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

Amazingly Successful Summer Paleontology Inventory

NPS Photo

Some of the more than 1000 fossil specimens found this summer included these brachiopods, *Orthambonites michaelis*; Kanosh Shale, Ordovician Period.

By Gorden Bell, Supervisory Environmental Protection Specialist and Paleontologist

If one were to judge the potential of Great Basin National Park (GRBA) to possess a significant amount of paleontological resources based on available scientific literature, it would not appear to be a good bet. As part of my collateral duties, I had been given the task of first assessing the likelihood of significant paleontological resources being present within the park and then searching for them if the results appeared promising.

My survey of the literature had turned up only one publication that identified fossil localities inside the park boundaries. Another three identified fewer than a half-dozen fossil localities in the southern Snake Range but outside of the park. However, numerous publications detailed exciting discoveries in the mountain ranges to the east, south, and west of the park.

During my first year after moving to GRBA, I had found a few good indications in the park's backcountry. Also, park staff had recognized fossils in some of the remote drainages (see the Summer 2011 *Midden* article, "Significant index fossils found in park").

In addition, geologic maps indicated broad areas of rock outcrops within the park where there was high potential for fossils to be found. These rocks are of the same age and formations that are extremely fossiliferous near Crystal Peak, Utah, and in central Nevada. So, as the park is situated directly between those areas, it would seem likely that our rocks might have the same kinds and quantities of fossils.

This past summer we were able to test that possibility when we brought in two Geoscientists-in-the Parks interns (GIPs) through a program sponsored jointly by the NPS and the Geological Society of America GeoCorps program. The two GIPs, Linda Sue Lassiter and Spencer Holmes, are enrolled in geology degree programs at the University of Northern Arizona and California State University - Chico, respectively.

During an intense 12-week internship, these two intrepid students and I covered approximately 600 hectares (1500 acres) of the park, searching rock outcrops for fossils and using GPS units and cameras to document what we found. Gradually, we began to build an inventory of paleontological resources heretofore unknown within the park. Over the course of the summer we added 38 new paleontology localities to the database, represented by 476 GPS positions and more than 1000 fossil specimens.

NPS Photo

An internal mold of a complete coiled nautiloid cephalopod surprisingly similar to the living chambered nautilus. The dark mass in the center is a bryozoan colony that encrusted the shell after it fell to the seafloor; Lehman Formation, Ordovician Period.

So, what types of fossils are present in the park? *Continued on Page 2*

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2012 Summer Paleoinventory Results (continued)

Most of the fossils are animals and plants that lived in a marine environment in a relatively shallow sea that alternately covered and then receded from this area many times over. Most are very old, spanning portions of the Cambrian and Ordovician geologic periods from about 510 to 470 million years ago.

We found strange types of algae called receptaculitids that have mineralized rod-shaped spicules forming an internal skeleton like that found in some sponges. One type, *Receptaculites*, as shown in the Summer 2011 issue of *The Midden*, is shaped like a biscuit while another type, called *Calathium*, is conical like an empty ice cream cone and often formed mounded colonies.

We found plenty of trilobites, which are common in the surrounding areas, including a couple of tiny blind forms called agnostids.

NPS Photo

This large trilobite tail is an undescribed species of *Cybelopsis* (the quarter used as scale is exactly an inch in diameter); Lehman Formation, Ordovician Period.

We also found brachiopods, which have bivalved shells. Some of these lived in muddy burrows and have phosphatic shells, while others had calcium carbonate shells and attached themselves to various living animals or dead shells. We located bryozoans, distantly related to brachiopods but living in tiny coral-like colonies that either grew independently or encrusted other organisms. We also spotted many types of molluscs, including some clams, many species of marine snails, and plenty of straight nautiloids, which are cephalopods like squids and octopi but which had a long conical external shell. We did find one coiled nautiloid, which does not appear to be much different than the chambered nautilus living in modern oceans today.

NPS Photo

The straight shell of a type of nautiloid cephalopod, sometimes called an orthoceracone; Lehman Formation, Ordovician Period.

We were even lucky enough to pick up a single plate from an animal known as a chiton, a slug-shaped mollusc with a row of eight hard plates armoring its back. We found lots of stalked echinoderms, aka “sea lilies,” such as crinoids that stood well above the sea floor to catch food particles floating in the water and cystoids that scooted around in the bottom muds to find food.

NPS Photo

A single plate from a cystid echinoderm, probably *Hadrocystis*; Pogonip Group, Ordovician Period.

Probably one of the most exciting finds was a thick bed of corals at an elevation of almost 3350 m (11,000 ft), north of Granite Peak. About 470 million years ago during the Ordovician Period, living corals may have covered the local sea floor like a patchwork blanket that stretched for many kilometers. Geologists would call this type of accumulation a “biostrome.” While the bed we found would not technically qualify as a reef because it only stood one to two metes (three to six feet) above the seafloor, it nonetheless must have functioned as reef-like habitat. The corals that grew in this biostrome, *Eofletcheria* and *Foerstephyllum*, are two of the three earliest forms of corals known in the fossil record. Both are classified as members of a stem group known as tabulate corals. Corals would have to evolve much greater complexity and longevity before they could grow into the massive shapes we know as true reefs. We were able to trace one unbroken outcrop of this bed of coral for a distance of about 370 m (1200 ft) where its edges are interrupted by erosion or by faulting. We could pick it out again in nearby outcrops at about the

NPS Photo

Crowded and overgrown masses of the coral, Eofletcheria, indicating a reefy type of habitat; Lehman Formation, Ordovician Period.

