



The Midden

The Resource Management Newsletter of Great Basin National Park

Bighorn Sheep in the Snake Range: Status and Restoration

By Bryan Hamilton, Biologist

Bighorn sheep were once the most numerous ungulate in the Great Basin and were described more frequently by early explorers than mule deer and elk. As an important food source for Native Americans, the images of bighorns are captured in rock art throughout the region. In spite of such historical abundance, bighorn sheep declined precipitously and were extirpated from the Snake Range by 1940, primarily due to overhunting and habitat degradation.



A bighorn sheep pictograph

The Nevada Department of Wildlife (NDOW) has aggressively pursued a program of trapping and transplanting bighorn sheep across the state. This program has restored three subspecies of mountain sheep into their historic range. Thanks largely to these efforts, Nevada currently has the largest bighorn sheep population in the lower 48 states.

Nevertheless, restoration efforts in the South Snake Range, which includes Great Basin National Park,

have been only marginally successful. In 1979, eight bighorn from Rocky Mountain National Park, Colorado, were released into the South Snake range, west of Wheeler Peak. This was followed by a release of twelve additional bighorns from the Tarryall Range in Colorado. While this population has persisted, it has not increased and is currently estimated at 20-25 individuals. While the South Snake Range bighorn herd has faltered, the North Snake Range population has successfully expanded. Releases in 1975, 1981, and 1990 totaled 48 bighorn. The population declined to low levels in the 1990s but showed signs of recovery after 2000. In January 2006, this herd was augmented with 30 bighorn from the Humboldt Range, Elko County Nevada and limited hunting has resumed.

In an effort to restore viable bighorn sheep populations to the South Snake Range, NDOW and Great Basin National Park have initiated a partnership. Healthy, reproducing ewes are the key to successful bighorn populations and as a first step in this partnership, a pilot study focused on ewes is in progress. Three ewes were captured by a helicopter crew with a net gun in January 2009, tested for disease, and outfitted with GPS collars.

Our initial findings suggest that while winter habitat is limited, ewes are utilizing recently burned areas as overwintering and lambing habitat. Consistent with most bighorn populations, ewes are apparently



A Rocky Mountain bighorn sheep

lambing in extremely steep, rugged areas. Disease and nutrient level testing shows that although the sheep have low selenium levels (which may reduce their reproductive success), the sheep are generally healthy.

Following this pilot study, a larger restoration project is planned. The primary objective of this project is to determine the potential for augmenting the South Snake Range bighorn herd with additional individuals from Nevada. When considering augmentation, an important concern is the level of risk presented by potential interactions between bighorn and domestic sheep.

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Bighorn Sheep in the Snake Range (continued)

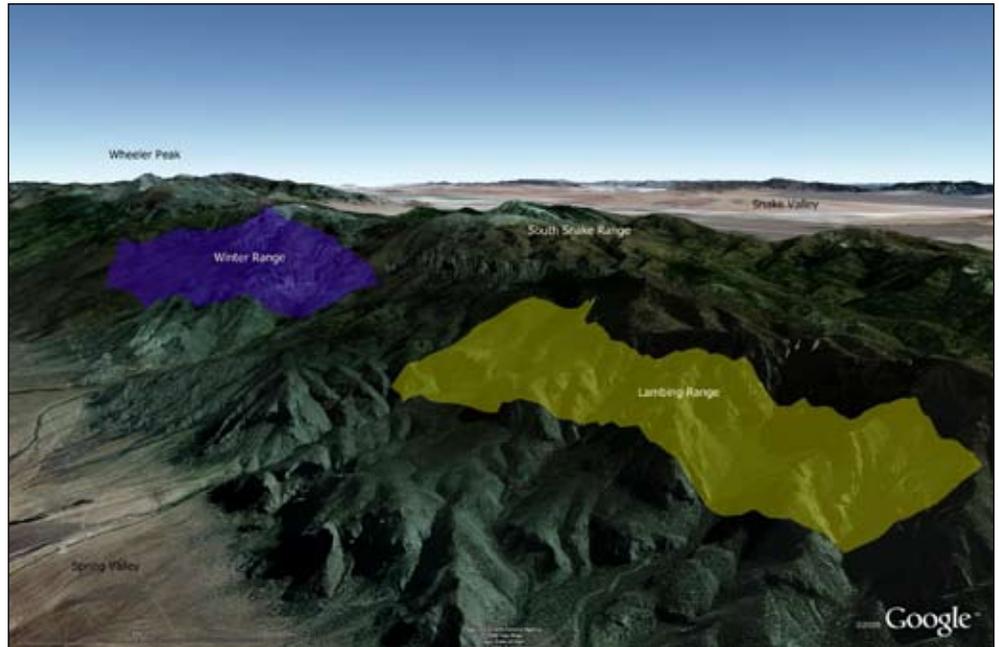
Towards this end, the current level of interactions between domestic and bighorn sheep will be determined.

