Parks as Labs

NATIONAL PARKS PROTECT A TREMENDOUS VARIETY OF NATURAL AND cultural wonders. The cliff dwellings of Mesa Verde, the thermal features of Yellowstone, the canyons of Canyonlands – these and other parks present opportunities for visitors to explore features that often don’t exist anywhere else in the world.

National Parks also present unique opportunities for scientific research. Of course many scientists study the various wonders for which parks were established, but that’s not all. Many parks prohibit activities like hunting, grazing, mining and off-road vehicle use that occur elsewhere on public and private lands. These regulations create a “control” area to which scientists can compare the affects of these activities elsewhere. This is especially important in the American west where parks often serve as the best model for what an undisturbed landscape should look like. For example, in order to assess soil fertility around an old copper mine, one would need benchmark values from a similar environment where no mining had occurred. National Parks can make establishing such benchmarks easier.

Over the years, Canyonlands has served as an outdoor laboratory for a variety of scientists. Given the landscape, it is no surprise that much of this research focuses on geology and soils. From the Island in the Sky’s Upheaval Dome to the Grabens area of the Needles, Canyonlands possesses many uncommon landforms. The fact that over 200 million years of geologic history are visible in the park draws scientists from all over the world.

Soil science has been a dominant research topic at Canyonlands for years. Since the 1970s, researchers have been uncovering the role biological soil crusts play in the high desert ecosystem. Since topsoil erosion and fertility have become issues of global importance, understanding the mechanisms which maintain healthy soils in deserts might benefit areas all over the world.

Much of the soil research has focused on the impacts of grazing and exotic grasses, especially the invasive cheatgrass (Bromus tectorum). This European import has overcome rangeland throughout the western United States. Animals rarely eat it and it appears that native grasses cannot compete with it. Scientists at Canyonlands are studying how changes in soil chemistry affect the ability of cheatgrass to transform a landscape.

In addition to such far-ranging benefits, research in Canyonlands also aids park managers. Much like a physician monitors a patient’s heartbeat and blood pressure for diagnostic purposes, National Park Service officials need accurate information about the resources in their care. Specifically, they need to know how and why natural systems change over time, and what amount of change is normal, in order to make sound management decisions.

Scientists have been implementing an integrated inventory and monitoring program. The first phase of the program is to verify records of what plants and animals exist in Canyonlands. To accomplish this, teams of scientists are conducting inventories of plants, mammals, reptiles, amphibians and birds.

The second phase of the program is the development of vital signs monitoring. Vital signs are measurable, early warning signals that indicate changes which could affect the long-term health of natural systems. Canyonlands, along with other parks, is planning a program to monitor biological and physical resources like air quality, water quality, exotic species, soils, and threatened and endangered species in the park.

The passage from the public law, passed by Congress in 1964, set aside a remarkable landscape containing much of the Colorado and Green River basins around their confluence. As Americans, we hold this to be a special place that preserves a part of this nation’s natural and cultural heritage.

Canyonlands offers a full spectrum of discovery and experience. The Island in the Sky provides a raven’s view of endless canyons and mesas. The Needles, whether accessed by vehicle or on foot, is a visual feast that constantly teases you into wanting to see what’s around the next sandstone fin or knob. Venturing into the remote canyons of the Maze District allows visitors to lose and find themselves at the same time. Finally, floating the calm waters of the Green or Colorado Rivers is nothing short of soothing therapy for the soul, while the rapids of Cataract Canyon below the confluencerouse your spirit. Canyonlands is a place to make and share memories that can sustain you for a long time to come. I hope you rest, relax, recreate and, most importantly, remember your time here. As you leave the park behind, please take a piece of it home in your heart. On behalf of the dedicated National Park Service staff and our many volunteers, I truly hope that you safely enjoy your visit.

Tony Schottz
Superintendent
Bat Inventory Completed

The inventory and monitoring program at Canyonlands recently concluded a two-year bat inventory which yielded a wealth of information about this little-known and often underappreciated group of animals.

Dr. Mike Bogan of the U.S. Geological Survey in Albuquerque, together with his colleague, Dr. Tony Melhagen, confirmed the presence of 16 native bat species in the park. Previous studies confirmed only eight species. As a comparison, only 18 bat species have been documented in the state of Utah.

