



The Midden

The Resource Management Newsletter of Great Basin National Park

USGS Study Shows Park Waters Susceptible to Pumping

by Gretchen Baker, Ecologist

In 2002, in response to a large number of groundwater applications in areas close to Great Basin National Park, the National Park Service asked the U.S. Geological Survey (USGS) to conduct a study on the susceptibility of park waters. Using data from two years of fieldwork, the USGS recently published their report, finding that several areas in the park could potentially lose water if large-scale pumping is conducted in nearby valleys.

These areas in the park include parts of the Lehman, Baker, Snake, and Pine/Ridge watersheds. In total, four stream systems with over 9 miles of stream habitat, 18 wetland areas, 25 perennial springs, 156 acres of riparian habitat, and 23 cave systems could be affected within the park. The report also showed that expansive areas outside the park, on private, Forest Service, and Bureau of Land Management land could also be impacted.

The study, titled "Characterization of Surface-Water Resources in the Great Basin National Park Area and Their Susceptibility to Ground-Water Withdrawals in Adjacent Valleys," involved monitoring stream flow at 12 locations using pressure transducers. The transducers measured the pressure, or height, of the water over them and recorded the information every 15 minutes. Several times a year, the stream flow was measured and correlated to the height of water so that the approximate stream flow was known throughout the year.

In addition, the study involved conducting seepage runs on several creeks. A seepage run consists of



NPS Photo

Rowland Spring is one of the water sources that may have diminished or no water flow if too much pumping occurs in the valley bottom.

making multiple stream flow measurements along a creek at the same time. The seepage run shows where the stream is gaining or losing water, which is usually explained by looking at the underlying geology. Limestone rock is generally porous, so when stream water reaches it, the water enters the rock and disappears. Snake Creek and South Fork Big Wash cross several limestone areas and are thus hydrologically very interesting. Water chemistry was measured at all the measurement sites for the seepage runs to help understand the underlying geology.

With the information gained from the stream flow monitoring and seepage runs, USGS scientists studied geologic maps and were able to predict which areas in and near the park would likely or potentially be susceptible to

ground-water withdrawals. They determined that if large amounts of pumping occur in the valley bottoms, the water in these susceptible areas could dry up or be greatly reduced. This in turn would affect the plants and animals that depend on this water.

The complete report is available online at <http://pubs.usgs.gov/sir/2006/5099>.

In This Issue

- Elusive Kingsnakes Uncovered*...2
- Return of the Sage Grouse*.....2
- Interpreting Aspen Carvings*.....3
- Caves Reveal New Creatures*....4
- New Lights in Cave*.....4
- Winter Tracking*.....5
- Out of the Mud*.....6

Elusive Kingsnakes Uncovered

By Ryan Thomas, Biological Science Technician

In May, National Park Service staff, Nevada Department of Wildlife personnel, Southern Nevada Water Authority biologists, and volunteers flipped rocks, turned over logs and explored rock crevices in search of the beautiful Utah mountain kingsnake (*Lampropeltis pyromelana infralabialis*) in and near Great Basin National Park. Mountain kingsnakes are extremely rare and secretive in Nevada and very little is known about their ecology, abundance, distribution, and habitat associations.

The Utah mountain kingsnake species has a shiny tri-colored body with red, black, and white bands. The head is white with a distinct black mask, and the snake can reach a length of 45 inches.

The Utah mountain kingsnake emerges from hibernation in early to mid-April at lower elevations. It is most active in the morning and late afternoon during the spring and summer. Favoring cool temperatures,

it spends most of its time underground or beneath vegetation. Preferable habitat consists of rocky canyons with riparian vegetation at elevations of 6,000 to 7,500 ft. Mice and lizards are also found in this type of habitat and are a main source of food for the snake. Utah mountain kingsnakes also prey upon ground nesting birds, their eggs and other snakes.



Utah mountain kingsnake.

Photo by B. Hamilton, NPS

Two kingsnakes were caught in the 3 1/2 day search effort in on the west side of the mountain range. The location of each catch site was documented by using a global position system (GPS), while ambient and air temperature was also taken at the site. The snakes were then measured, weighed, sexed and tail clipped for genetic sampling. The

snake was released back to the spot where it was captured.

The first kingsnake that was caught was found moving over a pile of small rocks in the early morning, and the second was found shading itself under sagebrush in the mid-afternoon. The temperature for most of the days were ideal for snake movement, with overcast cooler days.

The data collected during this kingsnake search helps us better understand this species. This is important, since as the Great Basin becomes hotter due to global climate change, the habitat of the Utah mountain kingsnake is likely to become more and more isolated along its mountainous riparian corridor habitat. Also vegetative changes like the loss of sage/steppe and Ponderosa ecosystems or increasing cheatgrass and piñon/juniper will likely affect this species.