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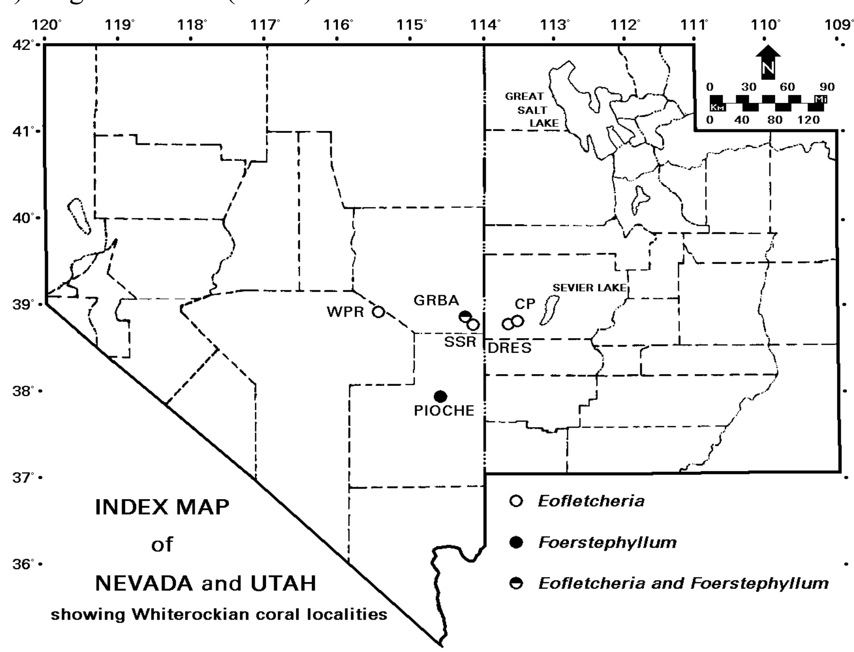
2012 Summer Paleoinventory Results (continued)

same horizon, suggesting it was indeed connected while growing. As it turns out, *Eofletcheria* has been reported as biostromal accumulations at about the same stratigraphic level in outcrops from Crystal Peak, in Utah all the way to the White Pine Range at the western edge of White Pine County in Nevada, a distance of more than 160 km (100 mi) today (map figure).

Based on calculations of the amount of geological extension that has occurred during faulting in the Great Basin, that distance would have been approximately 100 km (60 mi) at the time the coral was growing. Other observations note that *Eofletcheria* is found in float blocks at about the same stratigraphic level not far north of Big Springs on the southern end of the Snake Range. This suggests that the coral patch habitat might have originally grown in an east-west trending tract at least 100 km (60 mi) long and 16 km (10 mi) wide.



Distribution map of coral biostrome localities in the uppermost Lehman Formation updated with GRBA records (other data from Lehi Hintze, 1952, "Lower Ordovician Trilobites from Western Utah and Eastern Nevada," Utah Geological and Mineral Survey Bulletin 48).

NPS Photo

The first vertebrate fossil from the park, a partial fin spine of an acanthodian fish tentatively identified as *Nodocosta denisoni*; Sevy Dolomite, Devonian Period.

As a final note, the occurrence of *Foerstephyllum* at GBNP is only the second record from Nevada – the first being from the Ordovician rocks of the Pioche area.

And last but not least, this summer we also found the first vertebrate fossil from the park! It is not much to look at and is only 13 mm (0.5 in) long, but some people place more significance on vertebrate fossils than invertebrate fossils. Our specimen is shown above and is a fragmentary fin spine of an acanthodian fish. It was tentatively identified by Dr. David Elliot of Northern Arizona University as *Nodocosta denisoni*. The specimen was found on outcrops of the Sevy Dolomite which is Early Devonian age and is about 405-400 million years old. Appropriately, the Devonian Period of geologic time is also known as the "Age of Fishes."

So, in reflection, the amount and quality of fossil resources we found in such a short amount of time is amazing given so little indication in the scientific literature. This is due in large part to the efforts and dedication of our two GIPs, Linda Sue and Spencer. I want to extend a rousing round of thanks to them. It is also appaerent that GRBA contains a wealth of paleontological resources, but had simply been overlooked by researchers. After this past summer I am confident that we will make even more exciting discoveries next summer and that this paleontological inventory may very well spark a new era of geological and paleontological research at Great Basin National Park.

