
The Buffalo Chip

Resource Management Newsletter

Yellowstone National Park

Fall-Winter 1999



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FEDERAL AGENCIES MOVE FORWARD ON BISON PLAN

Information from USDA News Release

The federal agencies involved in the Yellowstone bison situation recently advised the state of Montana that they are moving ahead to complete an Environmental Impact Statement (EIS) on the management of the Yellowstone bison herd. Because negotiations with Montana reached an impasse, agency officials decided to move forward on their own to protect cattle and minimize the lethal control of bison.

The agency proposal is designed to address both short-term and long-term goals of the EIS process, including the eventual eradication of brucellosis from the Yellowstone ecosystem. In the short term, it would provide spatial and temporal separation of bison and cattle through a zoned approach. The proposal would allow bison outside of the park only in three very limited and well-defined areas to the west and north. Only 100 would be allowed in the Horse Butte west boundary area, 100 in the Reese Creek area, and 200 in the Eagle Creek/Bear Creek area. Adjustments would be made as needed.

These zones would then be buffered by additional zones into which no bison would be permitted. Cattle would be permitted back in the zones 45 days after bison have returned to the park. Given that the brucella organism survives for only approximately 17 days in spring conditions, this 45 day separation allows more than ample time for the organism to expire.

Long-term, the agencies are committed to developing and using a safe and effective vaccine in the park until brucellosis is eradicated from the herd. Safety studies for calthood vaccination should be completed by the winter of 2000–2001. Studies on vaccine effectiveness should be completed by the fall of 2002, and a safe and effective delivery mechanism should be developed by the summer of 2002.

The Park Service, the Forest Service, and Animal and Plant Health Inspection Service (APHIS) are in agreement on the basic elements of a sound, workable plan. The Park Service has agreed to vaccinate inside the park. The Forest

Service has adjusted grazing allotments to help maintain critical separation between bison and cattle. APHIS has clearly stated that the federal plan will not jeopardize Montana's brucellosis-free status. Further, the recent \$13 million purchase of

lands north of the park has provided significant additional potential for bison winter grazing.

As the agencies move forward, they will continue working with Montana on daily bison management issues.



WINTER BISON MONITORING PROJECTS CONTINUE

By Gregg Kurz

With the advent of the winter season, park personnel are once again making preparations for monitoring bison use of the groomed road system. For the past two years, as a result of a settlement agreement regarding winter use in Yellowstone and Grand Teton national parks and John D. Rockefeller, Jr., Memorial Parkway, the National Park Service has been monitoring bison movements and road use in the Hayden Valley portion of Yellowstone. Last year, the monitoring program was expanded to include the road section from Mammoth south to Gibbon Falls.

Each of the road segments will be monitored from December 7 through mid March with a combination of ground surveys, photo-points, and aerial surveys. Ground surveys are conducted by two-person crews on randomly determined days and times to record bison numbers, location, behavior, movement, and use of the road seg-

ments and their surrounding corridors. A total of eight automated camera systems in weatherproof boxes will be located within the two monitoring areas. The cameras are programmed to photograph the roadway at predetermined intervals throughout the entire monitoring season. Once a month, an aerial survey of the road corridors and surrounding areas will be conducted to monitor movement patterns and total numbers of bison. Groomer operators will also assist the monitoring effort by recording any encounters with bison during grooming runs.

During last year's monitoring period, a total of 64 ground surveys were completed between December 13, 1998, and March 27, 1999, in each study area. A total of 2,458 bison group observations were recorded during this period. Group sizes ranged from 1-135 in the Hayden study area, with an average of 14 animals per group. Group sizes in the Mammoth study area ranged from 1-62 and averaged 8 animals per group. Bison distances from the road ranged from 0-2.5 kilometers. Of the 2,458 observations, 5.8 percent (58) in Mammoth and 9.4 percent (137) in Hayden were documented on the roads, as compared to 2 percent (26) in Hayden in 1997-98. Aerial survey results indicated that the number of bison remained fairly stable in both study areas between December and February. Bison numbers changed substantially, however, during the month of March, more than doubling in the



Mammoth study area and decreasing by nearly 25 percent in the Hayden study area.

The eight cameras located along the survey routes were programmed to record an image at one and one-half hour intervals during daylight. As was the case last year, cold temperatures in the evenings and on certain days caused severe battery drain, occasionally interrupting the process. A total of 2,299 pictures were taken, 8 percent (184) recording bison. Of the 184 sightings, 8 percent (14) were of bison on the groomed road surface.

Canyon and Lake trail groomer operators provided data, date, and time for any bison encounter on the trail during each grooming run. A total of 185 grooming runs occurred during the study period, and on 14 (7.5%) occasions bison were observed on the road. Ten of these encoun-

ters resulted in bison running. On three occasions bison moved off the road, and on one occasion bison showed no discernible reaction.

In addition to the monitoring in Hayden Valley and along the Gibbon to Mammoth road segment, researchers from Montana State University (MSU) and ranger staff from Madison will also be monitoring bison use of the groomed roads. Graduate students from MSU will be documenting bison movements and road use along the roads from the West Entrance to Madison Junction and from Madison Junction to Old Faithful as a part of their winter field season. Ranger staff from Madison will be monitoring bison movements along the road corridor while on patrol and coordinating administrative activities with other staff. If you would like more information, please call Gregg Kurz at 344-2213.



PARKS JOIN TOGETHER IN HOLIDAY TOY AND BOOK COLLECTION FOR OGLALA INDIAN CHILDREN

By Laura Joss

In June, tornados struck the remote village of Oglala on the Pine Ridge Indian Reservation in South Dakota. As winter sets in, many Oglala families are still struggling to recover from the loss of homes or property. The Oglala Lakota/Sioux are one of the American Indian tribes culturally affiliated to many parks in the Intermountain and Midwest regions.

To assist the Oglala during this difficult time, Laura Joss contacted employees from Agate Fossil Beds National Monument, Badlands National Park, Fort Laramie National Historic Site, Jewel Cave National Monument, Scotts Bluff

National Monument and Wind Cave National Park so that they could join Yellowstone National Park in a holiday collection of toys and books for the Oglala children.

Thanks to generous donations from NPS and concessions staff at all seven parks, a total of five vehicles full of toys and books were taken to Oglala, South Dakota on Saturday, December 11, 1999. Some employees from Yellowstone drove personal vehicles as far as 1,200 miles round trip to make the delivery. Upon their arrival, all were pleased to see about 75 extremely happy children and their families receive these holiday gifts.



