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

Index Fossils Found

by Gorden Bell, Environmental Protection Specialist

Photo by Gorden Bell, NPS.

This fossil algae is known as *Receptaculties oweni* and was found in the park last August.

The first taxonomically identifiable fossils from Great Basin National Park were discovered last August by park staff Mark Pepper and Jonathan Reynolds in a stream in the southern part of the park. While they were walking along the streambed, assessing it for reintroduction of native fishes, they noticed an unusual shape and pattern on one of the pebbles in the streambed. A short distance away they found a similarly sized pebble with the same pattern and brought it back to the office.

Both pebbles turned out to be excellent examples of a type of fossil algae known as *Receptaculites oweni*. This species is found widely in North America, mainly in limestones formed during the Middle Ordovician Period from about 471 to 462 million years ago. Because it is known to occur in many places through a very short geologic interval, it is referred to as an index fossil and it enables paleontologists to confidently date the rocks wherever it is encountered. The telltale pattern that allows such easy recognition, and the one the biological technicians noticed, is a supporting framework of closely spaced rods arranged in a "double helix" pattern. This type of pattern has been found to occur in many groups of plants. One of the best and most familiar modern examples is the arrangement of seeds within the central disc of sunflowers.

Two weeks later other park staff and I went back to the same stream, where we found yet another characteristic index fossil for Middle Ordovician rocks, a section of a cephalopod shell known as *Orthoceras*. Unlike modern cephalopods, such as octopi and squids, these *Orthoceras* (meaning "straight horn") had a long, tapering, cylindrical shell that protected their soft body. All species currently referred to this genus are known from rocks formed during that time. A check of the geologic map for the park indicates that Middle Ordovician rocks crop out in the headwaters of this drainage, so it is most likely these fossils washed downstream from that area.

As the geologist and paleontologist at my previous park, it was very exciting to have arrived at Great Basin National Park just as the first well-preserved fossils were found. It was even more fun to find the next ones. Even this small amount of information will help the Resource Management staff plan how and where to begin the park's paleontological inventory, a process that will likely document numerous fossil localities, if the first few discoveries are any indication of the potential fossil richness within the park.

In This Issue

Cave Freshwater Shrimp Named

by Gretchen Baker, Ecologist

A species new to science was recently described and named in an article in *Subterranean Biology* by Steve Taylor and John Holsinger.

The species was found by park staff in a muddy pool deep in Model Cave. This cave has both groundwater and surface water inputs, and sections of the cave are only accessible during parts of the year due to flooding.

Park staff collected several specimens of the tiny (5 mm) white crustacean and sent them to Dr. Steve Taylor. He requested additional specimens, but it took about a half dozen trips until more could be found.


Photo by Steve Taylor, INHS

The newest species known to the park is *Stygobromus albapinus*, a freshwater shrimp.

Following intense scrutiny, it was determined that the freshwater shrimp, or amphipod, was a new species, which they named *Stygobromus albapinus*. The species name *albapinus* refers to White Pine County, the only known county where the shrimp lives. In fact, the amphipod has only been found in Model Cave within the park, and it is unlikely to occur in adjacent mountain ranges.

The nearest known *Stygobromus* amphipod is found in the Ruby Marshes, over 150 miles distant. The genus does not have eyes or pigmentation. This particular species lives in underground waterways.

A link to the *Subterranean Biology* article is available on the park website's publication page.

Remote Camera Surveys Target Mesocarnivores

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

Sixty-seven species of mammals occur in Great Basin National Park and vicinity (Rickart 2007). Surveys to document and monitor ungulates and small mammal populations are on-going; however, little is known about the presence or distribution of mesocarnivores (medium-sized carnivores) at the park. These species are difficult to sample due to their presumed rarity and secretive life histories, but information on the presence and distribution of these carnivores is important because of their designation as park sensitive species and because they play important roles as predators, scavengers, and prey.