Investigating Ideal Rattlesnake Relocation Distances

by Bryan Hamilton, Wildlife Biologist

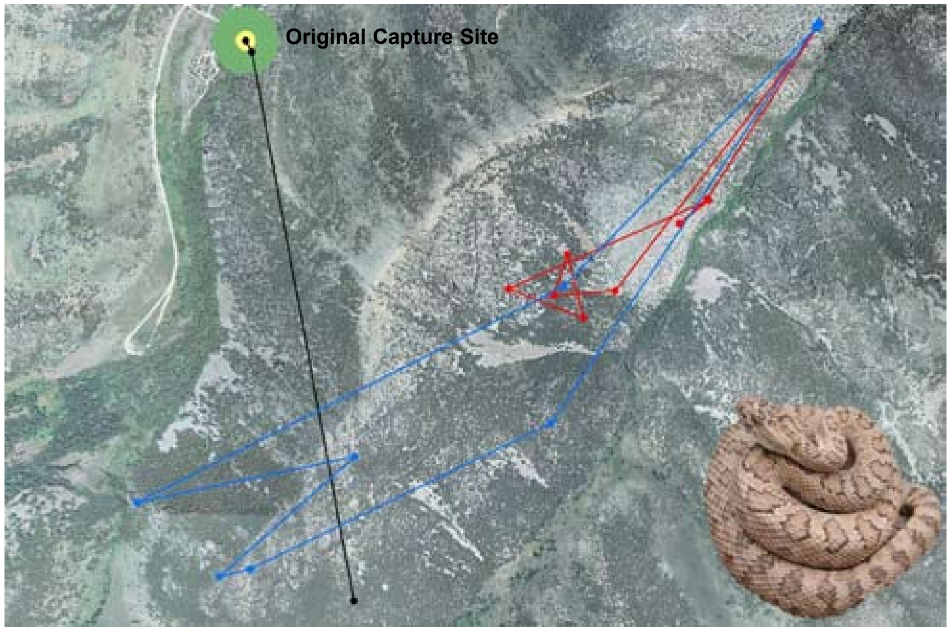


Figure 1. Movement of one male rattlesnake over three years; dots indicate where the snake was located, and lines in between extrapolate movement. 2009 is shown in black, 2010 in blue, and 2011 in red. Male rattlesnake home ranges tend to be larger than females. Males are less likely to return to their capture sites than females.

Rattlesnakes are important predators in ecosystems. As our understanding of rattlesnakes has grown, relocating rattlesnakes away from people has become a preferred management technique over killing the snakes.

Several studies have shown that rattlesnakes moved outside of their home ranges (>1000 m) have substantially lower survival rates than snakes moved short distances within their home ranges (~100 m). Great Basin National Park has initiated a study to learn more about rattlesnake-human interactions and specifically to test the hypothesis that rattlesnakes relocated short distances would not return to their capture sites.

Twenty-six Great Basin rattlesnakes (*Crotalus lutosus*) were implanted with radio transmitters and located every two weeks during the active season. On average snakes were moved 25.1 m from their capture sites (range 0 - 242 m). Following relocation, nine snakes returned to within 10 meters of their capture site (35%), 10 within 30 meters (38%) and 15 within 100 meters (58%).

Twenty-seven instances of recidivism (returning to previous behavior) were recorded at 10 meters, 32 at 30 meters and 60 at 100 meters. Snakes captured at den sites always returned to their capture site. This is not surprising given that Great Basin rattlesnakes have extremely high fidelity to their winter dens.

Winter dens are crucial for large bodied ectotherms, like rattlesnakes, to survive the harsh winters of the Great Basin. Females were more likely than males to return to their capture site. Males have larger home ranges than females and are less social (Figure 1). Female recidivism seems to occur primarily at rookery sites, which are social centers for breeding, gestation, and birthing.

While short distance translocations alleviate the immediate danger of a rattlesnake and reduce the probability of a harmful interaction between a rattlesnake and person, they do not eliminate the possibility that a translocated snake will return to its capture site.

Rattlesnakes are not aggressive animals and bite humans only in self-defense. Most snake bites occur as a result of humans trying to kill or capture rattlesnakes, and rattlesnakes are far more likely to be killed or injured in a human-snake encounter than a person. Killing rattlesnakes is illegal in national parks, which are mandated under the Organic Act to protect all native wildlife unimpaired.

Safety concerns for both people and rattlesnakes have resulted in a rattlesnake relocation policy in parks designed to balance human and rattlesnake safety. Outside of parks, human acceptance of rattlesnakes is the best way for coexistence to occur. Interest in relocating rather than killing rattlesnakes shows the heightened level of interest in snake conservation. Continued education, avoiding deliberate interaction with rattlesnakes, and short-distance snake relocations are the best way to protect both rattlesnakes and humans.

Learn more about snakes!
Join wildlife biologists for the annual kingsnake survey, May 20-27, 2013. Contact Bryan_Hamilton@nps.gov to sign up.

Lehman Cave Restoration

By Gretchen Baker, Ecologist

What happens when over 30,000 people visit Lehman Caves each year? It gets dirty. The dirt, hair, lint, and other debris that accidentally gets left behind in the cave can cover cave formations, detracting from the beauty of the cave. The dirt can alter the growth of cave formations, changing how calcite-laden water flows. It can also provide an unnatural food source for cave biota.

Fortunately, part of the cave was cleaned recently. Several members of the Southern Nevada Grotto spent their Thanksgiving vacation at Great Basin National Park. In addition to continuing their survey project, they also cleaned cave passages.

These dedicated volunteers spent over 120 hours in the cave. They removed 36.5 pounds of dirt, lint, hair, and debris from the entrance and exit tunnels and from the Music Room to the Lodge Room. The primary methods included using paintbrushes to dust the lint and other debris off the formations, stairs, and trail. A shop vac was used to suck up the fine material that escaped going into the bags held under the paintbrushes.

The nylon bristles on paintbrushes have a slight electrical charge and pick up lint easily.

The results were noticeable immediately. The staircases now gleam, and strands of hair no longer dangle under every step. Formations appear brighter. The park appreciates greatly the effort of these volunteers.