The ‘bat team’ worked at 34 different sites throughout the park and used two different methods to document bats: mist nets and acoustic surveys.

The team deployed mist nets near bodies of water and other places to capture bats coming to drink or feed on insects, their primary food source. The nets ranged from nine to 60 feet long. One to five nets were set up each evening, depending on the area and shape of the body of water at the sampling site. Nets were erected shortly before sunset and maintained until early morning when bats are most active. The team never left mist nets unattended in order to prevent captured bats from being injured. Once a bat was captured, team members recorded the species, sex, reproductive condition, time of capture and descriptive comments about individual animals.

Acoustic surveys involve the use of a bat detector which records bat echolocation calls. While bats can see as well as humans, they use an advanced method of using sound—echolocation—which enables them to navigate and find food in the dark. Bats produce echolocation by emitting high-frequency sounds through their mouths or noses and listening to the echo. With this echo, the bat can determine the size, shape and even texture of objects in its environment.

Most bat echolocation occurs beyond the range of human hearing. While humans can hear up to 20 kHz (depending on age), bat calls range from 9 kHz to 200 kHz.

Scientists have devised methods for eavesdropping on bats with the use of bat detectors. Bat detectors contain ultrasonic microphones that can detect bat echolocation and output the incoming call within the range of human hearing. These electronic signals are recorded and processed to assist in the identification of bat species. For the Canyonlands inventory, the bat detectors were positioned at nine sampling sites across the park for one to two nights, either on the ground or attached to a tripod. The detection systems were programmed to record from 30 minutes before sunset to 30 minutes before sunrise.

Over the course of the study, the bat team captured and identified 1,717 bats with mist nets. The team released all bats unharmed at their capture site. The maximum number on a single evening was 134 bats representing 10 species. The average catch per night was 26 bats (four species). The team identified 3,751 recordings with the use of bat detectors, with a total of 11 species. The maximum number of identifiable individual calls recorded during one night was 825, with a species count of nine. The average recordings per night were 250 calls (six species).

The study showed that several sites in Canyonlands provide exceptional habitat for bats. Chief among them is Salt Creek Canyon where the junction with Horse Canyon and Peekaboo is a whopping 62% of the total bats captured came from the sampling sites in this area. These sites also yielded high species diversity, suggesting that a variety of species can meet their resource needs along this riparian corridor.

No federally listed Threatened or Endangered bats were discovered in Canyonlands. However, the state of Utah lists five of the 16 bat species found as ‘wildlife-species-of-concern’—species for which there is credible scientific evidence of threats to a population’s continued viability. Although they are long-lived (5 to 20 years), bats are vulnerable because they have low reproductive rates (one “pup” per female per year) and often roost in large groups where disturbances can affect a lot of animals at once.

Bats have been maltreated in folklore and literature throughout our history. Yet these diverse flying mammals control insect populations, pollinate plants, disperse seeds, and pose little threat to people who do not handle them. Look for bats emerging from their day roosts in Canyonlands at dusk, especially in the spring and summer months.

Explo ring Island in the Sky

Exploring Island in the Sky

Basics
• Visitor center is open 8:00 a.m. to 6:00 p.m. from April to late October, and 8:00 a.m. to 4:30 p.m. the rest of the year. Hours vary, exhibit, gift and map sales, audio-visual programs, backcountry permits, general information, and park rangers on duty.
• There are no free water sources at the Island. Water is sold in the visitor center at the front desk and at a vending machine outside.
• Orientation movie: Wilderness of Rock is shown on request at the visitor center (15 minutes).
• Vault toilets are located at the visitor center, Grand View Point, Green River Overlook, Upheaval Dome, White Rim Overlook and Willow Flat Campground. The visitor center toilets are wheelchair accessible.
• Campground at Willow Flat has 12 sites available on a first-come, first-served basis. No water or hookups provided. Nightly fee is $10 per site.

Scenic drive
A 34-mile (round-trip) scenic drive allows visitors to tour the entire mesa top. The Road Guide to Canyonlands - Island in the Sky District offers an insightful narrative for the trip and can be purchased at the visitor center. A self-guided driving tour CD is also available for sale or loan. Wheelchair accessible overlooks include Grand View Point, Green River Overlook and Buck Canyon Overlook. There are picnic areas at White Rim Overlook and Upheaval Dome.