Starting in January 2010, five species of sensitive mesocarnivores, spotted skunk (*Spilogale gracilis*), ringtail (*Basssaricus astutus*), ermine (*Mustela erminea*), long-tailed weasel (*Mustela frenata*) and striped skunk (*Mephitis mephitis*), were targeted for remote camera surveys. For two of these species, ringtail and ermine, the park lies at the outer extent of their known range (Hall 1946, Reid 2006); and for ermine, extinction is predicted within this part of its range under an assumed climate change model (McDonald and Brown 1992). In addition to climate change, there are concerns about changes in riparian habitat due to groundwater development and its potential effects on wildlife. Data collected from this project will document target species presence and distribution, determine what habitat types these species occupy, and establish the proportion of use between riparian and upland habitats.

Remote cameras are useful tools for inventorying and monitoring mammals because they can verify the presence of a species, provide a photo voucher, allow for reliable species identification, provide distribution data, and document behavior. Rare or cryptic animals are difficult to sample using conventional methods (ocular surveys or traps) because chances of visual observation are remote, but using camera traps increases the chance of detection by allowing for use of baits, longer sampling periods, and remote sensing (Long et al 2008). Remote cameras serve as a non-invasive, cheap, and reliable survey alternative to standard trapping methods.

The following data represent sampling between January 2010 and March 2011. Seventy-five remote cameras were deployed (38 riparian and 37 upland). Seven

Remote Camera Surveys (continued)

carnivore species were recorded at 33 sites (17 riparian and 16 upland). Only six sites documented target species. Gray fox (*Urocyon cinereoargentus*) were the most common species followed by mountain lions (*Puma concolor*). Ringtail and striped skunk were recorded at three sites. Only one site recorded spotted skunk, and neither species of weasel were recorded (Table 1). Total trap nights for this sampling period were 2,496, resulting in 1,457 animal photos or captures.

Table 1. Total captures for the seven carnivore species encountered during sampling and the minimum number of individuals known alive (MNKA) from remote camera surveys, January 2010-March 2011. Total captures include recaptures of individuals that revisited camera sites.

Species	# sites	Total Captures	MNKA
Ringtail (Bassariscus astutus)	3	7	4
Coyote (Canis latrans)	2	5	2
Bobcat (Lynx rufus)	3	34	3
Striped skunk (Mephitis mephitis)	3	11	3
Mountain lion (Puma concolor)	11	24	11
Spotted skunk (Spilogale gracilis)	1	1	1
Gray fox (Urocyon cinereoargentus)	20	279	24

There were no obvious trends in captures between riparian and upland sites for target species. There were a total of 11 captures of target species (ringtail and striped skunk) at riparian sites (n=4), and 9 total captures of target species (spotted skunk and striped skunk) at upland sites (n=2) (Figure 1). Ringtails were the only target species missing from upland sites, and spotted skunks were the only target species not documented at riparian sites. The same number of carnivore species (n=6) were documented at both riparian and upland sites, but the total number of carnivore captures was greater at riparian sites (Figure 1). The number of carnivores captured per trap night was almost three times greater at riparian sites (0.2 captures/trap night) than upland sites (0.07 captures/trap night).

Gray fox were widespread, probably due to their abundance, mobility, and large home range size. We failed to detect either of the weasel species. Both species have relatively small home ranges and smaller body sizes making them less conspicuous and therefore harder to detect with motion sensor cameras. And because of their prey base, both ermine (short-tailed) and long-tailed weasels have high fidelity to meadows and wetlands which are limited habitat types. The park is dominated by upland vegetation; riparian habitat types account for only one percent of the park's total area. However, there were more total captures of carnivores at riparian sites, and these sites had a higher capture rate for carnivores.

This summer we will focus our efforts at higher elevations and in under-sampled areas of the park. Following the conclusion of surveys in January 2012, further data analyses will be conducted to determine habitat preferences, species distributions and differences in habitat use between riparian and upland sites.