RECONNAISSANCE OF P.W. NORRIS' "OLD RUIN"

By Lee H. Whittlesey

On September 9, 1999, a party of six, with special permission, hiked into the bear-closure area at the head of Antelope Creek northeast of Mount Washburn in order to survey a potential cultural site. According to Kerry Gunther, this area has been closed since 1983 for the protection of grizzly bears. Members of the party were Lee Whittlesey, archivist; Kerry Gunther, bear biologist; Paul Schullery, writer/editor; Frankie Collins, archival VIP; Kathryn Lancaster, library technician; and Carolyn Duckworth, Gardiner area writer/researcher.

The group was attempting to survey a site on the western edge of the Grand Canyon of the Yellowstone River, located on the river some five to six miles above the mouth of Antelope Creek. The site that we believe is Norris' "Old Ruin" is a prominent, bare knoll on the edge of the canyon that stands well above the surrounding landscape.

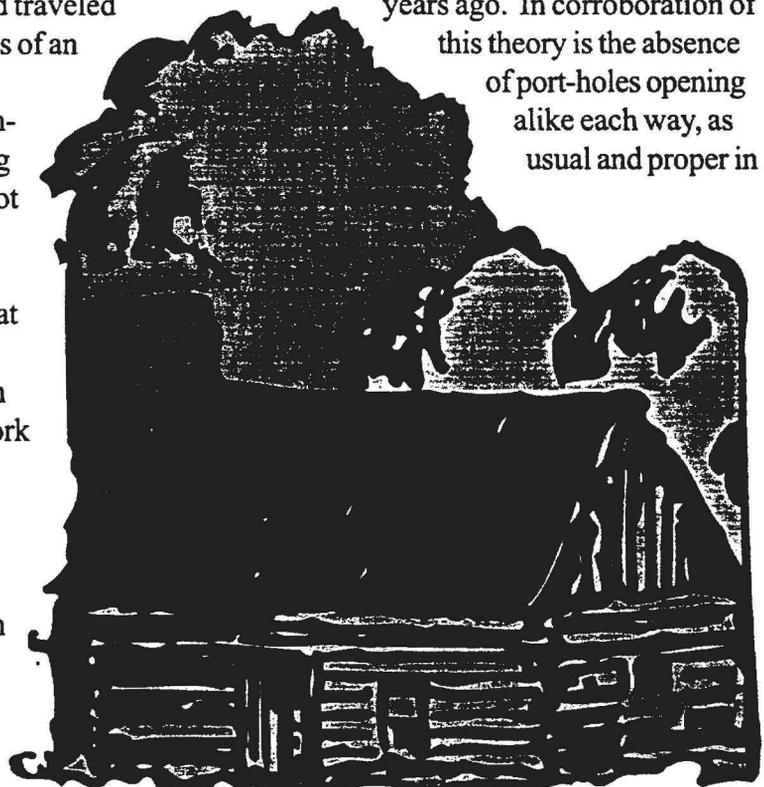
Norris first mentioned his Old Ruin in 1878 ("Report on the Yellowstone National Park," 1878, p. 983) when he noted that he had traveled along the canyon that year "past the ruins of an ancient, once loop-holed, earth-roofed block-house some 16 by 20 feet in diameter and of unknown origin" and implying that it was near "a dense forest at the foot of a bald rocky spur of Mount Washburn."

Norris referred a second time in that report (1878, p. 983) to this structure: "the ruins of an ancient block-house with earth roof and port-holes, clearly the work of unknown white men, near the Grand Canon below Mount Washburn" He gave the possible reasons for white trappers to have visited the park as follows: "Border legends, although often gross exaggerations, are seldom wholly false, and scores of them [that I have heard] indicate that white mountaineers

did long ago occasionally visit portions of the park for trapping or concealment, and perhaps both" (1878, p. 983).

In his 1880 report, Norris elaborated on this building that he thought was 40–50 years old at that time. Under the heading "Habitations of White Men Within the Park," he stated:

"An earth-roofed, loop-holed cabin, 16 by 20 feet in diameter, discovered by [my friend the hunter] Frederick Bottler, and visited and described by me in 1878, was almost entirely destroyed by the great fire of 1879. It was situated between Antelope Creek and the Grand Canon, below Mount Washburn. Nothing is certainly known of its age, or of the character of its builders, but the advanced decay of the timber of which it is constructed, its fallen roof and generally dilapidated condition, indicate that it was the work of Hudson Bay or other trappers forty or fifty years ago. In corroboration of this theory is the absence of port-holes opening alike each way, as usual and proper in



the now general use of fire-arms by Indians. This arrangement would have allowed a warrior armed with bow and arrows, by stealthy maneuvering in darkness through the timber, to use his weapons silence and within point-blank range in front with terrible effect, but which was in trapper days prevented by using loop-holes, each open but one way, but alternating in direction, thus preventing a bowman from reaching a dangerous position before exposed to loop-holed cross-fire" ("Annual Report of the Superintendent," 1880, p. 36.).

Norris showed this Old Ruin clearly on his maps of 1879, 1880, and 1881. These maps made it easy to find the proper knoll on the edge of the canyon that was once the site of this cabin. Not only was this site near an angled, dry creekbed shown on one of Norris' maps, but there is no other logical site for it on the edge of the heavily timbered and uneven canyon here between the knoll and the precipitous beginnings of Rowland Pass to the south. Additionally, the "bald rocky spur" of Mount Washburn, mentioned by Norris, is plainly visible to the south of this location. The ridge (spur) is timbered nearly to the top, but remains bald and rocky at one tiny spot on its summit, and was so prominent that at one point Paul Schullery mentioned it as a curiosity. I later noticed that Norris had actually mentioned it.

The group arrived at this location around one in the afternoon. After traveling east for sometime through dense, small new trees (called "doghair" forest by recent fire writers) toward the edge of the Grand Canyon, Paul Schullery called to our attention the prominent, bare knoll to the north-east. We hailed it immediately as the likely spot and ascended it. The six of us spent more than an hour walking individually over and around this knoll, searching for any signs of a log cabin or for any other cultural remnants. Even with the dense,

doghair trees (most of them seven feet high at this time, eleven years after the great fires of 1988) that covered much of the knoll (only its summit was bare), we believe that we did a good job of searching it. We found no cultural remnants of any kind: no chimney stones, leather hinges, hewn logs, nails, or anything else to indicate there had ever been a structure here. I carried a metal detector to the site and got no sounds from it as I walked the entire knoll. We then walked north through the meadows along Antelope Creek and reached the road at about four-thirty.