More of the cave remains to be cleaned. Would you like to help restore the cave? The park will hold a lint camp in February. Contact Gretchen_Baker@nps.gov to sign up or for more information.

Photos of a cave formation before and after cleaning. The formations are much easier to clean when they are dry than when they are wet.

A Southern Nevada grotto member dusting lint off part of a cave passage.

Lehman Cave
Lint Camp

February 8-9, 2013

Help restore the cave!

2012 Diptera BioBlitz

By Rebecca Clement, C. Riley Nelson, and Matthew D. Otis, Department of Biology, Brigham Young University

Each summer for the past few years Great Basin National Park has hosted a Bioblitz to target a specific group of invertebrates.They have invited scientists, volunteers and families to go to every conceivable place in the park and catch everything they could. Habitats in the park range from alpine at 3900 meters (13,000 ft) to salt desert shrublands at 1600 meters (5,300 ft).

This year Diptera was the focus of the extensive frenzy from June 19-21. With the help of several entomologists and a group of energetic volunteers, the 2012 Bioblitz was a great success. Thousands of flies were collected, adding many new families, genera, and species to the park's list. And good times were had by all. The Bioblitz officially

NPS Photo by Gretchen Baker

Park rangers Anna Snyder and Jonathan Jackson help a junior ranger collect Diptera during the park's fourth annual Bioblitz.

started with a talk by Dr. Riley Nelson from Brigham Young University introducing the fly families, the goals of the trip, and the collection methods to be used. Participants were equipped with nets, vials, plastic bags, and some spiffy green

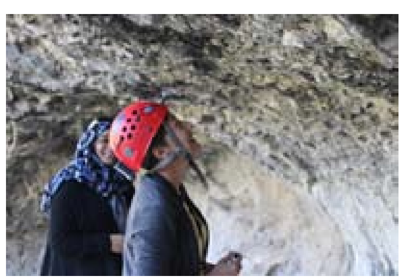
NPS Photo by Gretchen Baker

Dr. Riley Nelson led the BioBlitz activities, beginning with a workshop the first morning. He provided field identifications and took specimens back to Brigham Young University for further identification.

water bottles supplied by the park's volunteer program. We received advice from Gretchen Baker, the park ecologist, on how to adequately record localities with a grid system and GPS. After being equipped, the participants were then unleashed into the 310-square-kilometer (120-square-mile) park with high hopes and fly dreams of glory.

Over fifty Bioblitz team members searched during the next 48 hours. This may not have been the largest Bioblitz in the park's history, but it turned out to be the most international group the Park has ever had, including a family from Hungary, a volunteer from Oman, and an expert dipterist from Germany. The Nevada State Entomologist and his team came. All were enthusiastic about this variation from their routine work.

After half a day of collecting



NPS Photo by G. Baker

NPS Biodiversity Coordinator Sally Plumb helps look for Diptera, along with a volunteer from Oman.

we all assembled to hear a campfire talk entitled, "Desert Flies are Voluptuous," featuring Dr. Riley Nelson. The talk was geared around dispelling the myth that flies are repulsive. The next evening, Dr. Ken Kingsley favored us with a talk called, "Through a Fly's Eyes" with some particularly interesting information about mosquitoes.

On Thursday morning, we took a jovial little hike up to the bristlecone pine forest and collected more flies as we enjoyed the beauty of 3982 m (13,063 ft) towering Wheeler Peak, the serene Teresa Lake, and the groves of 3,000-5,000 year old bristlecones. We collected hundreds of anthomyiids and ephydrids at the lake. One sweep of the net and it was black with flies! It was also amazing to be collecting asilids and syrphids under the old, gnarled branches of the ancient bristlecone pines.

NPS Photo by G. Baker

Young BioBlitz participants proved adept at sorting the insects from vegetative matter. Further sorting was done by entomologists and students.

The participants gathered the morning of 21 June to sort their findings. At noon, the Great Basin National Park Foundation provided a farewell luncheon, with the Western National Parks Association providing raffle prizes. At the conclusion of the luncheon Riley Nelson presented the preliminary results of the Bioblitz to volunteers.

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2012 Diptera BioBlitz (Continued)

The 2012 Diptera Bioblitz added a number of new families, genera, and species to Great Basin National Park's repertoire of flies. In the 48 hours allotted to the Bioblitz, team members gathered over 125 samples of flies from 47 different families, which added 19 new families to the park list. There were four families known to the park that we didn't find, but our additions brought the total number of Diptera families to 51! (Table 1).

The results remain incomplete as we continue to sort and identify the numerous samples. Check future issues of *The Midden* for updates. For more pictures visit http://www.flickr.com/groups/gbnp_bioblitz/pool/

Table 1. Flies of Great Basin National Park. "1" indicates present, "0" indicates absent. Scale of numbers in samples: abundant>common>rare>one.