Interpretive activities
• Interpretive brochures are available for Mesa Arch and Upheaval Dome.
• Ranger programs: Geology talks (30 minutes) are presented daily at 10:30 and 11:30 a.m. at Grand View Point (April to late October). Afternoon talks and activities are presented daily (April to September).
• Check at the visitor center or campground for times and topics.

For kids
Free Junior Ranger booklets are available at the visitor center. Kids age 6 to 12 can earn a Junior Ranger badge by completing five or more activities in the book. For hiking, kids enjoy peeking through Mesa Arch and climbing the back of the whale at Whaile Rock. Use caution as there are uneven overlooks on both of these trails.

What to do with your day
First, stop at the visitor center for current information on trails, roads, interpretive programs, weather, or to watch the park orientation movie.

If you have 2 hours:
Drive to Grand View Point or Green River Overlook. Hike to Mesa Arch.

If you have 4 hours:
Drive to Grand View Point, Green River Overlook and Upheaval Dome. Hike the Grand View Point, Mesa Arch, and Upheaval Dome Overlook trails.

If you have 8 hours:
Visit every overlook. Hike several mesa top trails or one of the more strenuous trails descending to the White Rim. Enjoy lunch on the trail or at White Rim Overlook or Upheaval Dome picnic areas.

If you are interested in geology:
Visit the exhibits at the visitor center and pick up a free geology handout. Visit Grand View Point to see the rock layers. Visit Upheaval Dome and hike to the first overlook. There you can learn two theories about how the crater might have been formed.

If you are interested in natural history:
Visit the visitor center exhibits and pick up a free natural history handout. As you pass through Gray’s Pasture, watch for mule deer or bighorn sheep. Walk the Mesa Arch or Nebo Spring trails and learn about native plants.

If you are interested in human history:
Visit the visitor center exhibits and pick up a free handout. Hike the Aztec Butte Trail to see geological and historical artifacts. Hike the North Springs Trail to view remnants of the ranching era. Old fences and corrals are visible along the scenic drive and Murphy Point Trail. Also, old mining roads are visible from most overlooks.

If you are interested in watching sunrise/sunset:
Find out sunrise and sunset times at the visitor center. Visit Mesa Arch at dawn. Visit Green River Overlook or Grand View Point at dusk for incomparable views of sunset over the canyons. Hike to the top of Aztec Butte for a spectacular view of the Island in the Sky and surrounding countryside.
Tadpole shrimp inhabit pools throughout the park. Water quality standards, by state, the U.S. Environmental Protection Agency, and to a lesser extent the National Park Service, reflect this complexity, and also vary depending on use. One pool may have different standards for drinking water, recreation, agriculture, and aquatic life. Aquatic life standards have both chronic limits - a level that is only a problem if sustained - and acute limits. Despite these complexities, by examining the results from the last eleven years we can see some patterns. We looked for any values that did not fall within standard ranges, and then took a closer look at recurrent conditions, meaning that there were three or more exceedences of a particular standard at a particular site. The number three is arbitrary, but it is useful for focusing on potential problems. Generally, water quality in Canyonlands National Park is good. In eleven years of monitoring, many parameters were always within standards or at least never consistently broke standards. These include pH, alkalinity, arsenic, barium, cadmium, chromium, iron, lead, mercury, nitrogen, silver and zinc. However, the river sites have a few parameters that were frequently or consistently higher than standards, and all of the spring and pool sites have one or a few parameters with recurrent high readings. Phosphorus is often high at all of the sites, especially on the rivers. Dissolved oxygen varies with time of day, amount of aquatic vegetation, agriculture, temperature, and pollutants. Water quality standards, by state, the U.S. Environmental Protection Agency, and to a lesser extent the National Park Service, reflect this complexity, and also vary depending on use. One pool may have different standards for drinking water, recreation, agriculture, and aquatic life. Aquatic life standards have both chronic limits - a level that is only a problem if sustained - and acute limits. Despite these complexities, by examining the results from the last eleven years we can see some patterns. We looked for any values that did not fall within standard ranges, and then took a closer look at recurrent conditions, meaning that there were three or more exceedences of a particular standard at a particular site. The number three is arbitrary, but it is useful for focusing on potential problems. Generally, water quality in Canyonlands National Park is good. In eleven years of monitoring, many parameters were always within standards or at least never consistently broke standards. These include pH, alkalinity, arsenic, barium, cadmium, chromium, iron, lead, mercury, nitrogen, silver and zinc. However, the river sites have a few parameters that were frequently or consistently higher than standards, and all of the spring and pool sites have one or a few parameters with recurrent high readings. Phosphorus is often high at all of the sites, especially on the rivers. Dissolved oxygen varies with time of day, amount of aquatic vegetation, agriculture, temperature, and pollutants.