Although there is no historical documentation of Hudson's Bay Company (HBC) fur trappers in Yellowstone, I believe that P.W. Norris had greater credibility in making such a statement than most observers of his day, because he stated at one point that he personally worked for this company during the 1840s (I am fairly certain that this information is contained in Norris's long manuscript "Meanderings of a Mountaineer"). I suspect that Norris recognized something in the design or construction of the cabin that made him confident enough to state matter of factly that it was an HBC structure. That Norris mentioned the Hudson Bay Company in at least three places in his reports (1880, p. 30; 1878, p. 990; 1878, p. 989) makes it clear that he personally believed that HBC trappers had at some early time been in Yellowstone.

Norris also found a cache of what he thought were HBC traps near Obsidian Cliff. He stated that they were "martin steel-traps of a peculiar form only used by the Hudson Bay trappers some fifty years ago" (1878, p. 989). Perhaps the existence of traps like these at his Old Ruin or some other peculiarity convinced Norris that the Old Ruin had been constructed by HBC.

Paul Schullery is writing a letter to Aubrey L. Haines to ask whether or not Haines himself or others he knows of ever made any attempts to find Norris' Old Ruin.



NEW RESEARCH PROJECTS

By Ann Deutch

Developing Effective Ecological Indicators for Watershed Analysis

Principal Investigator: Dr. Duncan Patten, Yellowstone Ecosystem Studies

Dr. Patten proposes to develop a remote sensing routine that will evaluate watershed conditions accurately and economically throughout the western U.S. The Yellowstone River (including its headwaters in Soda Butte and Cache creeks) provides an ideal study site because it includes both pristine and disturbed sections. The full study area begins upstream of YNP and continues to Livingston, Montana. Although most work will be done using remote sensing techniques, several study sites will be chosen in YNP for stream morphology, habitat, and aquatic macroinvertebrate analysis.

Collection of Gametes from Wildstock Lewis Lake Lake Trout to Establish a Captive Broodstock to Support Lake Trout Restoration in the Great Lakes

Principal Investigators: Ed Stege, Saratoga National Fish Hatchery (USFWS), and Dave Erdahl, Bozeman Fish Technology Center (USFWS)

The lake trout in Lewis Lake were planted using stock from Lake Michigan in 1890. A second stocking of lake trout from a private hatchery was done in 1941, and no other stockings have since occurred. These lake trout comprise one of the most genetically variable populations remaining in existence. They are liable to be the most vigorous choice for reintroduction programs in the Great Lakes.

Earlier this century, lake trout in the Great Lakes were extirpated through overfishing and the invasion of the sea lamprey. The U.S. Fish and Wildlife Service (USFWS) is attempting to reintroduce lake trout to Michigan, Huron, Erie, and Ohio lakes.

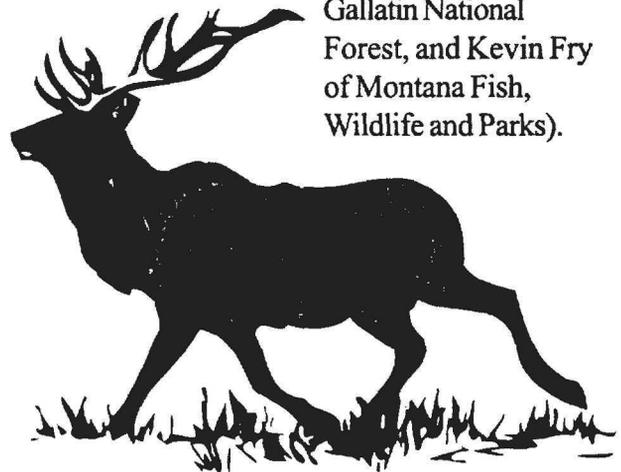
This project was carried out in 1995. The fish remaining in the hatchery are second generation descendents of wild fish. "Although hatchery management procedures today make every effort to minimize inbreeding potential and unintentional selection, the hatchery environment has inherent risks that may lead to a reduction in fitness for survival in the wild." Besides the risk of inbreeding, the shallow-flowing water environment in the hatchery affects these deep-water lake fish.

In September, the USFWS gillnetted about 100 lake trout in Lewis Lake and transferred them to "live cars," long, tubular underwater nets. The live cars were anchored a few hundred yards from the dock and marked with buoys. The captured fish were injected with a hormone to ripen their eggs and sperm. After approximately one week the fish were squeezed and the fertilized eggs collected. The adult fish were released.

Carnivore Spatial Organization Before and During Elk Harvest on the Buffalo Plateau: A Collaborative Pilot Study

Principal Investigator: Dr. Doug Smith, YNP (collaborating with Toni Ruth and Howard Quigley of the Hornocker Wildlife Institute, Charles Schwartz and Mark Haroldson of the IGBST,

Dan Tyers of the Gallatin National Forest, and Kevin Fry of Montana Fish, Wildlife and Parks).



Since the reintroduction of wolves to the greater Yellowstone area, the entire suite of large native carnivores, (grizzly and black bears, cougars, coyotes, and wolves) has been restored. Humans also harvest wild ungulates. Understanding how these different carnivores interact will be critical for managing and conserving carnivores as well as managing the human harvest of elk.

Besides the impacts on elk, how three of these carnivores (wolves, grizzly bears, and cougars) react to each other, use the landscape, and respond to the onset of hunting season is unknown and has not been previously studied. The little data that exists indicates that bears are dominant to wolves and wolves dominant to cougars at kill sites. Other studies indicate that habitat preferences tend to keep these carnivores separate, but no data exists on how hunter-killed elk attract or repulse carnivores, or what the hunter carcasses or increased human presence do to alter the habitat separation normally exhibited. We presume that bears will control hunter-provided carcasses and displace wolves and cougars. Mortality for all three species may increase because of human exposure.

A pilot study was conducted in September by daily aerial monitoring of wolves, grizzly bears, and cougars. The study area centered on the territory of the Rose Creek wolf pack, which ranges the Buffalo Plateau in and out of YNP and is bounded on the south by the Yellowstone River. Eight wolves, four to six grizzly bears, and three cougars comprised the telemetered animals involved in the study. Study animals were located by random search once each day prior to and during hunting season. Hunter camps and kills were located from the ground or opportunistically from the air. Carnivore landscape use was compared before and after the onset of hunting season. The major objectives of the pilot study were to test methodologies, and to determine sampling error and necessary sample sizes. Another objective was to test the (null) hypothesis that carnivore landscape use, behavior, and

mortality do not change with the onset of hunting season.

Search for the Upper Temperature Limit for Eucarya—Is There Complex Life Beyond Earth?