Family	Before Bioblitz	During Bioblitz	How many?		Family	Before Bioblitz	During Bioblitz	How many?
Agromyzidae	1	1	common		Periscelididae	0	1	one
Anthomyiidae	1	1	abundant		Phoridae	1	1	common
Asilidae	0	1	common		Psilidae	0	1	rare
Bibionidae	0	1	rare		Psychodidae	1	1	rare
Bombyliidae	1	1	common		Ptychopteridae	0	1	one
Calliphoridae	1	1	common		Rhagionidae	0	1	one
Carnidae	1	0	rare		Sarcophagidae	1	1	common
Cecidomyiidae	1	1	common		Scathophagidae	1	1	common
Ceratopogonidae	1	1	common		Scatopsidae	0	1	one
Chamaemyiidae	0	1	rare		Sciaridae	1	1	common
Chironomidae	1	1	abundant		Sciomyzidae	0	1	common
Chloropidae	1	1	common		Sepsidae	1	1	common
Clusiidae	0	1	one		Simuliidae	1	1	rare
Conopidae	1	1	one		Sphaeroceridae	1	1	rare
Culicidae	1	0	rare		Stratiomyidae	0	1	rare
Dixidae	0	1	rare		Streblidae	1	0	rare
Dolichopodidae	1	1	common		Syrphidae	0	1	common
Drosophilidae	1	1	rare		Tabanidae	0	1	one
Empididae	1	1	common		Tachinidae	1	1	common
Ephydridae	1	1	abundant		Tephritidae	1	1	common
Heleomyzidae	1	1	rare		Tethinidae	0	1	one
Lauxaniidae	0	1	rare		Therevidae	1	1	rare
Micropezidae	0	1	one		Tipulidae	1	1	common
Milichiidae	0	1	one		Trichoceridae	1	0	rare
Muscidae	1	1	abundant		Ulidiidae	0	1	rare
Mycetophilidae	1	1	one		**Total Families**	**32**	**47**	

Join us July 8-10, 2013 for the Great Basin National Park Arachnid BioBlitz.
Help us find spiders, mites, scorpions, pseudoscorpions, and more.
The event includes a workshop, talks, walks, and a collecting period.
Contact Gretchen_Baker@nps.gov to be added to the mailing list.

Forest Service Assists Park with Forest Health Issues

USFS Photo by Danielle Reboletti

The fading and dead piñon pine located along the Park's main entrance road in July 2012.

By Danielle Reboletti, Forest Service Entomologist and Gretchen Baker, Park Ecologist

In early summer, it became noticeable that piñon trees along the park entrance road were turning brown and dying. The park did not know the cause, so asked for assistance from the Forest Service Forest Health Protection Lab. Located in Ogden, Utah, the group assists federal agencies in a multi-state area. A forest entomologist arrived and examined the trees with park staff, determining that a suite of factors was causing the die-off next to the road corridor.

USFS Photo by Danielle Reboletti

A typical dead piñon pine tree examined for piñon *Ips*, but showing no signs of a biotic cause for death.

The fading trees were showing some signs of piñon sawfly (*Neodiprion edulicolus*) damage; this insect, while not in an epidemic stage, did cause light feeding damage on needles and premature needle cast. Pitch mass borer (*Dioryctria* sp.) and pine tip moth (*Dioryctria albovitella*) activity were noted as well. Piñon tip moth has little effect on overall tree health. In addition, high infestations of piñon dwarf mistletoe were observed in several trees. However, because fading foliage was concentrated near the roadway, we determined the cause of tree damage to be roadway stress, with salt as a contributing factor. Currently, we are waiting for the results of foliar and soil lab tests.

The concern of park staff was the tendency for piñon *Ips* (*Ips confusus*), a native bark beetle, to increase populations in slash and weakened trees and cause high levels of tree death on the landscape. Despite not finding current piñon *Ips* damage, but also knowing that a large portion of trees were already weakened from salt and roadway stress, park managers, biologists, and ecologists opted to be proactive with their management efforts. The dead trees along the park entrance road were removed, which also allowed visitors to concentrate more on the beautiful views around them.

USFS Photo by D. Reboletti

Tip moth damage on dying piñon pine.

USFS Photo by D. Reboletti

Sawfly feeding damage on piñon pine.

USFS Photo by D. Reboletti

Piñon pine dwarf mistletoe.

The good news was that the piñon *Ips* beetle was not the cause. Piñon *Ips* can have up to four generations in one year, spreading rapidly from tree to tree. This insect has the ability to cause major economic losses when it reaches epidemic levels. Piñon *Ips* epidemics have been witnessed in the

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Forest Service Assists Park with Forest Health Issues (continued)

southwestern US, and are capable of occurring throughout the range of this insect.

Piñon *Ips* bark beetles have four life stages: egg, larvae, pupae and adult. The adult males bore into a susceptible tree and release a pheromone that attracts female piñon *Ips*. Once joined by females, the males mate with several female beetles. The females then bore galleries and lay their fertilized eggs. Once the eggs hatch, the larvae begin to feed outward, also boring or etching a trail-like system in the trees' inner bark/water and nutrient conducting system (phloem). Once the larvae complete their feeding, they bore a pupal chamber where they complete their growth and later emerge as adults. When we are experiencing drought conditions, weakened trees are most susceptible to this insect.

NPS Photo by G. Baker

Piñon *Ips* bark beetles in the inner bark of a piñon tree.

Piñon *Ips* was found later in the summer, when two Forest Service entomologists examined the picnic area near the Lehman Caves Visitor Center. Piñon *Ips* beetles are attacking a number of trees there. Due to the park's desire to retain some shaded picnic areas, the park is going to remove the infested trees and dispose of the wood in the hopes that additional trees in the picnic area are not infested.