Other important questions about bighorn sheep in the South Snake Range that will be addressed include habitat utilization (winter, lambing and breeding range), survival, recruitment, fecundity, age class structure (ewe: lamb ratios), and metapopulation dynamics between the North and South Snake Range herds. The potential for bighorn augmentation in the South Snake Range is high. Several recent high elevation fires have expanded bighorn habitat, and sheep are already utilizing these areas. The bighorn sheep population was once estimated at 10-15 individuals, but is currently at 20-25, suggesting that habitat conditions have improved.

The ultimate goal of this restoration effort is a viable South Snake Range bighorn population which can

support limited harvest, provide viewing opportunities to park visitors, and reestablish metapopulation dynamics with the North Snake Range herd. As an important part of the ecosystems and cultural heritage of the Great Basin,

the successful restoration of bighorn herds to the Snake Range is a testament to the science-based wildlife and land management practices of NDOW and the public land management agencies in eastern Nevada.



Bighorn sheep ewe winter range is shown in purple further to the north than the lambing range, the wide strip of yellow in the southwestern part of the Snake Range.

Recent Publications about Great Basin National Park

Glaudas, X., S. R. Goldberg, and B. T. Hamilton. 2009. Reproductive ecology of a cold desert viperid snake from North America, the Great Basin rattlesnake (*Crotalus lutosus*). *Journal of Arid Environments* 73:719-725.

Hamilton, B. T. 2009. Small mammals in portions of Great Basin National Park susceptible to groundwater withdrawal: Diversity and stable isotope perspectives. Masters Thesis, Department of Biology, Brigham Young University:1-79.

Horner, Margaret A., Gretchen M. Baker, and Debra L. Hughson. 2009. Baseline Water Quality Inventory of Great Basin National Park. Natural Resource Report NPS/PWR/GRBA/NRTR—2009/201. National Park Service, Fort Collins, Colorado. Available at: <http://www.nature.nps.gov/publications/NRPM/nrtr.cfm>. Final report of a year-long study documenting water quality in a variety of water sources.

Prudic, David E. and Pat A. Glancy. 2009. Geochemical investigation of source water to Cave Springs, Great Basin National Park, White Pine County, Nevada: U.S. Geological Survey Scientific Investigations Report 2009-5073, 28 p. Available at: <http://pubs.usgs.gov/sir/2009/5073/>. Study and results of the source of water to Cave Springs, the water supply for the park headquarters area.

Shear, W. A., S. J. Taylor, J. J. Wynne, J. K. Krejca. 2009. Cave millipeds of the United States. VIII. New genera and species of polydesmid millipeds from caves in the southwestern United States. *Zootaxa* 2151:47-65. Available at: <http://www.mapress.com/zootaxa/list/2009/zto2151.html>. See article on page 6 for more information.

Taylor, Steven J., Jean K. Krejca, Michael E. Slay, and Terry L. Harrison. 2009. Milbert's Tortoiseshell, *Aglais milberti* (Lepidoptera: Nymphalidae): a facultative troglaxene in alpine caves. *Speleology Notes* 1:20-23. Available at: <http://speleologynotes.edu>. A brush-footed butterfly commonly found in riparian areas was detected in two alpine caves in Great Basin National Park.