Principal Investigator: Dr. Jonathan Trent, NASA Ames Research Center, Moffett Field, CA

Modern biologists divide life into three categories: bacteria, archaea, and eucarya. The eucarya are complex organisms like us whose cells all have internal organelles such as a nucleus and mitochondria. Although some 40 projects a year study the microbes of YNP thermal environments, only a few researchers have searched for high temperature eucarya. Dr. Trent will search for other very small life forms that exist along with the bacteria studied by most other researchers.

Request to Explore Drill Hole Y-7 (Biscuit Basin) for Microbial Life

Principal Investigator: Dr. Norman Pace, University of Colorado, permit #1403, Phylogenetic Analysis of High-Temperature Ecosystems

In 1967 or 1968, several wells were drilled in YNP thermal areas by the USGS under the direction of Dr. Don White. Well Y-7 is near Biscuit Basin, and it is 242 feet deep with a steel casing lining the upper 102 feet. In 1978, Dr. Thomas Brock was unable to find microbes in one of the drilled wells. In 1993, Ph.D. candidate Sue Barns (under Dr. Pace's direction) was also unable to find life in Y-7. It is assumed by the current research team that the contamination introduced into the well by the original drilling mud as well as the minimal contamination introduced in Dr. Barns' study has since been flushed from the well. Dr. Pace will try once again to search for microbial life in Y-7.

Dr. Pace will open the well and drop a thermometer down to various depths. When the temperature gradient has been defined, 10 to 30 microbe "traps" will be deployed along a cable and the whole cable lowered into the well and left

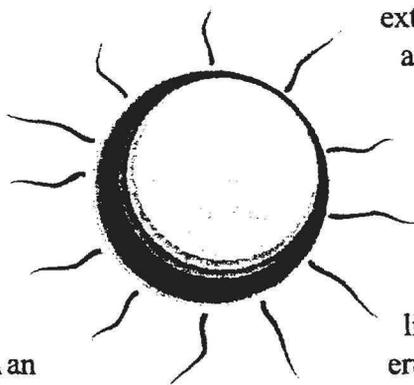
for one or two months. When the traps are removed, another temperature gradient measurement will be made.

Dr. Pace expects to conclusively prove that there is no life deep in the hole. However, he anticipates a distinct possibility that he will be wrong. If so, this hole will become a unique laboratory for the study of extremophiles. The temperature near the surface is 50°C, and at 200 feet it is 140°C. This conveniently spans the known upper temperature limit for life (113°C). If life is found, Y-7 will undoubtedly become a site of considerable scientific interest because it is far more accessible than the ocean bottom, the nearest analog to the depths of Y-7.

Climatic Variation in the Greater Yellowstone Ecosystem: Evaluating the Evidence for Decade to Centennial Variability in Climate

Principal Investigator: Dr. Lisa Graumlich, Director, Mountain Research Center, Montana State University

Dr. Graumlich will study the climate of the last 1,000 years in Yellowstone. She will then evaluate the degree to which the late twentieth century's climate is (or is not) outside the range of natural variability. Such an analysis was done near YNP in the early 1970s, however only six sites were sampled. In addition, utilizing over 20 more years of climatic data will allow a more reliable model of climate-growth relationships for extrapolation into the past. A recent study in the Sawtooth/Salmon River region of Idaho indicates that the study near YNP missed several major climate changes. Dr. Graumlich proposes to find out if the "Medieval Warm Period" and the "Little Ice Age" are recorded in YNP's tree rings. She will also look for the more complicated variability in evidence in



the Idaho study with a special emphasis on identifying periods of drought analogous to the drought of 1988. In addition, Dr. Graumlich will explore the potential of using tree ring data from across the Western U.S. to model climate change in the GYE. She collaborates with Dr. Brown of the Laboratory of Tree-Ring Research of the University of Arizona, whose project in YNP was approved earlier this year.



Residence Times of Silicic Magmas Under Yellowstone

Principal Investigator: Dr. Mary R. Reid, UCLA, Department of Earth and Space Sciences, Los Angeles, CA

Do post-caldera lava flows represent residual magma from the caldera-forming eruption, or new magma entering the reservoir from deeper below Yellowstone? What is the volume and extent of convective overturn in the magma associated with the voluminous, caldera-forming eruption? Dr. Reid has recently developed a tool for measuring thorium isotopes in zircon crystals, which are common in YNP lava flows. This allows her to calculate the age of zircon crystallization in each flow. Since zircons may crystallize (at 850°C) even before the magma is erupted, this tool will allow Dr. Reid to draw conclusions about heat and chemistry changes in the magma chamber before and between lava flows.

In addition, Dr. Reid proposes to attempt isotope dating of allanite, another thorium rich mineral. She will also use argon isotope measurements of other minerals to supplement this work. Volcanic glass probably crystallizes at a much lower temperature, and its calculated age will corroborate (or not) the new thorium work.

Dr. Reid's work has been primarily at the Long Valley caldera system in California. This

proposal will serve to expand her new methods to another young volcanic system and allow her to begin making generalizations about high silica caldera-forming volcanic systems. She will also study the Toba Tuff in northern Sumatra, Indonesia, associated with the largest Quaternary caldera on Earth.

Documenting Trends in Yellowstone's Beaver Population: A Comparison of Aerial and Ground Survey Methods

Principal Investigator: Sue Consolo Murphy, YNP

The presence of beaver on a watercourse can have a significant effect on the ecology of the area. Resource managers can monitor widescale changes in the land under their care by monitoring trends in the resident beaver population. Mrs. Consolo Murphy will continue an inventory and monitoring project for beaver. Her objective is to compare aerial and ground-based inventories. If aerial inventories are an adequate reflection of ground-based observations, then repeated monitoring from the air alone will be far more economical than labor intensive ground surveys.



Diversity and Habitat Range of Sulfate-Reducing Microorganisms

Principal Investigator: Dr. David Stahl, Northwestern University

Biogeochemical cycling of elements is a common process in the biosphere. Microbes control these cycles. This project has two aspects. First, it will examine part of the sulfur cycle on a global basis including YNP, deep sea-vents, deep wells (drilled by the petroleum industry), moderate to hypersaline marine areas, and mine tailings. The microorganisms that reduce sulfate are extremely difficult to grow in the lab. Dr. Stahl has recently identified a fragment of DNA that

controls sulfate reduction in several unrelated organisms. Therefore, he can search for the appropriate DNA rather than attempting to grow these organisms. He hopes to define the role of such microorganisms in the global sulfur cycle. Second, the gene identified by Dr. Stahl is extraordinarily similar among several archaea and a bacteria under study. The enzyme produced by this gene might be remarkably ancient, descended from a primordial organism. Dr. Stahl hopes to find DNA from a wide variety of sulfate reducing microorganisms to test his ancient enzyme theory. If he is right, the old method of classifying some bacteria according to whether they can reduce sulfate will be rendered obsolete.