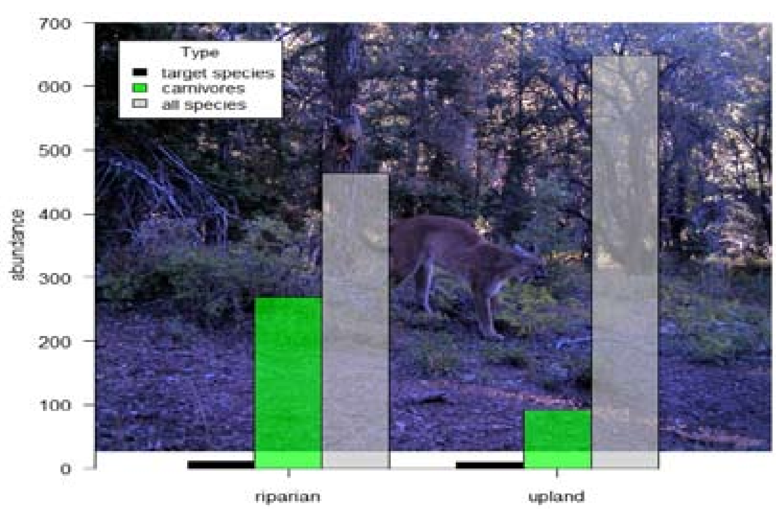

Figure 1. Total captures at riparian and upland sites for three groups: all species, carnivore species and target species by remote camera traps from January to March 2011. Total captures represent the total number of photos taken at all sampling sites within each habitat type. Multiple captures of the same individual are included.

References

-Hall, E. Raymond. 1946. Mammals of Nevada. University of Nevada Press.

-Long, R. A., P. McKay, W. J. Zielinski, and J. C. Ray, editors. 2008. Noninvasive survey methods for carnivores. Island Press, Washington.

-McDonald, K. A. and J. H. Brown. 1992. Using montane mammals to model extinctions due to global change. Conservation Biology 6(3): 409-415.

-Reid, F. A. 2006. Peterson field guide to mammals of North America. 4th. ed. Houghton Mifflin,Boston.

-Rickart, E. A., and S. L. Robson. 2007. A guide to the mammals of Great Basin National Park. Utah Museum of Natural History, University of Utah, Salt Lake City, UT.

Rocks of the Ages: Rock Art Culture Affiliation and Styles

By Nicole Lohman, Archaeologist

If you have driven through the West, there is a good chance you have either visited a rock art site or at least seen one advertised. Ever wonder who made it and when? Archaeologists have been studying rock art for decades to answer these questions.

Rock art can be divided into two general classes, petroglyphs and pictographs. Petroglyphs are carved or pecked into rocks and can be found on canyon walls, rock outcroppings, and even on small portable stones. Pictographs are painted and are usually located in areas that are less exposed to the elements than petroglyphs; they are commonly located in and near rock shelters and on vertical cliff faces.

There are several petroglyph and pictograph sites located within Great Basin National Park, some of which contain both rock art classes. Park archaeologists record and monitor the condition of these rock art sites.

Through the use of digital image enhancement, park archaeologists are able to see pigments and carvings that have faded over the course of time, sometimes revealing new pictographs and petroglyphs at sites. Their research provides further insight into the style and cultural affiliation of rock art sites in the park. This, in turn, furthers the understanding of rock art in the Great Basin region.

Rock art comes in many different styles. Seven styles have been identified in the South Snake Range, with the following six dated to the Great Basin Desert Archaic period which spanned from around 9,000 B.C. to 500 A.D.:

- **Pit and Groove**- shallow pecked pits connected by grooved lines or enclosed by a grooved circle
- **Cupule**- pecked depressions ranging from 3mm to as deep as 30mm
- **Great Basin Curvilinear Abstract and Representational**- meandering lines, circles, sun disks, wavy lines, serpentine forms, anthropomorphic (human-like figures) and zoomorphic (animal-like) figures are also common
- **Great Basin Rectilinear Abstract**- dots, rectangular grids, rakes, crosshatching
- **Great Basin Scratched**- created by scratching or carving a stone with a harder, sharper stone; more common at end of Archaic period
- **Great Basin Painted**- red and black pictographs of circles, sun disks, dots, zigzags, parallel lines, short vertical lines, blobs

A later style tied specifically to one distinct culture group is the Parowan Fremont style, named after the culture of the same name. The Parowan Freemont Culture lasted from approximately 500 A.D. to 1,300 A.D. The Parowan Fremont rock art style is very distinct and recognizable. Figures in this style can be found in either pictograph or petroglyph form. Many of the pictographs dating to this time period and consistent with this style are found on rock shelter walls. This is the style that is prevalent at Upper Pictograph Cave within Great Basin National Park:

NPS Photo

Boulder with Great Basin Curvilinear Abstract Petroglyphs.