Future kingsnake searches are being planned for new locations, and we'll keep you posted in upcoming Midden publications.

Return of the Sage Grouse

By Neal Darby, Biologist/GIS Analyst

Sage Grouse returned to their leks (breeding grounds) this spring, where they were counted on five separate days between March 1 and May 5. A total of seven birds were seen this year, compared to eight observed last year. This provides an estimated Sage Grouse population of between 13 and 20 birds in Snake Valley on the east side of Great Basin National Park. This estimate is derived from a population model developed from scientific research on Sage Grouse throughout the West. The discrepancy between the number of grouse actually seen and the estimated population is due to the fact that only strutting adult males are regularly seen during the counts while subadult males and females are



Greater Sage Grouse.

USDA NCRS Photo

more difficult to observe. Research has shown that for every strutting male Sage Grouse there are at least two birds present that cannot be seen. This population estimate seems reasonable, for during the winter 15 Sage Grouse were flushed while locating a male Sage Grouse fitted with a radio telemetry transmitter.

The period between March 1 and May 5 is the best time to observe and count

Sage Grouse, since during this time they search for a mate. Each year males gather at the same location called a lek and put on an elaborate strutting display for the purpose of attracting females. The males stand erect, displaying brilliant white chest feathers and fanning their tail. At the same time they inflate and deflate large yellow air sacs on each breast making an unusual sound often referred to as booming. This display makes the male Sage Grouse much easier to observe in the sagebrush sea.

Lek counts will continue each year between March 1 and May 5. Participants and volunteers are welcome to help with the count. Be prepared though, for surveys start before dawn. This might be early but the sunrise and strutting grouse make it worth it.

Interpreting Aspen Carvings

by JoAnn Blalack, Archeologist

Aspen carvings, also known as dendroglyphs, arborglyphs and aspen art, are an important record of an area's historic past. These carvings were started by Basque sheepherders in the late 1800s. Basque sheepherders were replaced by Peruvian sheepherders in the late 1900s adding yet another style and mix of arborglyphs. Recreational campers and cattlemen also left their marks, some of which date from the early 1900s.



Arborglyph from 1929.

Photo by R. Layland, NPS

Basques, who call themselves Euskaldunak, are from the Pyrenees Mountains located on the border of Spain and France. Basques have their own language known as Eusk but since the majority live in Spain, they also speak, read and write in Spanish. This explains why some of the carvings contain a mix of both Eusk and Spanish.

The Basque culture is one where the oldest son inherited the family property. This left the younger brothers having to leave and find a place to live. During the California gold rush in the mid- 1800s, Basques came to try their hand at gold mining. They soon left the gold fields for a more profitable venture in sheepherding and supplying mining camps with mutton and shipping the wool back East. By the late 1800s Basque sheepherders were in Nevada.

The sheepherder life was a very lonely one. Sheep camps consisted of one herder, a couple of dogs, and hundreds if not thousands of sheep in a vast land-

scape devoid of opportunities for other human contact. This loneliness was compounded by a three to four month grazing season, if not longer. The herders were also continuously on the move finding new grazing for the herd.

By carving on aspen trees, the herders were keeping a connection with the outside world. It was like letting the other herders know that they were present.

The park has little information on the history of sheepherding in the area. We do know, though, that Basques were in the area in the early 1900s by a few of the aspen carvings with dates of 1908 associated with Spanish and Basque words.

By the 1960s there had been a decrease in sheep grazing in the West and a shift from using Basque herders to herders from Peru. A lot of carvings within the park show Peruvian herders here in the 1980s and 1990s.

Some carvings are not related to sheepherders. These carvings are from early settlers and early recreationists. It seems that cattlemen did not carve trees all that much since they very



Arborglyphs found in Shingle Creek.

Photo by G. Baker, NPS



Photo by R. Layland, NPS

Palomino left many arborglyphs, among them his name on this aspen.

rarely stayed in the field with the cattle. Cattle were normally put out on the range for the summer and herded up in the fall so the cattlemen were never away from their ranches for extended periods of time.

Aspens are a short lived species, living from 70 to 100 years. When isolated from fire, the species can live longer. The importance of aspen carvings is that these carvings not only establish dates as to when the carvings were produced but they also show the carvers' names and their home towns or countries, which to an archeologist helps in establishing the history of land use for an area.

Because of the important land use history, and since aspen trees are short lived, aspen carvings are a non-renewable resource, and it is important that archeologists document these carvings before they are lost forever. Great Basin National Park is starting to do that this year. During the 2006 field season the main branch of Strawberry Creek will be surveyed and all aspen carvings will be documented.

Note: Carving aspen trees is not permitted in Great Basin National Park. Please enjoy the historical carvings but help us to protect the aspen trees in their natural state.