The Diet of the Yellowstone River Otter: An Umbrella Species for Aquatic Systems

Principal Investigator: William R. Wengeler, Ph.D. student with Douglas A. Kelt, University of California, Davis

The North American river otter (*Lutra canadensis*) is a key species in aquatic environments. The otters' position at the top of aquatic food webs makes it probable that they will be affected by any significant changes in lower trophic levels. Lake trout have recently been introduced into Yellowstone Lake and represent a great threat to the resident cutthroat population and also to those species that depend upon cutthroat for food. This study proposes to clarify the ecological role of native vs. non-native species on Yellowstone river otters by comparing two lakes in Yellowstone, one with a healthy population of cutthroat and one with non-native populations of lake and brown trout. Mr. Wengeler will identify the major components of river otter diets, compare dietary composition with park fisheries data, and quantify the degree to which river otters prey upon native vs. non-native fish.



UPDATE FROM THE SPATIAL ANALYSIS CENTER

By Ann Rodman

The Spatial Analysis Center is part of the Yellowstone Center for Resources. We are located in Mammoth and can be reached at extensions 344-2215, -2216, -2218, -2246, or -2247.

Global Positioning Systems (GPS). Using GPS units to collect digital location data is becoming a common data collection method in Yellowstone. Locations are quickly recorded, accurate, and easy to convert into GIS layers. Last year the units were used to collect data about the locations of roads, buildings, wetlands, archeological sites, rare plants, fires, thermal features, weeds, and many other things. To accommodate this increased demand, the Spatial Analysis Center now has three different types of GPS units available for your use. We have six ProX series units, two GeoExplorers, and two Precision Lightweight GPS Receivers (PLGRs). These units have been designed for different situations, so you need to think about your application before you choose the correct GPS unit.

The ProX series units should be used when you want to collect very accurate data (up to sub-meter accuracy), with more than one attribute, for areas (*i.e.*, wetlands), lines (*i.e.*, trails or roads), or points (*i.e.*, archeological sites or thermal features). This unit is worn in a fanny pack and includes a handheld datalogger and an antenna that extends on a long pole above the user's head.

The GeoExplorer is a smaller, handheld unit good for collecting points, but less accurate than the ProX for collecting line and area data. This is the accepted standard in the greater Yellowstone area for collecting weed patch locations.

The PLGR is a handheld unit best used for navigating to a known location (such as a research plot or an abandoned wildlife telemetry collar) or collecting quick perimeter data. This unit has been used to map fire perimeters and to relocate research plots. It is great for both navigation and

very simple data collection. One major difference between the first two units and the PLGR is that the PLGR collects "real-time" data while the other two collect data that must be differentially corrected. To differentially correct the data, you must go through an additional post-processing step to achieve the desired accuracy.

The ProX and GeoExplorer units can be checked out by anyone working for or with the park. Access to PLGRs is controlled by the military, so Federal employees can use them, but volunteers and nonfederal researchers cannot. Using any of these units requires some training that we are happy to provide. Please give us a call at 344-2215 if you think you might want to use one of the above units for your project.

Thermal Features Inventory. During the summer of 1998, we started a spatially accurate, digital inventory of Yellowstone's thermal features. The inventory includes an accurate point representing the feature; measurements of pH, temperature, and conductivity; a digital photograph; the official name (if it exists); and a description. While we are out there, we also map all the trails and boardwalks in the thermal areas. Because this information is stored as GIS layers in our database, we can easily create a variety of maps (locations with photos, pH distribution, etc.) for any of the areas listed below. During the summer of 1998, 1,146 thermal features were inventoried. Last summer an additional 1,557 features were inventoried, for a total of 2,703 features so far.

Completed areas include Heart Lake Geyser Basin, Midway Geyser Basin, Shoshone Geyser Basin, Mammoth Hot Springs, Amphitheater Springs, Smoke Jumper Hot Springs, and the Mud Volcano area. Partially inventoried areas include Norris Geyser Basin (Back Basin, Porcelain Basin, large features in 100 Springs Plain), Gibbon Geyser Basin (Artists Paint Pots, Chocolate Pots, Monument Geyser Basin, Gibbon

Canyon), Lower Geyser Basin (Firehole Lake Group, Fountain Group, Kaleidoscope, Microcosm Basin, Pink Cone Group, Pocket Basin, Porcupine Hill Group, River Group, White Creek Group, White Dome Group), Upper Geyser Basin (Biscuit Basin, Black Sand Basin, Cascade Group, Chain Lake Complex, Daisy Group, Geyser Hill Group, Grand Group, Grotto Group, Morning Glory Group, Old Road or Cascade Group, Round Spring Group, and Sawmill Group), and West Thumb Geyser Basin (Potts Geyser Basin).

If this type of information sounds useful to you, give us a call at 344-2216 or -2247, and we'll get it to you in a form you can use.

New Data Layers. In 1999 we put a lot of time into creating new data layers and improving old ones. Following is a brief list of this new data:

Trails, Campsites, Cabins, Backcountry Bridges. Three years ago David Karplus began an extensive survey of the trail system in Yellowstone. This summer, we inherited the project from him and continued to use accurate GPS units to finish the work. This winter we will consult with staff from each district to check all the maps, correct errors, and identify missing data. Very soon, we will have accurate maps of all the trails (including frontcountry boardwalks), campsite locations, cabins, and backcountry bridges. The bridge data includes information about bridge type, construction materials, size, and condition. For information about this data, please call us at 344-2216 or -2215.

Roads. A new GIS layer has been completed for all the motorized travel roads in Yellowstone. This includes main roads, service roads, and all the roads in developed areas. Each road segment is attributed with information such as name, speed limit, surface type, and use category. A field survey, using accurate GPS units, was conducted to ground truth each road segment. If you'd like more information about this layer, please call us at 344-2218 or -2216.

Buildings. Over the last year, we've created a GIS layer that inventories all the buildings in the park. This spatial database can be linked to information from a variety of existing databases dealing with the management and maintenance of buildings. Geo-referenced CADD drawings and paper maps from the Concessions and Maintenance divisions and the Cultural Resources branch provided primary building locations and footprints. For building sites that were not included on CADD drawings, or where accurate paper maps did not exist, location information was obtained using a GPS unit. A field survey was conducted to ground truth all the data. If you'd like more information about this layer, please call us at 344-2218 or -2216.