Rocks of the Ages (continued)

- **Parowan Fremont-** petroglyphs or red pictographs; anthropomorphs with stylized triangular bodies, occasionally black charcoal tally lines and meanders

Parowan Fremont Style Pictograph from Upper Pictograph Cave. Naked Eye image on left, digital color enhanced image on right.

After the collapse of the Fremont Culture around 1,300 A.D., Southern Paiute and Western Shoshone moved into and utilized the area around Great Basin National Park. Historically these peoples subsisted by hunting small mammals and harvesting small plant bulbs and seeds.

While no distinct rock art style has been attributed to these people, historical records indicate that they used many of the same areas as previous cultures and occupied rock shelters with rock art dating to earlier periods. It would not be unlikely that these people added to the existing rock art in the area. Descendants of these groups still live in the area.

Rock art is fascinating and its true meaning will likely remain an enigma. Very little interpretation can be made of figures and rock art panels, as the cultural meaning and the reasons behind its creation were products of a society with no written records. Without understanding the symbolism within the culture that created the art, no interpretation can be considered "correct." Rock art means something different to each viewer, the same as with any other art form.

Numerous publically accessible rock art sites are scattered throughout the Great Basin area. Please remember that these sites are special areas to Native Americans. Be respectful when visiting and refrain from carving your own figures or name. Please do not take rubbings or chalk rock art elements; both of these methods are very damaging. If you are having a difficult time taking photos of petroglyphs try coming back in the early morning or late afternoon or try drawing a sketch. Also, please refrain from touching rock art elements as the oil in your skin can cause increased degradation of already fragile and ancient art forms.

Recent Publications about Great Basin National Park

Asch, T. H. and D. S. Sweetkind. 2011. Audiomagnetotelluric characterization of range-front faults, Snake Range, Nevada. Geophysics 76(1): B1-B7.

Taylor, S. J., and Holsinger, J.R. 2011. A new species of the subterranean amphipod crustacean genus *Stygobromus* (Crangonyctidae) from a cave in Nevada, USA. Subterranean Biology, 8: 39-47.

Halford, K.J., and R. W. Plume. 2011. Potential effects of groundwater pumping on water levels, phreatophytes, and spring discharges in Spring and Snake Valleys, White Pine County, Nevada, and adjacent areas in Nevada and Utah: U.S. Geological Survey Scientific Investigations Report 2011-5032, 52 p. Available at: http://pubs.usgs.gov/sir/2011/5032/.

New Vegetation Map Reveals Need for Restoration

By Louis Provencher, The Nature Conservancy & Bryan Hamilton, Wildlife Biologist

In 2008, The Nature Conservancy (TNC) approached the park to conduct mapping of park vegetation. The proposed map would be based on field-interpreted high resolution satellite imagery and computer models of all major potential natural communities. With funding from TNC's Fire Learning Network, the park and TNC developed 21 computer models that represented the reference condition: the pre-European settlement condition of the landscape.

In 2009, with funding from the Southern Nevada Public Land Management Act-Eastern Nevada Landscape Restoration Initiative, Great Basin National Park and TNC collaborated with the contractor Spatial Solutions to create new, highly detailed maps of potential natural plant communities, the vegetation classes within each community, and ecological departure from reference condition. The park also funded TNC to simulate various management actions, such as prescribed fire and mechanical thinning, and budget that would be required to reach reference condition.

Every project has "light bulb" moments and this project had two *before* the maps were created. (1) A new soil survey by the USDA Natural Resources Conservation Service revealed that the majority of the conifer forests were, in fact, aspen-mixed conifer and aspen-subalpine conifer forests. The original park's FRCC map was based on a map of natural communities dominated by montane and subalpine conifer forests (>30,000 acres). In the absence of natural disturbances, aspen becomes dominated by conifers, even leading to the permanent loss of aspen clones. (2) TNC's early analysis of ecological departure of remote sensing data revealed that the majority of natural communities were *moderately* departed, but not highly departed as previously mapped. This detail led to the park adopting "beneficial wildland fire use" in most areas of the park.