Caves Reveal New Creatures

by Gretchen Baker, Ecologist

Cave biologists Steve Taylor (University of Illinois), Jean Krejca (Zara Environmental), and Mike Slay (The Nature Conservancy) visited the park for a week in May to start a cave biota inventory project. The study will include examining 15 caves over a two year period to learn what creatures inhabit them, as well as training park staff to conduct future monitoring.



Photo by J. Krejca, Zara Environmental

White millipedes were found in several park caves, including Lehman Caves.



Photo by G. Baker, NPS

Arrhopalites springtail is often found on water surfaces.

Cave ecology is rather simple, since caves generally have few nutrient sources. Nutrients enter the cave via water; troglonemes, which are creatures who come and go out of the cave such as bats and pack rats; or troglonemes, like cave crickets, which spend part of their life cycle in the cave.

The guano and other nutrients left behind by the water and these creatures may be eaten by small troglonemes, or cave adapted critters. In turn, these springtails, flies, and beetles may be eaten by troglonemic predators like the pseudoscorpions,

harvestman spiders, and others.

Although the ecology of cave life is relatively simple, little is known about it. Some creatures have literally never seen the light of day and have never been seen by any humans.

One of the reasons that biospeleology, or the study of life in caves, is still an emerging field is that some caves are not easy to visit. For example, caves sampled in May included a cave that had such a narrow constriction that only one researcher could fit into it, a cave with a rattlesnake in the entrance passage, a cave with cold stream water flowing through the entrance gate, and a cave that had a stream of water flowing out of it so it could not be entered. At this last cave, a plankton net was set at the entrance to catch any biota that might be living in the groundwater, since

these creatures are seldom studied.

At all the caves, specimens were collected and preliminarily identified. Since field guides are practically nonexistent for these rarely studied creatures, the specimens will be sent to specialists for further identification.

The caves at high elevations were not accessible in May, so the cave biologists will return to the park in late summer to search some of the alpine caves for additional species. Furthermore, a monitoring plan was set up in Lehman Caves to study how the cave biota varies during different seasons and also on and off the tour route.

Once a month, park staff will visit the 15 paired stations in the cave and smear limburger cheese on the bottom of a rock. The next day, the stations will be revisited. Staff will search a 1 meter circle around each station for any cave biota and count and identify each creature.

This promises to be an exciting project with new discoveries. Preliminary results of the May trip include finding cave-adapted millipedes on the edge of the Lehman Caves tour trail; finding at least one new class of insect for the park caves, and further extending the range of several insects like Diplurans and springtails. It is likely that at least one new species to science is hiding out in park caves.

New Lights in Cave

New light emitting diodes (LEDs) were installed in wet areas of Lehman Caves to reduce the amount of moss and algae growing near those lights. Since LEDs produce less heat, they have a smaller impact on the cave atmosphere than regular incandescent lights. In addition, LEDs last 100 times longer than regular incandescent lights, thus requiring fewer maintenance trips and lessening the impact on the cave.



Photo by G. Baker, NPS

A new LED in the cave.

LEDs come in a variety of wavelengths, and several are being tested in the cave. Those that produce a yellowish-orange light do not emit the wavelengths that moss and algae require and thus further decrease their ability to survive in the cave. LEDs that produce a more whitish light illuminate different hues in the cave. The park is interested in your opinion of how the cave looks with its new lights.

Winter Tracking

Bryan Petryl, Resource Management Volunteer

The winter of 2006 marked the second year of a carnivore winter use study in Great Basin National Park. The project included tracking, observing, and photographing (with remote cameras) carnivores and their prey in the park.



Mountain lion tracks.

Four 6 kilometer transects were laid out in the major drainages of the park: Strawberry, Lehman, Baker, and Snake Creeks. Throughout the winter, park employees and volunteers hiked, snowshoed, and skied the transects, looking for animal tracks. Twenty-six transects were completed and divided into 259 half-kilometer segments. Carnivore tracks were seen in ninety-two segments. Tracks from the same animal were only counted in the first segment in which they were found.



Turkey tracks including wing marks.

The most predominate carnivore tracks were fox tracks, which were found in thirty-four segments. This was followed by unknown carnivores (n=27), mountain lion (n=14), coyote (n=7), weasel (n=6), and bobcat (n=4). No skunk tracks