Cultural Resource Accomplishments and Changes

By Karla Jageman, Archeologist

The cultural resource program at Great Basin National Park has been very busy over the past year. Archeological site condition assessments in the park were completed, a cultural Landscape Inventory of the Johnson Lake Mine was begun, the Nevada Rock Art Foundation visited the park to record several rock art sites, our former Cultural Resource Manager left in September, and the new Cultural Resource Manager arrived in May.

Over the past two years, the park was able to complete condition assessments on all known archeological sites in the park. These sites were updated in a nationwide archeological database called Archeological Sites Management Inventory System (ASMIS). The database is available to the park's cultural resource staff and allows them to maintain accurate records of the known archeological sites in the park.

The goal of the condition assessment mandate by the Washington, D.C. office is to assess site conditions for mitigation purposes. For example, the assessments will allow park staff to determine what needs to be done in order to maintain archeological sites for the future and to protect them from vandalism and looting.

The park's goal is to continue to perform condition assessments on sites as required by the ASMIS database. The timeframe for performing condition assessments on sites can vary from one to fifteen years, depending on a variety of factors. For example, a site will be visited more often if it is easily



Mill site at Johnson Lake mine

accessible and more susceptible to vandalism, looting, and decay. One site that will need a condition assessment completed every year is the Johnson Lake Mine.

A Cultural Landscape Inventory (CLI) was undertaken at Johnson Lake Mine in the summer of 2008. "A CLI is a comprehensive inventory of all historically significant landscapes within the National Park System..."

The CLI is an evaluated inventory that provides baseline documentation for cultural landscapes. It documents general descriptive information, existing documentation, and management information. The CLI looks at the physical development and historical significance of the landscape, including eligibility for the National Register of Historic Places. Existing and historic characteristics that contribute to the significance

are described and evaluated. They include characteristics such as natural systems, spatial organization, land use, vegetation, circulation, structures, and views. The CLI also assesses the integrity and condition of the landscape. Information is gathered primarily from secondary sources and through field surveys of the landscape (Harmon 2001: 311).

Johnson Lake Mine was listed on the National Register of Historic Places (NRHP) in 1995 as a Historic District. The CLI will expand upon the information found in the NRHP nomination form. The Johnson Lake Mine was an early 20th century tungsten mine in the Snake/Bonita Mining District. The mine was at a high elevation, approximately 11,000 feet. It was in operation from about 1916 to 1935, when the mine was shut down by an avalanche.

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Cultural Resources (continued)

It included a mill, stable, cookhouse, three possible residences, a collapsed tramway station, an aerial tramway, and a partially collapsed mining adit.

Some of the things discussed by the CLI team, which included park cultural staff, regional cultural staff, and staff from an archeological contracting company, included the high cut stumps near the residence buildings and expanding the historic district boundaries to include the road/trail that leads up to the mine.

The Cultural Landscape Inventory is currently in draft form and should be completed sometime in late 2009. It is important to remember that the structures and features at the mine are unstable. Visitor safety is important to the park; therefore visitors should stay out of the structures and away from the collapsed mining adit.

The Nevada Rock Art Foundation (NRAF) returned to the park last August to assist recording two known rock art sites. NRAF specializes in recording rock art in Nevada and their eagerness in recording rock art for the park is greatly appreciated.

There are two different types of rock art, pictographs and petroglyphs. Pictographs are designs drawn using natural pigment, generally red, such as ochre. Petroglyphs are designs that are pecked or scratched into rock surfaces. The first site is an early pictograph site which is approximately 3,000 years old. This date is based on excavations at the site in 2000. The other site that NRAF assisted the park in recording was a petroglyph site of undetermined age. Both sites are important to our



New cultural resource manager, Eva Jensen

understanding of Great Basin rock art. With the assistance of NRAF the documentation of these sites is now finished and the completed paperwork should be sent to the park in late 2009.

A major change to the cultural resource program was the loss of our Cultural Resource Manager to another park. JoAnn Blalack left the park at the end of last September to become the Cultural Resource Manager at Craters of the Moon National Monument and Preserve in Idaho.