Findings. TNC mapped 21 potential natural communities based on pixels spanning 2.4 meters (Figure 1). Nine were slightly departed from the natural range of variability, 10 were moderately departed, and only 2 smaller systems were highly departed. The primary cause of ecological departure was due to sagebrush systems which lacked the earliest succession classes and aspen-conifer systems which were over-represented by late succession classes. Two small systems

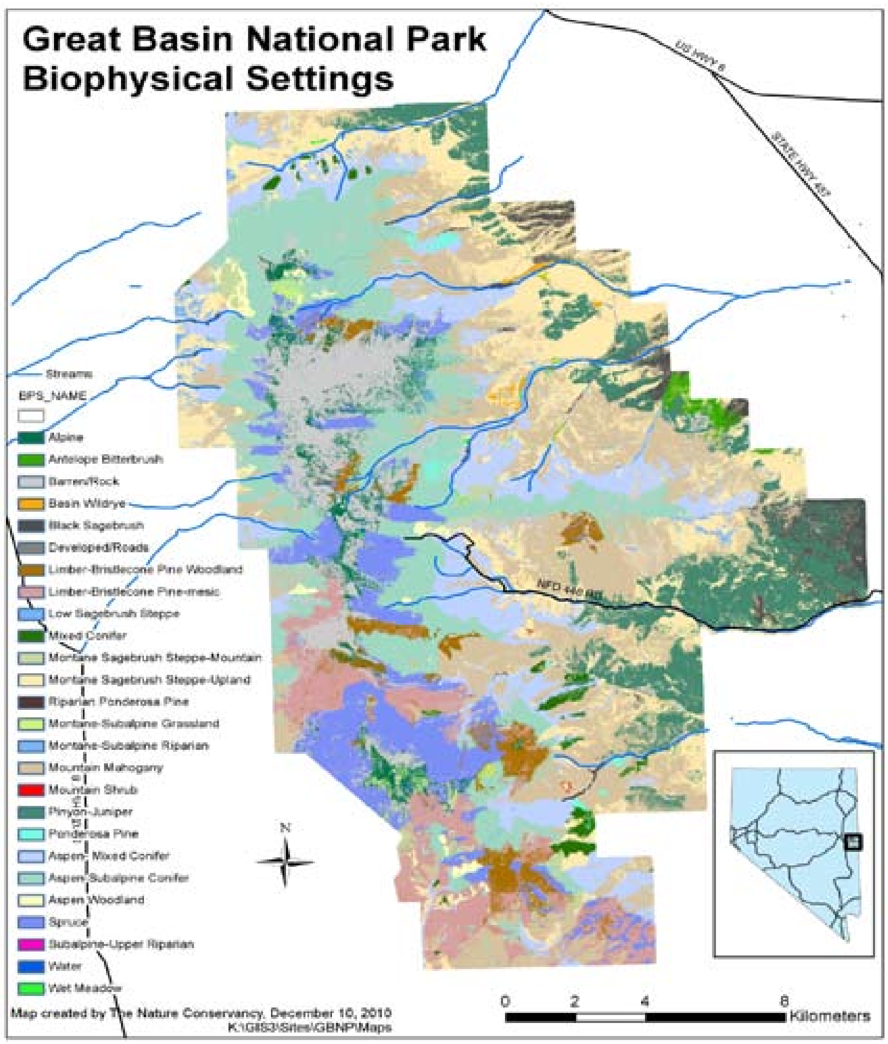

Figure 1. Map of Great basin National Park's potential natural communities, also called biophysical settings.

New Vegetation Map Reveals Need for Restoration (continued)

(antelope bitterbrush and basin wildrye) were highly departed due primarily to the presence of conifer encroachment and non-native cheatgrass.

Eleven natural communities were not targeted for active management in the park because they were projected to benefit from periodic wildfires imbedded in the computer simulations. These natural communities included curl-leaf mountain mahogany, pinyon-juniper woodland, spruce, limber-bristlecone pine, montane sagebrush steppe-subalpine sites, mixed conifer, aspen woodland, montane-subalpine grassland, ponderosa pine, riparian, ponderosa pine, mountain shrub, and subalpine riparian.