USFS Photo by Danielle Reboletti

This piñon pine is infested with piñon *Ips*, please note the red pitch tubes located at the site where the insect entered the tree.

Other bark beetles are affecting additional tree species in the park. In the Wheeler Peak campground, mountain pine beetles and spruce beetles have both been identified in older dead trees and in live trees (typically called "green infested trees").

Spruce beetles attack Engelmann spruce trees, causing them to die within 1-2 years of infestation. Spruce beetle has the ability to destroy large populations of Engelmann spruce across the landscape. The striking effects of this bark beetle are currently most evident in the Uinta's (northern UT, Wolf Creek Pass).

Mountain pine beetles attack limber and ponderosa pines within the park. Mountain pine beetles were also seen attacking Engelmann spruce at Wheeler Peak campground. In most cases, mountain pine beetle will not kill an Engelmann spruce, but there are some cases where these bark beetles can cause spruce death.

The park aims to protect high value trees, including those in campgrounds, at trailheads, and along some roads, by using pheromone pouches to deter the beetles. The pheromones are attached to the trees and send out a chemical message that the tree is already full of beetles. Pheromone protection works well as an integrated approach to bark beetle management; an integrated approach should include removing infested material, thinning, pheromone protection, and insecticide applications where warranted.

Currently, there is no pheromone pouch available for spruce beetle, although spraying trees with the insecticide carbaryl has been effective in other areas. The park needs to complete NEPA compliance before any spraying commences.

How can you help? The park is at risk of having non-native diseases and insects brought into the park. One of the primary ways is from campers bringing in wood from other areas that might contain other pests. To maintain forest health, it is best to obtain firewood locally. Also, please do not touch or remove pheromone packets or damage trees in campgrounds with hatchets. Hatchet damaged trees are more susceptible to bark beetle attack.

For more information about forest health, ask at one of the visitor centers for a brochure or visit http://www.fs.fed.us/foresthealth/.

Re-Discovering Abandoned Mine Lands: The Johnson Lake Mine

by Karla Jageman, Archeologist and Eva Jensen, Cultural Resource Program Manager

The Great Basin National Park Cultural Resource Management (CRM) staff continued to work with Great Basin Natural Resource crews to identify, locate, and document the features of historic abandoned mine lands during the 2012 field season. Prior to beginning field work, historic documents, early maps, and aerial photos were compared and geo-referenced with current satellite imagery to identify known mining features and potential areas for previously undocumented sites. During 2011-2012, archeologists recorded 16 previously undocumented mining sites and updated records for 5 previously documented sites.

Mining sites often have a variety of features and artifacts; these contribute to the archeologists' understanding of the miners' daily lives and the techniques they used to mine the ore. During the 2011 and 2012 field seasons, archeologists recorded mining claims, stacked rock cairns, prospects, adits, shafts, artifacts such as cans and glass, living quarters, and animal facilities.

As part of this project, CRM staff spent several weeks in the backcountry recording mining features located within the Johnson Lake Mine Historic District. Among the known features previously recorded at Johnson Lake Mine were six standing structures, a collapsed structure, an earthen dam, three tent/loading platforms, a depression, an aerial tramway, two prospecting trenches, and an adit.

During the 2012 field season, numerous additional features were located. These included a corral, four tent/loading platforms, a privy depression, a shaving station, five wooden mining claims (Figure 1), six stacked rock cairns, fifteen prospects, and an adit (Figure 2).

With this new information, park archeologists are beginning to understand why numerous structures were built at the Johnson Lake Mine. The addition of claims, cairns, prospects, and an adit to the archeological record indicate that mining operations were much more intense than previously reported. Tent platforms indicate temporary lodging for miners, and the corrals show that more animals were needed for hauling supplies and moving ore to the mill and out of the canyon.

The park will continue to record and begin to stabilize the historic structures at Johnson Lake Mine over the next five years. Beginning in the 2013 field season artifact scatters will be recorded in detail and mapped using GIS, which will provide details of use areas. Artifact analysis can provide information about how long the site was used and where suppliers were located. Types of artifacts and even high cut stumps might indicate a seasonal occupation. GIS mapping could reveal if the site was one planned building episode or if it was slow and haphazard as the mining activity expanded. With this new information, CRM staff will help assure park staff and visitor safety, and enhance the visitor understanding of the Johnson Lake Mine and other historic abandoned mine lands in the park.

NPS Photo by Karla Jageman

Figure 1. Example of a wooden mining claim found at the Johnson Lake Mine.

NPS Photo by Nick Arndt

Figure 2. Adit found during the 2012 field season at Johnson Lake Mine.

Fire Needed to Maintain Healthy Ecosystems

by Bryan Hamilton, Wildlife Biologist

In the Great Basin, fire is an important agent of change. Fire has a cleansing effect on plant communities, removing dead and dense vegetation, invigorating plant growth, and maintaining grass dominated communities like sagebrush steppe grasslands, basin wildrye, and aspen.

Without fire, plant communities become choked with vegetation and allow conifers to invade. As the time between fires increases, conifer canopies extend and expand, outcompeting grasses and shrubs for sunlight and eliminating aspen regeneration. Over time grasses and shrubs slowly disappear and aspen trees become decadent and die. The plant community has now shifted from a more productive herbaceous understory to conifer-dominated woodland or forest with little understory. Evidence of this change is testified by sagebrush “skeletons” still present in piñon and juniper woodlands and aspen stands now towered over by white fir.