The natural and cultural resource program was happy to welcome Eva Jensen to Great Basin National Park in May as the new Cultural Resource Manager. She comes to the park from southern Nevada and the Lost City Museum. In the few months that Eva has been here, she has brought new perspectives and an infusion of enthusiasm to the cultural resource program. Her input, expertise, and passion are a welcome addition to the cultural resource staff and to Great Basin National Park.

With all of these activities and changes the cultural resource program looks forward to all of the new opportunities available in the coming years. Pending projects include the archeological survey and clearance of the Snake Creek Campground

and Road Improvement project, the stabilization of structures at the Johnson Lake Mine, and the rerouting of the trail to the Johnson Lake Mine. These and many other projects will continue to keep the cultural resource management staff busy for years to come.

There is always something new to learn and something new to find, around every corner and under every rock. Enjoy and respect your Great Basin National Park cultural resources and help the staff to protect them for generations to come.

References

Harmon, David. 2001. *Crossing Boundaries in Park Management: Proceedings of the 11th Conference on Research and Resource Management in Parks and on Public Lands*, Hancock, Michigan: The George Wright Society.

Stella Lake: A Glimpse into the Past

By Scott Reinemann, Ohio State University

In August 2007 I spent eight days in Great Basin National Park (GBNP), participating in fieldwork to collect paleoenvironmental data for my Master's thesis titled "A Chironomid-Based Paleolimnological Study of Recent and Mid-Holocene Changes in Mean July Air Temperature in the Great Basin, Nevada, USA."

I was joined in the field by David Porinchu, Bryan Mark, Jim Degrand, and Adam Harrington, all from The Ohio State University. GBNP is a beautiful park and spending a week hiking among its mountain peaks and beautiful sub-alpine lakes while conducting research for my Master's thesis was very gratifying. Furthermore, this was my first experience with fieldwork, and the data and knowledge I brought back turned out to be very rewarding.

I chose Great Basin National Park to conduct my research following the encouragement of Professors David Porinchu, Bryan Mark, and Jason Box, who have been conducting research in the park since the summer of 2005. The OSU Geography research program is focused upon describing the patterns and processes responsible for controlling the hydro-climatology of GBNP.

GBNP is situated in a transition zone between winter-dominated and summer-dominated precipitation regimes. Understanding the variability of the spatial extent of these precipitation regimes in the past may help in anticipating future climate conditions.



Coring Stella Lake, August 2007

There are a number of sub-alpine lakes present in GBNP, which act as archives of past climate conditions and provide a superb means of reconstructing past environments.

I recovered sediment cores from two of these lakes: Stella Lake and Baker Lake. The 3.28 m core I recovered from Stella Lake spans approximately 7,000 years, while the core I recovered from Baker Lake is only 13 cm, which spans only the past ~100 years.

The sediment samples were analyzed for organic carbon content, magnetic properties, and midge remains in the Integrated Paleoenvironmental Lab, at The Ohio State University. Changes in the Stella Lake midge community were used to develop a temperature reconstruction spanning the past ~ 7,000 years for the central Great Basin.

This study reveals that the central Great Basin was characterized by a warm and arid mid-Holocene period, followed by a cool and moist "Neoglacial" period and then a

return to warmer conditions during the late Holocene time period.

The Stella Lake record broadens our knowledge of the thermal conditions that existed during the Holocene in the Great Basin. This may be useful in constraining model simulations of past climates and improve future climate projections.

Great Basin National Park is a great place to conduct academic research, thanks to the great support of the park staff. I hope to return this summer to continue ongoing research with the team from Geography and Atmospheric Sciences at The Ohio State University.

Editor's Note: Scott Reinemann is the lead author for the article "A multi-proxy paleolimnological reconstruction of Holocene climate conditions in the Great Basin, United States," that will be published in Quaternary Research later this summer.