Watersheds. We finally have a good map of the park's watersheds. The layer was created using stream and river information from 1:24,000 USGS quad map data combined with 10m digital elevation models. The database actually includes the following hydrologic units: regions (very big divisions), sub-regions, basins, sub-basins (at least 450,000 acres), watersheds (40,000 to 450,000 acres), sub-watersheds (10,000 to 40,000 acres), and micro-watersheds (less than 10,000 acres). The units are attributed with names and hydrologic unit codes. These codes follow the system used by the USDA Natural Resources Conservation Service. We are working with Wyoming, Idaho, and Montana to ensure seamless joining across boundaries. If you are interested in this data, give us a call at 344-2216.



Rivers and Streams. This new layer was created from 1:24,000 USGS quad map data. We've attributed the data with official names and SONYEW numbers. The aquatic resources office uses SONYEW numbers as unique identifiers for stream sections. These numbers will allow us to tie the spatial layer to the huge amount of research and data collection done by these folks over many years. If you have any questions about this data, please call us at 344-2216 or -2247.

Research Enclosures. This project includes all the spatial information regarding 10 research

enclosures constructed between 1957 and 1962 near Gardiner, Mammoth, Blacktail Plateau, Tower, Trumpeter Lake, and Lamar. This includes the locations of photo points, permanent plots (transects and quadrats), witness posts, enclosure perimeters, and locations of tree clusters. This information was collected on-site using available maps and ProX series GPS units. Because some permanent plots could not be located, this is not a complete inventory. Call 344-2216 for more information.



ROCK SLIDE IN THE GARDINER RIVER CANYON

Information from the Public Affairs Office

The North Entrance road was temporarily closed due to a rockslide in the Gardner River Canyon approximately 1-3/4 miles south of Gardiner, Montana, on December 4. Park staff were in the area when the slide occurred and immediately closed the road. One vehicle sustained minor damage, but there were no injuries. The slide covered both traffic lanes, was approximately 40 feet in length and 5-7 feet in depth, with rocks estimated at up to 4 feet square. Debris and rock continued to fall onto the road.

Park staff consulted with geologists and other appropriate experts. The decision was made to use explosives to remove a large fractured slab of rock, approximately 6-10 yards long with a potential weight of close to 400 tons, which

had separated and was leaning away from the cliff face close to where the slide occurred; the slab and surrounding area appeared to be very unstable. Park staff climbed to the site and, after evaluation, placed explosive charges at the base of the rock slab. The explosives were successful in moving the unstable rock. It took park staff several days to clear rock and rubble off the roadway.

A preliminary investigation indicates the rockslide could have been caused by the recent constant freezing/thawing

temperature changes. No record of seismic activity in the Mammoth area was recorded for December 4. Critical and emergency traffic was temporarily routed on the Old Gardiner Road.



.....NEWSBRIEFS.....

Wildlife

- On August 14, 1999, Gregory G. Snyder arrived at Lake Hospital reporting a possible **bat bite** that occurred in the Fishing Bridge village parking lot. The bat flew into Snyder while he was exiting his vehicle. Snyder felt the bat on his leg before he reached down to the pavement and grabbed it. He placed the bat in a plastic coffee container and drove to Lake Hospital, as he was concerned about being exposed to rabies. There was a break in the skin on his left calf, but he was not sure what caused it. He had been hiking earlier in the day and may have rubbed against something.

The bat was destroyed, packaged, and refrigerated for transport to Mammoth and then to a lab in Bozeman, Montana.

- David H. Jones, 23 years old, of Ketchum, Idaho, pled guilty on September 27, 1999, before U.S. Magistrate Judge Stephen E. Cole in Mammoth to three charges: illegal hunting and killing of a wild animal; possession of an illegal weapon; and interference with a law enforcement officer.

Shortly after 6 p.m. on September 25, an off-duty park ranger discovered Jones in the woods near Norris Junction with a bow and quiver of arrows. The ranger contacted Jones and instructed him to return to the roadway with him. Upon their arrival at the roadway, Jones got into a private vehicle—against the instruction of the ranger—and fled the scene. The ranger notified the park's Communication Center, and Jones was apprehended and arrested by park rangers in the Madison area. Jones' bow, arrows, and other hunting equipment were confiscated. An investigation determined that Jones had killed a **bull elk**

near the area where he had initially been contacted; the bull elk appeared to have been shot by four arrows.

Jones was sentenced to 90 days in jail with 60 days suspended, ordered to pay \$3,260 restitution to the park, and placed on supervised probation for three years. During his probation, he is prohibited from entering Yellowstone.

- A reward of up to \$500 is being offered for information leading to the arrest and conviction of the person or persons responsible for illegally killing a **cow elk** on the west side of the park sometime before November 27, 1999. Park rangers discovered the elk carcass near milepost 24 on U.S. Highway 191 on Saturday, November 27, 1999, and

believe it was killed several days earlier. A preliminary

investigation indicates the animal was likely shot from the highway during the night. Individuals with information on this incident should contact park headquarters at (307) 344-2120. All information is confidential and individuals are not required to give their name.

Fish

- Fisheries biologists have discovered cutthroat trout infected with **whirling disease** in a second tributary of Yellowstone Lake, indicating that the disease is spreading within the lake. In early 1999, three or four mature cutthroat trout taken from Bridge Creek (which flows into Yellowstone Lake at Bridge Bay) tested positive for the parasite that causes whirling disease. In 1998, biologists first detected whirling disease in cutthroats caught in Yellowstone Lake at the mouth of Clear Creek, about 10 miles away and across



the main body of the lake from Bridge Creek. Yellowstone fish are not yet visibly crippled by the parasite. The fish that have tested positive are adults that seem to have survived the onset of the disease without serious harm. It could be that predators consume crippled fish, but there have been no declines in the number of cutthroats in spawning tributaries of Yellowstone Lake. Possibly some Yellowstone cutthroat are resistant to or tolerant of whirling disease, or the disease is present in Yellowstone at very low levels.

- Based on catch and mortality rates, about 30,000 lake trout were in Yellowstone Lake in 1996 when gillnetting began in earnest after an apparent illegal plant established a population. About half of that number have since been removed, and the program appears to be making a dent in the population. In 1998, crews caught about 7,000 juvenile lake trout, while in 1999 they caught a little over half as many with the same amount of effort, simply because there aren't as many fish out there. They also caught fewer large fish. The netting is catching virtually all lake trout that reach spawning grounds in the West Thumb region of Yellowstone Lake, effectively keeping them from spawning in any large numbers. But the netting may have to continue indefinitely, and at great expense. It's unlikely the netting program will ever completely exterminate lake trout from Yellowstone Lake, and only a perpetual netting campaign will keep numbers in check.