The ecological implications of fire exclusion are profound. Woodlands and forests are less productive and support fewer plants and animals than sagebrush and aspen habitats. Fire exclusion is responsible for shifting sagebrush steppe grasslands to piñon-juniper woodlands and open aspen woodlands to closed canopy fir forest. Once these shifts have occurred fire becomes a threat instead of an ally to the ecosystem. Excessive fuel loads and ladder fuels allow fire to easily move into tree canopies where it burns with extreme intensity, killing all plants and compromising the soils’ ability to support life. Extreme fires such as this set the stage for invasion by non-native plants like cheatgrass.

Post fire recovery of vegetation at higher elevations in the Great Basin is rapid and improves habitat for sensitive species such as bighorn sheep and sage grouse.

The Nature Conservancy recently completed a spatial modeling exercise in the park using best-available science to understand the ecological health of park ecosystems and how these systems could benefit from management. The key result was that sagebrush and aspen plant communities in the park require active restoration to restore them to natural conditions.

Restoration would utilize a variety of management techniques, including prescribed fire, wildland fire use, mechanical thinning, chipping, slash pile burns, reseeding native vegetation and weed management with herbicides and inventories. These actions would restore plant communities to their natural range of variation.

Great Basin National Park recognizes the role of fire in maintaining healthy, resilient ecosystems. We also recognize the inherent ecological risks now present because of past fire exclusion and non-native plants like cheatgrass. In an effort to restore fire as a tool of change in maintaining healthy ecosystems and plant communities we have undertaken several sagebrush steppe restoration projects.

The goal of these projects is two-fold: to reduce excessive fuel loads and to restore healthy, resilient plant communities. If these goals can be met, fire may be reintroduced back into the system, reducing the potential for a catastrophic fire and the potential for cheatgrass invasion. It should be kept in mind that the goal of these projects is to correct a human- induced problem (fire suppression) to allow fire back into the system in a safe and ecologically sound fashion. In order to allow natural change to work on landscapes, we must first correct the human-induced change.

Determining Carnivore Occurrence with Remote Cameras

by Meg Horner, Supervisory Biological Science Technician and Bryan Hamilton, Wildlife Biologist

Great Basin National Park (GRBA) is the only national park located entirely within the physiographic Great Basin region. This region is highlighted by a distinct geology, dramatic elevation gradients, and an arid climate, all of which have resulted in a unique biological diversity (Hall 1946 and Grayson 1993).

Sixty-seven species of mammals occur in GRBA and vicinity including 13 species of carnivores: coyote, gray fox, kit fox, red fox, ringtail, raccoon, ermine, long-tailed weasel, badger, striped skunk, spotted skunk, bobcat and mountain lion (Rickart 2007) (Figure 1).

The nominal precipitation and arid climate of the Great Basin is reflected on the landscape by limited riparian habitat. Streams and springs are often ephemeral. Perennial water sources are restricted in area, forming narrow corridors of riparian habitat. The park is no exception; it is dominated by upland vegetation with riparian habitat accounting for less than one percent of the park's total area. Despite its limited area, riparian habitat is essential to many species of wildlife because it contains higher biodiversity and provides access to water, cover, and prey species.

Figure 1. Remote camera carnivore photos. a) striped skunk (*Mephitis mephitis)* b) spotted skunk (*Spilogale gracilis*) c) gray fox (*Urocyon cinereoargenteus*) and d) mountain lion (*Puma concolor*).

The question we addressed was whether carnivore occurrence is influenced by habitat type – riparian or upland – using remote cameras. Little was known about carnivore occurrence or habitat use at GRBA, but we hypothesized carnivores would utilize riparian habitat more than upland habitat, despite differences in area, because of the ecosystem services it provides.

We used baited remote cameras to detect carnivores. Sampling sites were characterized by their proximity to perennial water as either riparian or upland. The park was divided into 31,710 one-hectare grid cells, and grid cells intersecting a perennial water source were considered riparian.

Upland sites were at least 300 meters from the nearest perennial water. The park was also stratified by elevation. For winter sampling, site selection was constrained below 2,450 meters.

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Determining Carnivore Occurrence with Remote Cameras (continued)

Within that elevation range, a grid cell was randomly selected that intersected a perennial water source (spring or stream). Each riparian cell was paired with a randomly selected upland site.

For the summer sampling period, site selection was constrained above 2,450 meters, and grid cells were randomly selected. To ensure independence, no grid cells were selected within a distance of 700 meters from another sampling point. Each camera was deployed for at least 27 nights – our target was 28 trap nights. We used logistic regression to test habitat-species interactions after accounting for differences in trap nights.

A total of 133 remote cameras traps were installed at 65 riparian and 68 upland sites between January 2010 and January 2012. Sixty-seven sites were surveyed during summer months (May through October) and 66 were surveyed during the winter (November through April). Remote cameras were deployed for a total of 4,295 trap nights. There were 2,320 photos (total captures) of 29 different species of mammals and birds and 972 total captures of seven carnivore species. Total carnivore captures were greater at riparian sites.

Gray fox were the most commonly detected carnivore. Ringtails were absent from our upland sites; and we failed to detect either weasel species. No species was limited by season or elevation. Even species typically associated with lower elevations (e.g. coyote) were documented above 3,000 meters.