New Genus of Millipede Described

by Gretchen Baker, Ecologist

A tiny white millipede that has only been found in a handful of caves at Great Basin National Park, including Lehman Cave, has recently been described as a new genus. This addition to science took many years, with collections of the millipede occurring in 2003 and 2006 under the lead of Steve Taylor and Jean Krejca, who are co-authors on the paper. The subsequent study and description was undertaken by William Shear of Hampden-Sydney College in Virginia, the lead author.

The name of the millipede is *Nevadesmus ophimontis*, with “*Nevad*” referring to the state where it’s found, “*desmus*” a common ending for millipedes in the Polydesmidae Family,



Photo by Jean K. Krejca, Zara Environmental

The Snake Range millipede, *Nevadesmus ophimontis*, is a new genus of millipedes, found only in a few caves in Great Basin National Park. It is less than an inch long.

“*ophi*” meaning serpentine, and “*montis*” meaning mountains. Thus the common name is Snake Range millipede.

It is believed that this millipede only lives in caves. Millipedes like cool, moist conditions, so they are relatively rare in deserts. Caves have provided an environment where millipedes can find relative constant humidity and temperatures.

Nevadesmus ophimontis joins several other named endemic species in the Great Basin National Park area, including the pseudoscorpion *Microcreagris grandis* Muchmore, the harvestman *Cyrtobunus unguulatus unguulatus* Briggs, and the conotylid millipede *Idagona lehmanensis* Shear.

The entire article about *Nevadesmus ophimontis* can be found at: <http://www.mapress.com/zootaxa/list/2009/zto2151.html>

Photos and descriptions of many cave species can be found on the park’s website: www.nps.gov/grba in the Nature and Science section.

I & M Beginning Monitoring in Park

By Gretchen Baker, Ecologist

For many years, the Mojave Desert Network Inventory and Monitoring program has been conducting inventories in the seven parks that make up the network. This year marks the first official year of monitoring, with the streams and lakes protocol being implemented in Great Basin National Park.

Monitoring is intended to be long-term. Each stream in the park has had a monitoring location designated. In the late summer, these sites will be visited to conduct water quality monitoring and to collect aquatic macroinvertebrates. The aquatic macroinvertebrates are an indicator of the water quality—some species have specific requirements, such as extremely clean water, for where they



Measuring water quality in the middle of Stella Lake in the late spring.

live. If those macroinvertebrates are found, then the water is known to be of a certain quality.

In addition, a multiparameter water quality probe is being deployed for two weeks at a time and rotated among creeks. The data collected will show how water quality fluctuates in that period, including how sunlight might affect photosynthesis and thus water quality.

The six sub-alpine lakes will be sampled on a rotating basis. Water quality is the focus of sampling. Dataloggers have already been installed in two lakes and will be installed in the remaining ones to monitor temperature and water level year-round. These will hopefully also help determine when the ice melts on each lake in the spring.

The stream discharge measuring that the park is conducting at selected sites is also being included in the I&M Monitoring plan.

Great Basin National Park is excited to have this monitoring begin. Additional protocols will be implemented in upcoming years for other habitats.

Park Staff Assist at Mojave National Preserve with Deer Capture

By Meg Horner, Biological Science Technician

Starting in the late 19th century, water sources were developed to facilitate raising cattle in the arid environment of the Mojave Desert. When livestock were removed from what is now Mojave National Preserve, many of the wells and developed water sources were abandoned or removed. The loss or removal of historical water sources brought attention to the possible effects a decrease in water availability could have on wildlife. In response, the preserve initiated a ten year study in collaboration with the University of Nevada – Reno and the California Fish and Game to study effects of water availability on mule deer populations in the Mojave National Preserve, CA.

In 2008, three test areas were created within the preserve: a control with pre-existing, natural water sources; a study area containing wells, troughs and other man-made water sources; and a dry area. These areas were used to obtain data on deer survival, reproductive rates and physiologic condition under differing water source conditions. To track mule deer



Helicopter bringing deer to waiting truck at the processing area

movements and water use, each deer was given an ear tag and fitted with VHF and GPS equipped collars; and remote sensor cameras were placed at water sources.