Lake trout prey on Yellowstone cutthroat, which are the base of the area food chain. Eagles, grizzly bears, and other animals depend on feeding on cutthroat when they spawn in tributary streams. Lake trout eat cutthroat, but do not replace them in the food chain because lake trout spawn in the depths of the lake.

The NPS has approved an additional \$150,000 per year for four years for a new commercial-grade fishing boat and crew dedicated to lake trout control. This will double the park's current expenditure on lake trout control.

Birds

- On December 19, 1999, Yellowstone hosted its 26th annual **Christmas Bird Count**. Participants are among a cadre of 50,000 volunteers from a broad geographic area including all 50 states, every Canadian province, parts of Central and South America, Bermuda, the West Indies, and many of the Pacific Islands.

This year marks the 100th anniversary of the National Audubon Society Christmas Bird Count. The count originated in New York as a protest to the traditional holiday "side hunt" in which teams competed to see who could shoot the most birds and mammals in one day. A group of 27 concerned birdwatchers decided to protest the traditional bird shoot by counting birds rather than shooting them. The Christmas Bird Count, no longer a protest event, is now a social birding event scheduled around the Christmas holiday season, and can occur on any day from December 16 through January 3.

The Yellowstone Christmas Bird Count tallies birds found in the Mammoth, Wyoming/Gardiner, Montana area. For the results of this year's count, contact Terry McEneaney at 344-2222.



- The peregrine falcon was removed from the endangered species list on August 20, 1999. In announcing the decision, the U.S. Fish and Wildlife Service noted one of the most dramatic success stories of the Endangered Species Act. Peregrines once ranged from the subarctic boreal forests of Canada to Mexico, and even today migrate to Latin and South America for the winter. A massive population decline was attributed largely to the use of DDT and other pesticides earlier in this century. The falcon, which can dive at speeds of 200 mph, was listed as endangered in

1970, and in 1975 only 324 nesting pairs were found in North America. In Yellowstone and other locations across the continent, efforts to ban DDT and, subsequently, to restore captive-born peregrines resulted in the species' remarkable recovery. Currently there are at least 1,650 breeding pairs of birds in the U.S. and Canada. Although no longer endangered, peregrine falcons, their eggs, parts, and nests will continue to be protected from unauthorized killing, possession, transportation, and importation by the Migratory Bird Treaty Act. The species will be monitored across the nation for the next 13 years to provide data on at least 2 generations of peregrines and ensure that the bird is doing well after delisting.

- The scavenged carcass of ultralight **whooping crane** #35 was recovered in late August. The bird had apparently been summering in the north-east corner of Utah north of Randolph in Rich County. There is no information on possible cause of death. This whooping crane was part of Kent Clegg's ultralight experiment in the fall of 1997. It was attacked by an eagle in Colorado on its flight south, was stitched up by a vet, and trucked the rest of the way to New Mexico. It was released at Bosque del Apache National Wildlife Refuge upon arrival. It survived the 1997–98 winter and migrated north to the border of Colorado/Wyoming where it was captured by Kent Clegg and transported to Yellowstone on May 1, 1998. It migrated back to Bosque del Apache where it spent the 1998–99 winter. The two remaining ultralight whoopers started the spring 1999 migration from Bosque on March 12. The last information on this bird was a sighting of the two ultralight whoopers together April 11 near Heber City, Utah. The one surviving ultralight whooping crane moved on to the Arbon Valley, Idaho, on May 16, and then summered west of Grays Lake. The three remaining whooping cranes in the Rocky Mountains are two cross-fostered birds from 1982 and 1984, one ultralight bird from 1997, and one whooper-sandhill hybrid.

Other

- Citations were issued in September to four individuals after an investigation documented **improper food storage and human waste disposal** at several backcountry campsites where the group stayed in the Canyon area. Each citation carries a \$100 fine, for a total of \$800 (each individual received two citations—one for improper food storage, one for improper human waste disposal).

The violations were discovered after another individual, who stayed in two of the campsites used by the four offenders, notified park rangers that the previous occupants had left large amounts of trash (aluminum foil, burnt cans, candy wrappers) in the fire rings at both campsites, along with some personal property. At one of the campsites, the individual also found numerous piles of human waste, along with large amounts of toilet paper, within 25 feet of a water source. Park regulations require that all human waste be buried, 6–8 inches deep, at least 100 feet from all water sources; all toilet paper must either be burned in the designated fire ring or, if fires are not allowed, packed out with the trash. The individual was able to provide park staff with pictures and other documentation.

Canyon backcountry rangers investigated and found that the previous occupants had also stayed at two other Canyon area backcountry campsites. In checking with the parties that next used those sites, it was confirmed that they found the campsites in the same condition—large amounts of trash left in the fire rings. One of the individuals was able to provide park staff with pictures and other documentation of a campsite.

Park investigators then contacted the four individuals. All four



admitted to staying at the campsites. They stated they tried to burn their trash but did not check the fire rings before they left the campsites. They also admitted that they did not bury all human waste.

A backcountry permit is required for all overnight use of the Yellowstone backcountry and must be obtained in person. At the time a permit is issued, the permit holder is required to go through a short orientation that explains park regulations and guidelines for staying in the backcountry. The permit holder of this group received the orientation and was informed of park regulations on proper food storage and waste disposal.

Yellowstone follows the "Leave No Trace" guidelines that help protect park visitors and resources. Backcountry users are required to pack out all unburned trash. Where fires are permitted, campers are allowed to burn paper, organic material, or leftover foodstuffs, but are instructed to sift through ashes and remove all unburned material; aluminum foil is not to be burned. Proper food storage/disposal and waste disposal will reduce odors that may attract bears. Leaving foods and other attractants where bears can get them is not only illegal, but also extremely dangerous for both bears and people. To leave campsites in the kind of condition these four individuals did created a safety hazard not only for them but other backcountry users as well.

- Toby P. Brown (21 years old) and Katrina M. Usher (19 years old) of Upton, Massachusetts, and Andrew S. Trick (19 years old) of Beaver Creek, Ohio, pled guilty on October 13, 1999, before U.S. Magistrate Judge Stephen E. Cole in Mammoth Hot Springs, to the charge of **removing natural features** from the park. The persons had dug up and collected over 150 pieces of petrified wood around the Petrified Tree, about three miles west of Tower Junction.