Surveying invertebrates in the Maze District.

What to do with your day
First, stop at the visitor center for current information on trails, roads, interpretive programs, weather, or to watch the park orientation movie.
If you have 2 hours:
Drive to the Big Spring Canyon Overlook and hike the Pothole Point trail along the way. Drive to a view of the Needles on the Elephant Hill access road.
If you have 4 hours:
Explore the scenic drive and graded dirt roads. Hike the Cave Spring, Pothole Point and Roadside Ruin trails or the longer Slickrock Trail.
If you have 8 hours:
After exploring the scenic drive, hike to Chesler Park or around the Big Springs-Squaw Canyon loop. Enjoy lunch on the trail.
If you are interested in geology:
View the exhibits at the visitor center and pick up a free natural history handout. Bighorn sheep are most frequently overlooked along the Slickrock Trail. Squaw, Lost and Salt Creek canyons are great for early morning birding.
If you are interested in human history:
View the visitor center exhibits and pick up the free human history handout. Hike the Roadside Ruin and Cave Springs trails. If time permits, visit the Pekaboo rock art panel in Salt Creek Canyon.
If you are interested in watching sunrise/sunset:
Find out sunrise and sunset times at the visitor center. Sunrise is spectacular from the campground area, especially along the short trail over the butte between Loops A and B. Visit Pothole Point or Wooden Shoe Arch Overlook as the glow of sunset washes over the Needles.
Thanks to You

CANYONLANDS NATIONAL PARK WILL ENCHANT YOU WITH ITS MYSTERY AND BEAUTY MILES of roads and trails offer access to a colorful geologic wonderland in the heart of the high desert of southeastern Utah—a masterpiece of nature’s work. From sagebrush and claret cup to bighorn sheep and lizards, hundreds of species of plants and animals weave color and texture into Canyonlands’ diverse landscape.

With all this majesty, hundreds of thousands of hikers, campers, boaters and other outdoor enthusiasts are drawn to Canyonlands each year. The park’s popularity creates a challenge—to assist and protect its visitors, while preserving the natural and cultural treasures that brought them here in the first place. With your park fees and continued support, we can meet this challenge together.

In 1996, Congress authorized the Recreational Fee Demonstration Program in order to reverse the deteriorating scope and quality of federal facilities and address natural and cultural resource issues. In 2004, Congress passed the Federal Lands Recreation Enhancement Act that continues the fee programs for an additional 10 years. Prior to these programs, user fees were returned to the general fund of the federal government and parks were reimbursed only for their collection costs. Now, Canyonlands keeps 80% of camping and entrance fees. During the past nine years, over 5 million dollars in retained fee revenue has been put to work at Canyonlands.

The park’s trail crew continues to perform routine maintenance on over 120 miles of trails. All of the paved roads at Canyonlands have received preventative maintenance that extends its life and makes travel safer. Campsites have been rehabilitated both in the frontcountry and along the White Rim Road.

National Park Service employees and volunteers work hard to protect the resources of Canyonlands. Now you’re a partner in this important work. Thanks to you, park facilities and programs are improving, and visitors can continue to experience this national treasure for generations to come.

How Deep is the River?

ASK ANY RANGER OR RIVER GUIDE HOW DEEP the river is and they’ll probably roll their eyes. Aside from being a common question, it’s a very difficult one to answer accurately. The reason? The Colorado and Green rivers have serpentine channels that change constantly as the current and the sediment it carries act upon each other. Along both rivers, sand bars move continually. Add runoff from storms and spring snowmelt to the mix, and one could argue that few places in the river ever have the same depth for very long.