Mule deer were captured by net gun from a helicopter in January 2008 and January 2009. Great Basin staff assisted veterinarians and preserve staff with processing the animals and collecting data during the 2009 deer capture to gain experience working with ungulates. Each captured deer was processed and then fitted with a radio collar and ear tag. Standard measurements were taken including length and weight. Blood, hair, dental and fecal samples were collected; and physical and sexual condition were determined using ultrasound.

In 2009, a total of 31 deer were captured over four days from two locations. All were female. Twenty-eight were examined for pregnancy, and twenty-six of them were pregnant. Only half of those pregnant were carrying twins.

Even though data is preliminary, the results from the first year of the study shed new light on an understudied mule deer population. The data hint that weather patterns in the late summer and fall have an effect on plant growth and the amount of forage available for deer which likely has an influence on pregnancy and twinning rates in female mule deer the following spring. The fall of 2008 was dryer than the fall of 2007; and subsequently, in January of 2009 there were fewer does carrying twins than in January of 2008. Photos from remote sensor cameras show that mule deer utilize water sources most frequently in August and during the night-time hours.



Photo by Meg Horner, NPS

Neal Darby, Ben Roberts, and Tod Williams assist with evaluating the deer.

The study will provide further information for preserve managers on resource utilization by mule deer, reproductive rates, and use of springs by mule deer and other species of animals. As the study continues, additional data will help to determine the effects of weather variation as well as the availability of water on the physical condition and reproductive rates of mule deer on the Mojave National Preserve that can then be used by managers in other arid environments with mule deer populations.

The skills and contacts Great Basin staff acquired through this collaboration will prove essential for future work with bighorn sheep monitoring in the park and neighboring lands.

For more information about this project, see the Mojave National Preserve Newsletter at <http://www.nps.gov/moja/naturescience/upload/200904science.pdf>



National Park Service
U.S. Department of the Interior

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

Summer and winter issues of The Midden are available on the Park's website at www.nps.gov/grba. To be added to the email notification list, please email Gretchen_Baker@nps.gov.

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.



Beetle Bioblitz Coming Soon

Great Basin will complete its first Bioblitz in 2009 with the help of Southern Utah University and other volunteers. This intensive survey will focus on beetles occurring in the park, using a wide variety of sampling techniques. Interested individuals and amateur and professional naturalists are welcome to participate.

Bioblitzes are generally 24-hour events that focus on collecting a single taxon to learn more about the diversity found in an area. Acadia National Park has been doing Bioblitzes for several years and is the inspiration for this Bioblitz.

In addition to learning about the array of invertebrates found in an area, sometimes a Bioblitz can reveal a new species to science. This happened at Death Valley, when a new ant species was found.

The Bioblitz will be held the weekend of September 11-13, with the actual collecting during a 24-hour period.



Rove beetle

Photo by Gretchen Baker, NPS

The weekend schedule is as follows:

Friday evening - Introduction & Orientation

Saturday morning - Beetle Collecting Workshop

Saturday noon to Sunday noon--Bioblitz

Sunday morning - Educational Program for visitors

The Bioblitz will be headquartered at Great Basin National Park. The park is providing free camping for participants. For more Bioblitz information or a registration form, please email Gretchen_Baker@nps.gov.

Upcoming Events:

Aug 12 Perseid Meteor Shower. One of the most active meteor showers of the year is usually spectacular in the park due to the clear skies.

Sept 5 & 6 Night Sky Program. Learn more about the beautiful night sky. Call the park for more information.

Sept 11-13 Beetle Bioblitz. Help document the beetle diversity in the park.

Sept 27 Ken Burns National Park Series Program begins on PBS. Look for bristlecone pine trees filmed in Great Basin National Park.

Oct 27 Great Basin National Park turns 23! The National Park was expanded from the Lehman Caves National Monument on October 27, 1986.

Nov 11 Veterans Day. Veterans receive free cave tours of Lehman Cave.

Throughout the Year, Great Basin National Park. Volunteer opportunities with resource management are available to help conduct animal surveys, reclaim disturbed lands, measure water quality, and work on other projects. Contact us at 775-234-7331.