Ten natural communities were chosen for specific management actions that would be computer simulated over 50 years within the constraints of reasonable budgets. The key ecological management issues included:

* *Sagebrush systems (montane sagebrush-upland sites, black sagebrush, low sagebrush steppe, antelope bitterbrush, basin wildrye)* – lack of early succession classes, pinyon-juniper encroachment, and prediction of increased cheatgrass cover.

* *Aspen-conifer systems (aspen-subalpine conifer and aspen-mixed conifer)* -- high percentage of conversion to conifers and permanent loss of aspen clones.

* *Mesic limber-bristlecone pine* – high percentage of late-succession classes at the expense of mostly mid-succession forests.

* *Riparian, wet meadow, and basin wildrye systems* – invasion by exotic forbs.

A variety of strategies were modeled for each natural community targeted for management. Multiple strategies were required for most ecosystems:

* *Sagebrush* management strategies included: prescribed fire to restore early succession classes (Figure 2); chainsaw lopping of encroached conifer trees; chainsaw thinning of late succession classes or tree-encroached sagebrush, variously combined with chipping, mastication, pile burning, herbicide and/or seeding of native species; and varied applications of herbicide and/or native seeding to uncharacteristic vegetation classes.

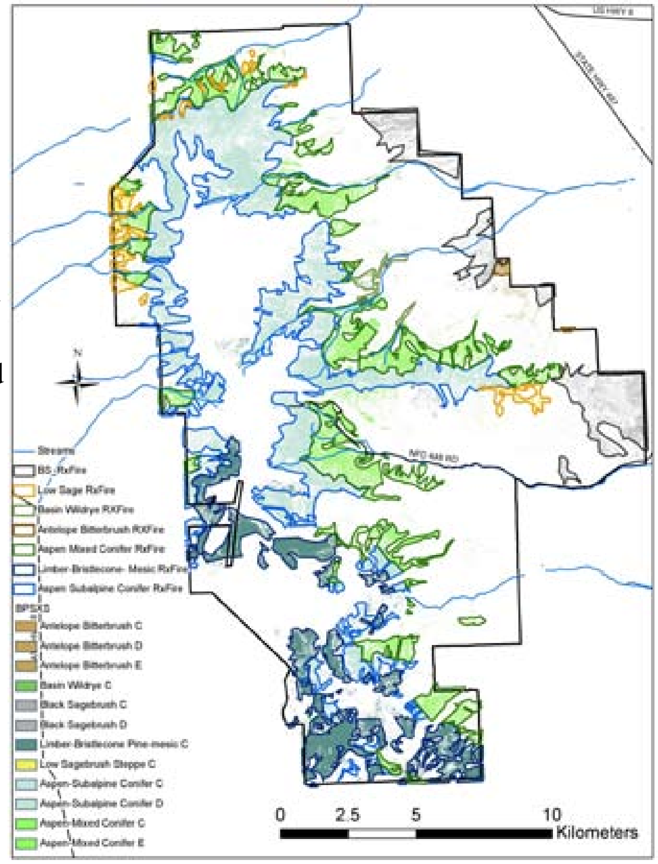

Figure 2. Map of recommended prescribed fire areas (shaded areas) for different ecological systems.

* *Aspen-conifer* management strategies included prescribed fire to prevent transition to conifers and loss of aspen clone.

* *The mesic limber-bristlecone pine* forest management strategy included prescribed fire to reduce the area of late-succession classes and increase those of early and mid-succession classes.

* *Riparian and wet meadow* management strategies included cyclic weed inventory and spot application of herbicides

Computer simulations of cost-effective management actions achieved lower ecological departure for all 10 focal natural communities. Many actions, however, were implemented fully in the first years of simulation and, with additional funding, greater ecological benefits were predicted to be achieved.

The next step of the collaboration between the park and TNC is to update simulated management actions given that climate change may affect the natural communities' ability to reach target conditions.