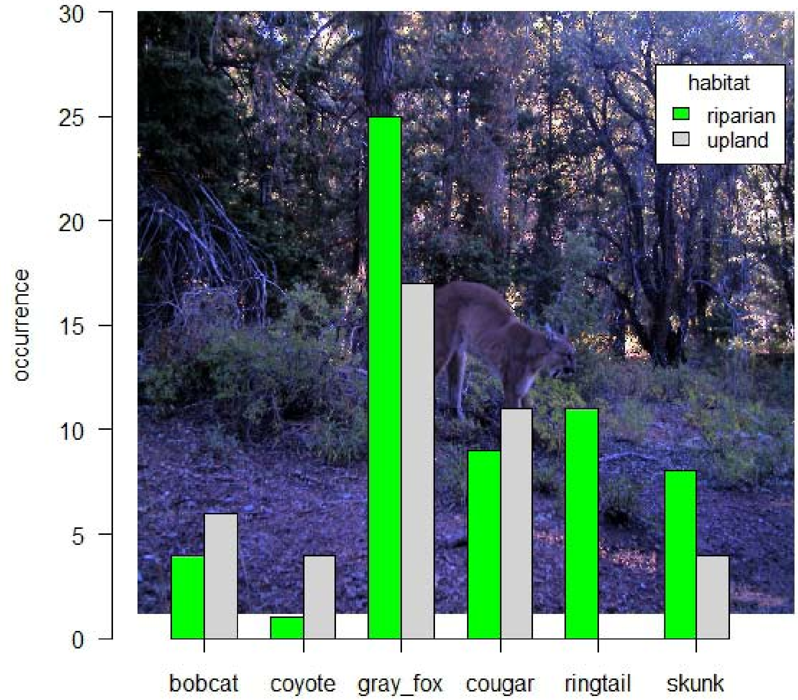

Figure 2. Carnivore occurrence by habitat type. The two skunk species were lumped because of limited capture data.

Habitat type (riparian or upland) was not a strong indicator of occurrence for park carnivores. The only species with high fidelity to riparian sites were ringtail. Gray fox were more likely to occur at riparian sites, but they were not restricted to it (Figure 2).
Our data did not support our hypothesis that carnivore occurrence would be greater in riparian habitat. Instead, the data show the relatively even occurrence of carnivores in both upland and riparian habitat.

Only ringtail were strongly associated with riparian habitat. Low fidelity to riparian sites by all but one carnivore species in our study may be related to available area. Riparian habitat is greatly restricted even in montane regions of the Great Basin forcing species to use xeric, upland habitats. Limited occurrence data (n_{total} = 100), especially for the skunk species, limited our ability to confidently infer differences in habitat use for park carnivores. Additional sampling of riparian and upland sites with remote cameras may reveal relationships our existing dataset did not.

References

Grayson. 1993. The desert's past: a natural prehistory of the Great Basin.

Hall. 1946. Mammals of Nevada.

Rickart and Robson. 2007. A guide to the mammals of Great Basin National Park.

Wanted: Wildlife Observations

If you see carnivores or other animals in the park, please fill out a wildlife observation form, available in either visitor center.

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

Hymenoptera BioBlitz Update

By Ken Kingsley, NPS Volunteer Entomologist

The 2011 Bioblitz focused on the insect order Hymenoptera—the ants, bees, and wasps. Over 80 participants collected specimens and made observations. Dr. James Pitts and his graduate students at Utah State University took the specimens back to the lab and identified most of them to genus.

A review of the 2011 Hymenoptera BioBlitz at Great Basin National Park is now available on the park website.

Participants in the 2011 Hymenoptera BioBlitz at Great Basin National Park found 32 families and more than 120 species. Most of these had never been documented previously in the park. A list of these identifications was sent out to participants by email in August 2012. For those who are entomologists with extensive training in this order, that list was quite interesting.

For those who would like to know more and might not know an Ichneumonid from a Crabonid, I compiled a document that includes descriptions, ecological roles, and number of species known for each family in North America. Many of the families are illustrated with photographs by David Hunter, a professional photographer who worked the Bioblitz, and by my wife, Zion National Park Ranger Amy Gaiennie, and I. The document includes the number of species in each Family collected during the Bioblitz, identifications to genus and species where available, and additional information.

This document is available as a free pdf download from the Park website: http://www.nps.gov/grba/naturescience/great-basin-bioblitz.htm Please check it out. It is a work in progress, so if you have additions, corrections, photographs, or information that might make it more useful, please contact Gretchen Baker: Gretchen_Baker@nps.gov.

Upcoming Events:

February 8-9: Lehman Caves Lint Camp. Help clean and restore the cave. Contact Gretchen_Baker@nps.gov for more information.

May 20-27: Kingsnake Survey. Contact Bryan_Hamilton@nps.gov for more information.

May 25 & 26 : Memorial Day Weekend Star Party. Enjoy the dark skies!

July 8-10: Arachnid BioBlitz. Join Dr. Paula Cushing, other entomologists, and volunteers for a fun three-day event to document spiders and other arachnids in the park. See http://www.nps.gov/grba/naturescience/great-basin-bioblitz.htm

August 5-14: GLORIA resurvey efforts. Volunteer botanists are welcome to assist. Contact Gretchen_Baker@nps.gov for more info.