitor Center since 1937; GRBA has participated in several widespread, long-term climate and air quality monitoring efforts, and currently collects data for the Interagency Monitoring of Protected Visual Environments program (IMPROVE), started in 1985. Snow surveys, as part of the USDA's Natural Resources Conservation Service effort started in 1939, have taken place in Baker

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Importance of Long-Term Ecological Research (continued)

Creek drainage since the 1942, and the Wheeler Peak SNOWTEL site was installed in 2010. Great Basin N.P. coordinates volunteers to participate in National Audubon Society's Christmas Bird Count, which started in 1900.

Great Basin N.P. is also adopting long-term monitoring protocols for sagebrush and five-needle pines that have multi-park footprints, which will give greater context to the unique findings at each park. NPS-generated information is available to the public through online agency portals such as the [Integrated Resource Management Applications (IRMA)](#).

Great Basin N.P. also is part of the larger Mojave Inventory and Monitoring Network. The NPS Inventory and Monitoring Division (IMD) was started in 1998 by congressional mandate to provide park managers with broad-based information on the status and trends of their entrusted ecosystem and resources. The IMD was purposively structured to be top-down and wide-reaching, in order to bridge program, activity, and funding boundaries inherent to the independent structure of park resource programs. The Vital Signs Monitoring program, in place for almost 20 years, uses standardized practices of resources assessment across and between their networks to scale-up and contextualize information gathered on air quality, water quality, and other vital resources at individual park units. Great

Ringneck snake in the wild.

Basin N.P.'s vegetation, soil, and geologic resource maps have been produced from this work.

Direct action and planning can take effect on the basis of comprehensive, long-term data. Model Cave was closed to recreation after comprehensive surveying revealed its rich and sensitive biodiversity. As we come into fire season, long-term trends of climate patterns paired with accurate vegetation data allows the park to better anticipate fire behavior and potential suppression needs before fires occurs.

Having quality long-view data is crucial to all park operations, not only natural resources. Visitor-use data informs administrative policies and allocation of interpretation, law enforcement, and maintenance resources. It also affects volunteer opportunities for the public. Park visitation data has been collected since 1933, and GRBA visitor use report cards have been collected since 1998. The Visitor Services Program, through the University of Idaho, assesses the economic impacts of visitation to park units by region, state, and nationally using visitor information collected since 1982.

At Great Basin N.P. and in other park units, LTER helps us fulfill the mission to preserve unimpaired the resources for future generations by making the necessary investments for sound and scientific management.

Sources

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Caughlan L. and K.L. Oakley. 2001. Cost considerations for long-term ecological monitoring. Ecological Indicators 1:123–134.

Lindenmayer D.B. et al. 2012. Value of long-term ecological studies. Austral Ecology 37:745–757.

Rodhouse T.R, et al. 2016. Ecological monitoring and evidence-based decision-making in America's National Parks: highlights of the Special Feature. Ecosphere 7:e01608.

Join us for Public Bat Mistnetting on June 30, 2017!

Meet at the Lehman Caves Visitor Center at 6 pm.
Contact Kathleen_Slocum@nps.gov for more information.

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

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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

2017 Lichen BioBlitz

This year, Great Basin National Park will hold its ninth BioBlitz. Each year, the park focuses on a different topic, from beetles to birds and now to lichens. Results help the park learn more about what lives in the park and where it is found.

What are lichens? They are an organism made up of fungi, algae, and sometimes bacteria. Lichens can grow on soil, trees, rocks, and more. They can live thousands of years. Some are very particular about air quality, and so only grow in the cleanest air. Disappearence of those species indicates problems not only for the lichens.

In 2014 Natassja Noell and Jason Hollinger studied the lichens on Wheeler Peak to repeat a lichen study done in the 1950s. They found about 50 species of lichens just at the top of the peak.

In 2015, the park funded a small baseline lichen survey by Dr. Brad Kropp from Utah State University. He set up 14 plots and spent a couple hours at each one. He found 123 lichen species in these plots. In addition, there are 37 lichen species from the Wheeler Peak list weren't in those plots. That means that there are now 160 known lichen species in the park, and probably many more!

NPSpecies, the database that records what lives in each park, shows zero non-vascular plants in the park. Now we're up to 160 species in just a few years. With this summer's Bioblitz focusing on lichens, we're expecting the list to grow even more.

Photo by Brad Kropp

***Xanthoria elegans*, one of the most common and easiest identified lichens in the park due to its bright orange color.**

Photo by John Dickson

You're invited to participate in the 2017 Lichen BioBlitz! Guided hikes to various locations in the park with lichen experts will be offered, as well as talks about lichen natural history, an art workshop, and more. To sign up, email GRBA_BioBlitz@nps.gov

Upcoming Events:

June 30 Public BatBlitz Help learn about the park's bats with mistnestting at night. Contact Kathleen_Slocum@nps.gov for more info.

July 9, August 7, September 6, Full Moon Hikes Experience the park at night without flashlights. Call 775-234-7500 for more information.

July 17-19, Lichen BioBlitz Help find lichens throughout the park. Email GRBA_BioBlitz@nps.gov to learn more.

September 21-September 23, Astronomy Festival Discover the celestial wonders in the dark skies above the park.