A New Jumping Insect and Its Genes

By Alan de Queiroz,
University of Nevada, Reno

Photo by Alan de Queiroz, UNR

This jumping bristletail is a member of a newly discovered species that is widespread in the Great Basin. The new species has been found in the park above the treeline on Mt. Wheeler and Bald Mountain.

In rockpiles above the treeline in the Snake Range you can find inch-long insects that look vaguely like shrimp, jump like grasshoppers, and are covered with scales like those on the wings of a butterfly. My colleagues John Gatesy and Cheryl Hayashi, biologists at the University of California at Riverside, and I first came across these creatures in the summer of 2005 on the summit of Cleve Creek Baldy in the Schell Creek Range (the range to the west of Great Basin National Park, across Spring Valley) and later found them on Wheeler Peak and Bald Mountain within the park.

Marshal Hedin of San Diego State University identified our specimens as jumping bristletails, members of an obscure, wingless group that branched off from the rest of the insects more than 400 million years ago. Eventually we all became familiar with them and began studying the genetics and evolution of the Great Basin species.

Our genetic studies, headed by another colleague, Laura Baldo, revealed that the Snake Range bristletails are part of a new species, a finding that Marshal painstakingly corroborated by discovering a subtle difference in the shape of a small protuberance on the legs of males compared to the most similar known species. Most new species that are being discovered in the Great Basin had previously gone unnoticed because they are only found within small areas. For instance, as an extreme example, the new cave arthropods recently discovered in the park are mostly confined to just one or a few caves (see page 2). However, the newly discovered bristletail, in the genus *Mesomachilis*, can be found across almost the entire Great Basin, from the White Mountains of California to the Wasatch Range east of Salt Lake City. More than likely, it had gone undetected because there are so few biologists who would recognize a potentially new bristletail if they ran across one.

Our study has focused on genes that have lost their function, so-called "pseudogenes." The bristletail pseudogenes we examined represent extra copies of one particular genetic region and are especially useful for evolutionary studies because each copy carries information about the state of the original "parent" genetic region at the time the pseudogene was created. In other words, the pseudogenes are like windows allowing glimpses of past genetic variation within the species. Examining these pseudogene sequences has revealed a surprising amount of mating between individuals that differed substantially in their genetic makeup. It may be that this history of genetic mixing reflects the merging of distinct populations as the climate and landscape of the Great Basin has changed over the last few million years.

Our encounters with *Mesomachilis* bristletails in eastern Nevada eventually got us hooked on bristletails in general. As a result, we are now using DNA sequences to determine how different taxonomic groups within this insect order are related to each other. When this work is done, we will have a much better idea of exactly where the Snake Range bristletails fit in the evolutionary tree of life.

Come help find new species to the park (and possibly to science) at the Hymenoptera (bees, wasps, and ants) Bioblitz August 1-3, 2011!

Weed Management through Integrated Pest Management (IPM)

by Patrick Mingus, Biological Science Technician

Invasive plants pose a serious threat to native landscapes in many areas of the Great Basin and around the world. The good news is that many plant invasions can be reversed, and even badly infested areas can be restored to healthy, native plant communities. This requires taking action to control and manage invasive plants. Here is some basic information about the planning, tools, and techniques for controlling weeds in natural areas.

Before embarking on a weed management program, it is important to develop an action plan:

(1) Target an invasive plant - observe known infestations, scout and map new outbreaks, prioritize by size, scale and likelihood of spread

(2) Determine which control methods are best - manual, biological, cultural, chemical, or a combination of treatment techniques

(3) Develop a treatment plan to restore conditions - consider post-treatment seeding or replanting native plants to augment healthy plant communities in disturbed areas

(4) Monitor and assess effectiveness - compare results of different strategies over time, modify, and start the management cycle again.

Most often, successful weed control requires the combination and sequential use of several methods. This approach is called Integrated Pest Management (IPM). For example, cutting and bagging invasive plants before flowering followed by herbicide applications has been used successfully against knapweed in the park. Many options exist: manual, mechanical, biocontrols, herbicides, and promoting competition. Each treatment has different advantages, impacts, risks, and costs. A weed control program is best viewed as part of an overall restoration program, so we focus on replacing invasive species, rather than simply eliminating the weed. When selecting treatment methods, keep in mind that the ultimate purpose of this work is to preserve native plant species and communities.