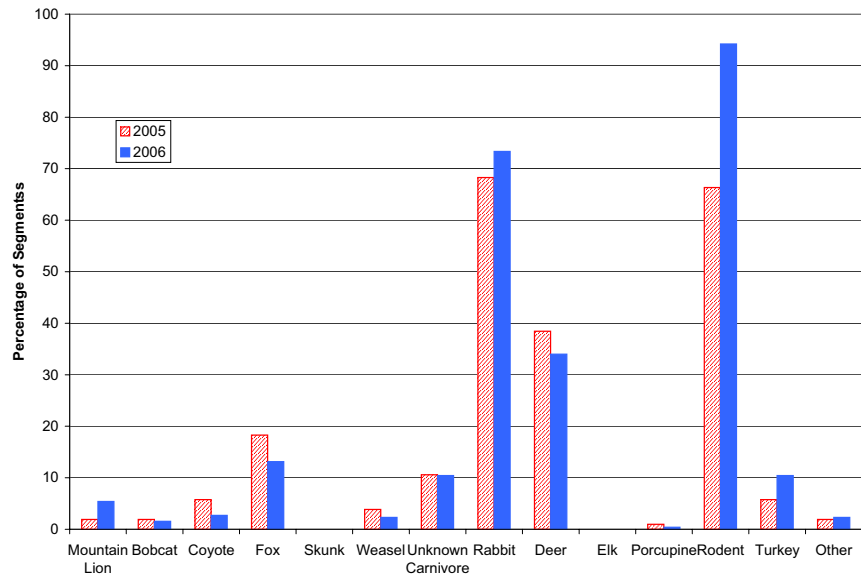


Figure 1. Percentage of 1/2 km segments containing tracks by taxa and year.

were found. In addition, herbivore tracks were counted. The most predominate were rodent (n=244), followed by rabbit (n=190), deer (n=88), turkey (n=27), and porcupine (n=1). No elk tracks were found.

In the winter of 2006, carnivore tracks were seen in 35% of the segments, fewer than the winter of 2005 when carnivore tracks were seen in 43% of the segments (Figure 1). However, mountain lion tracks were seen more often in 2006 (5.4%) than in 2005 (1.9%), but no other carnivore tracks were observed more frequently in 2006 than in 2005. The carnivore tracks with the largest decline in the frequency of sightings was the fox, which was observed in 18% of the segments in 2005, but in only 13% of the segments in 2006.

There were also differences in the frequency of herbivore tracks between the winter of 2006 and the winter of 2005. Rodent tracks had the greatest increase in the frequency of sightings. They were observed in 94% of the segments in 2006 compared with 66% in 2005, possibly due to an increase in rodent populations in 2006 or because rodents burrowed more tunnels through the deep snow of 2005 and thus weren't seen on the surface. The herbivore tracks with the greatest de-

cline were deer tracks. They were observed in 38% of the segments in 2005, but only 34% of the segments in 2006.

Porcupine tracks were also observed, a rare sighting since porcupine populations are declining in the west.

Mountain lions and other carnivores will be monitored throughout the summer with remote cameras and wildlife observations. If you see carnivores in the park, please fill out a wildlife observation report, which can be found in the Visitor Centers.



Trail of porcupine tracks.



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:

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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.



Out of the Mud

By Gretchen Baker, Ecologist

In July 2005, two community residents brought some strange looking creatures into the Resource Management office to find out what they were. After conducting some research, staff learned that they were Triops, also called tadpole shrimp. Triops are crustaceans in the class Branchiopoda and order Notostraca. Adults have an exoskeleton, 72 pairs of leaf-like legs, two compound eyes and a simple eye, and a mouth on their stomach.

Although these unusual critters have been around the earth for over 220 million years, they are not widely known, since they are often not seen in their adult form. Triops lay their eggs in mud, and these eggs have the amazing ability to remain in a state of diapause (suspended animation) for up to 20 years. When enough water wets the mud, the eggs hatch, and Triops develop and swim in the pools of water. They live about one to two months, eating almost anything including microscopic algae and anything smaller than themselves. The females may lay thousands of eggs during this time period, and the eggs then wait for favorable conditions to hatch and repeat this cycle. These



Triops in a petri dish.

Photo by G. Baker, NPS

conditions have to be just right, and the twenty-year flood of 2005 provided those conditions.

Mark Vinson at the Utah State University Macroinvertebrate Lab notes that there are two species of Triops in the area, with the one pictured here, *Triops longimanus*, more common. The less common species, *Lepidurus couesii*, is often found at higher elevations and has a paddle-looking appendage between its tails.

Triops have been found on almost every continent. In addition, some people learn about triops by buying packets of their eggs online to use for science projects or additions to an aquarium. If you happen to be lucky enough to see Triops in the wild, we would like to hear about it!

Upcoming Events:

July 21, 22 & 29 Great Basin National Park Star Party. Learn more about the beautiful night sky in some of the best visibility. Call the park for more information.

Aug 12 Perseid Meteor Shower. View this famous meteor shower in some of the darkest skies in the nation! The shower is expected to peak at about 15-30 Perseids per hour.

Sept 2 Snake Valley Days. This annual event celebrates the history of Snake Valley area with a barbeque and dance. Many old-timers return to share stories.

Oct 27 Great Basin National Park turns 20! The National Park was expanded from the Lehman Caves National Monument on October 27, 1986.

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