But what’s below all this shifting sediment? The Colorado and Green rivers carry and traverse millions of tons of sand, mud and rocks, but at some point their channels must encounter bedrock. At what depth? Scientists studying this question in Canyonlands have found some unexpected answers.

Cataract Canyon contains roughly 14 miles of closely spaced, large rapids. These noise makers stand in stark contrast to the calm conditions upstream on both the Green and Colorado rivers. Glen Canyon, below Cataract, was also known as a leisurely stretch of water before it filled with the waters of Lake Powell. So Cataract Canyon interrupts an otherwise continuous calm with large and water before it filled with the waters of Lake Colorado rivers. Glen Canyon, below Cataract Canyon, stands in stark contrast to the calmer noise of closely spaced, large rapids. These noise makers stand in stark contrast to the calm conditions upstream on both the Green and Colorado rivers. Glen Canyon, below Cataract, was also known as a leisurely stretch of water before it filled with the waters of Lake Powell. So Cataract Canyon interrupts an otherwise continuous calm with large and

The rapids of Cataract Canyon are created by very large boulders. Some of the most famous are Capsize Rock, which captures the unwary in Rapid 15, and Niagara Rock in Big Drop Two, which forms a fierce hole during high water. None of the rapids in Cataract Canyon are directly affected by bedrock beneath the river. Instead, water is flowing over a mantle of large boulders.

Most of these boulders were placed in the river by debris flows from side canyons. Like concrete flowing from a cement mixer, debris flows are surges of sediment and water, with sediment making up more than 80% of the mix. But on this scale, flows have enough energy to move house-sized boulders. Although isolated rock falls affect the river on occasion, debris flows are the most common process for forming and maintaining rapids.

In 1921, the U.S. Geological Survey (USGS) sent a research expedition through Cataract Canyon to locate potential dam sites for water storage and hydroelectric power generation. To evaluate the sites and estimate the volume of water that could be stored in a reservoir, they surveyed the first longitudinal profile of the river. Today we have a complete longitudinal profile of the Colorado River from its headwaters in Colorado to the Gulf of California.

In 2003, a USGS team resurveyed the 1921 Cataract Canyon profile and measured changes in the fall of various rapids. Results from this work showed that the profile of the river through Cataract Canyon forms a “bulge” or “convexity” in the overall profile of the river. This bulge is the largest on the river and suggests that bedrock is far beneath the surface.

Using seismic refraction, scientists evaluated the depth to bedrock in several locations. This method involves transmitting sound waves into the ground and measuring the returning waves. At Spanish Bottom, near the head of the Cataract Canyon convexity, bedrock was found to be 260 feet below the water’s surface.

Conventional wisdom holds that rivers constantly erode the land over which they flow. In Cataract Canyon, this doesn’t appear to be the case. Due to debris flows from side canyons, the river may be rising. In fact, Cataract Canyon may be one of the most actively filling canyons in the world. The USGS will continue this work in the coming years. Their results may very well change our understanding of local rivers and the natural processes which guide their evolution.

Protect Your Park

• Avoid tampering crypto biotic soil crusts. Always walk on trails, slickrock or in sandy wash bottoms. Pots are not allowed on hiking trails or four-wheel-drive roads, even in a vehicle. Pots may be walked along paved roads and in the campground, but must be loaded at all times. Protect water sources. Do not swim or bathe in potholes or intermittent streams. Preserve your heritage. Do not enter, alter or deface archeological sites. Leave artifacts undisturbed. It is illegal to remove natural or cultural features including plants, rocks, artifacts, driftwood or antlers. Vehicles and bicycles must travel on designated roads. ATVs are not permitted.

Protect Yourself

• Drink at least one gallon of water per day if you’re active in the desert. Always carry a map, adequate clothing and flashlight in the backcountry. Remain in one place if you become lost or separated from a group. Always let someone know where you are going and when you expect to return. Never cross a canyon that is flooding. During lightning storms, avoid lone trees and high ridges. Sit in a vehicle if possible. Be careful near cliff edges, especially when rock surfaces are wet or icy.