Featured Weed: *Cardaria draba,* Whitetop

Roots: Wide spreading and deep; thick and producing side shoots from the rootstocks.

Stems/Leaves: Grows from 1.5 to 3 feet and slightly hairy. Stems are medium, upper leaves clasp the stem with two lobes. The leaves are gray-green in color, serrated, alternate, or staggered. They are irregular and lance-shaped.

Flowers: Small, white, four-petaled, producing a flat-topped appearance. Blooms from late April to late June at the park.

Fruits/Seeds: Heart-shaped reddish-brown pods.

Methods of Reproduction:
It reproduces by rootstock, creeping roots, and seeds. Root fragments are the most efficient means of reproduction. Do not till or disturb this plant! It is a perennial weed. It

infests pastures, roadsides, and waste areas. It favors alkaline soil, disturbed soils, and areas where native plants are not established. It increases soil erosion and decreases desirable plants. It aggressively produces monocultures. It pushes out native plants. It can be spread by grazing wildlife.

Native Range/ Probable Entry: It originally came from Eurasia early in the 1900's along the Eastern U.S., and gradually infested the entire nation, except for lower California east to lower Mississippi. It is thought to have arrived as seed in the soil ballast of sailing ships, or it came as an impurity in mattress stuffing in 1909.

Methods of control: Chemical: 2,4-D herbicide applied two times a year for three consecutive years. **Cultural:** Flooding the affected area before Whitetop produces seed can drown the rootstock and slow the spread. Manual removal by shoveling is not recommended.

How to Prevent Spread: Wash your vehicle undercarriage immediately after leaving an infested area. Dispose of seeds and plant fragments from your car, shoes, and pets before entering another area.

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
Andy Ferguson

Chief of Resource Management
Tod Williams

Editor & Layout
Gretchen Baker

Year-Round Hydrologic Monitoring of Lakes

By Gretchen Baker, Ecologist

How much do lakes in Great Basin National Park fluctuate? How long are they frozen in the winter? These are just two of the questions that the park and the Mojave Desert Inventory & Monitoring Network (MOJN) wanted to answer.

Photo by Gretchen Baker, NPS.

Dead Lake was added to the subalpine lake monitoring network in 2010.

To do this, HOBO U-20 dataloggers were installed in four lakes in 2009, capable of recording daily temperature and pressure (depth of water). They were recovered in September 2010. The dataloggers showed that the maximum water levels occurred in early June for both Baker and Johnson lakes, with minimums in November and December, decreasing lake elevation by up to 1.5 m.

The daily maximum temperature (about 15 C) occurred in late July and August for all lakes. Daily minimum temperatures occurred from December (Teresa Lake) to April (Baker Lake). The dataloggers showed that Baker, Johnson, Teresa, and Stella lakes had some temporary freezing in September and October, but it wasn't until November 13 that they froze for the winter. The lakes remained ice-covered for over six months, until between May 31 and June 3, 2010. This was the first time that the duration of ice cover for the park's sub-alpine lakes has been quantified.

Monitoring will continue on all lakes to learn more about their levels and temperatures.

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.

Upcoming Events:

July 23 & 24: Great Basin Star Party. Special program & night sky viewing with telescopes. See http://www.nps.gov/grba for more details.

July 28-30: 2nd Annual Astronomy Festival. Join hundreds of star gazaers for a fun filled weekend. Excellent sky-viewing opportunities and a variety of programs and talks offered. See http://www.nps.gov/grba for more details.

August 1-3: Hymenoptera Bioblitz. Help collect ants, bees, and wasps to add to the baseline data on invertebrates in the park. Email Gretchen_Baker@nps.gov for more details.

September 3-5: Great Basin Star Party. Special program & night sky viewing with telescopes. See http://www.nps.gov/grba for more details.

October 27: Great Basin National Park's 25th Anniversary.

Lehman Cave Tours daily at 9 AM, 11 AM, 1 PM, and 3 PM. Additional tours are added during busy periods.
Visitor Center open daily except Thanksgiving, 12/25 & 1/1.

Great Basin National Park