On October 8, Tower rangers received two reports from park visitors of two men and one woman digging in the ground with a screwdriver on the slope above the petrified tree. A park

ranger responded to the area and saw two of the people digging in the area. The ranger contacted the third person at one of the two vehicles the group was travelling in. The investigation uncovered one bag of about one hundred small pieces of petrified wood in one of the vehicles, and a large number of pieces of petrified wood in a small backpack. Several other mineral specimens and fossils were also found in the car. One of the men said he had taken pieces of travertine and geysersite from one of the thermal areas earlier in the day but denied finding the fossils and other minerals in the park. All of the specimens were seized and will be returned to their natural state if possible. Each individual was fined \$750, placed on three years probation, and prohibited from entering the park for three years.

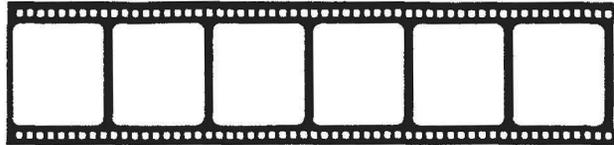
- A series of **weapons violations** occurred this fall in Yellowstone's backcountry. Carrying a weapon (loaded or unloaded) in the backcountry of the park is illegal and can result in a court appearance and/or citation accompanied by fines.

On August 5, a group of boy scouts from Idaho on a camping trip to Shoshone Lake were cited for a weapons violation and several food storage violations. A backcountry park ranger during a routine contact, discovered food improperly stored at the scouts two campsites near Shoshone Lake. While investigating the obvious food violations, the ranger also discovered a 40-caliber Glock handgun and ammunition in a backpack. The group was assisted from the backcountry and issued several citations.

On August 8, also at Shoshone Lake, four campers from Utah were discovered camping illegally. During a contact by a park ranger, it was also discovered that the group had improperly stored food, had planned to use wheeled carts to move their canoes, were in violation of their boating permit due to unsafe boating practices; and were carrying two weapons (a hunting-type compound bow and a Marlin .30-.30 rifle). They will be required to appear in court.

In yet a third incident, rangers were notified by hikers that they had seen a group hiking on the DeLacy Creek Trail to Shoshone Lake with a 12-gauge shotgun. Rangers found the group from Utah camped illegally on the beach of the lake. Shawn Thomas Whiting, 21 years old, of West Jordan, Utah, appeared in U.S. District Court on August 25, 1999, and pled guilty to several charges: carrying a weapon, camping without a backcountry permit, improper food storage, possession of an illegal firearm, and disorderly conduct. Whiting was fined \$275 and placed on one year's probation.

- Mark Hrubesky of Pulse Communications contacted the park this fall to obtain a **permit to film** grizzly collaring and bison helicopter net-gunning operations in the park for a documentary. After careful consideration, the permit was denied due to safety concerns and potential detriment to these research projects. Park staff agreed, however, to allow Hrubesky to mount a remote camera on the helicopter during the net-gunning operations and to film the ground darting of bison that was also taking place at the same time. Although Hrubesky was told the specifics of these provisions on several occasions prior to the company's arrival in the park, Hrubesky ignored them and chartered a helicopter with the intent of filming the net-gunning operations. This was discovered and prevented when the helicopter pilot contacted the park to ensure that he had the proper permits. When Hrubesky arrived with members of his crew, he met with public affairs staff to obtain the filming permit and acted surprised when informed that he wouldn't be allowed access to the helicopter net-gunning operations. Hrubesky proved to be very difficult to deal with during the application process, refusing to accept the terms and conditions established in the permit. He was again expressly told that neither he nor his crew members were to fly over or enter any areas on foot or by any other means where bison helicopter operations were taking place. This was

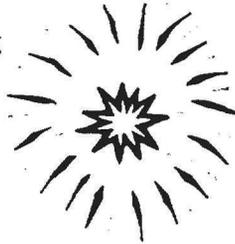


all specified in the addendum to the company's **filming permit**, which also contained a map of the restricted area. On October 20, a law enforcement ranger spotted the crew about a half-mile off-road in the restricted area where bison helicopter operations were taking place. Hrubesky was fined and his filming permit was revoked for violation of its terms and conditions. The park will deny all future filming permits to Pulse Communications, or any representative thereof, for a probationary period of three years.

- A **new book** published by Yale University Press showcases a number of Yellowstone Center for Resources staff members. It is Tim W. Clark, A. Peyton Curlee, et al., *Carnivores in Ecosystems: The Yellowstone Experience* (New Haven and London: Yale University Press, 1999). The book includes chapters on the history of Yellowstone carnivores by Paul Schullery and Lee Whittlesey, Yellowstone bears by Richard Knight and Paul Schullery, cougars by Kerry Murphy, wolves by Doug Smith and Wayne Brewster, and wildfire and predation by John Mack.
- Two Yellowstone employees recently received prestigious **NPS awards**. Tim Hudson, Chief of Maintenance, received the Director's Award for Excellence in Natural Resource Stewardship through Maintenance for 1999. Hudson has been instrumental in implementing a wide variety of sustainability improvement projects under the banner, the "Greening of Yellowstone." Projects include recycling, composting, use of cleaner fuels and lubricants, and use of less toxic cleaning materials. He has worked closely with other federal, state, and local governments and private entities in the greater Yellowstone area to explore and implement more environmentally-friendly methods for conducting business.

Mona Divine, Assistant Chief Ranger, received the Harry Yount Award for the Intermountain Region. The award honors those rangers who have demonstrated an overall excellence in service and leadership abilities, excelled in traditional ranger duties and skills, and are dedicated to the ranger profession and the National Park Service. Mrs. Divine was selected for the award because of her accomplishments in the field of traditional as well as modern ranger skills, her dedication to resource protection, and for the inspiration and guidance she provides to park staff and the public in her daily conduct.

- U.S. Geological Survey scientist Dr. Thomas J. Roffe recently received the Department of the Interior's **Superior Service Award** during a recent meeting of the Greater Yellowstone Interagency Brucellosis Committee. Roffe's leadership of the DOI's brucellosis research program since 1995 resulted in a long-needed, dedicated program focused on resolving the issue of brucellosis in greater Yellowstone area wildlife.



Bison and elk in 27 separate herd units in the greater Yellowstone area are affected by brucellosis, a disease that can cause cattle and wildlife to abort their first calves following infection. The issue has national and international significance because of expensive brucellosis eradication programs in the U.S. and many other countries. After millions of dollars of research since 1934, the nation is now on the verge of completing brucellosis eradication in cattle.

Soon, elk, and bison in greater Yellowstone will be the only reservoir for potential re-infection of livestock. Consequently, states and countries that have successfully eradicated the disease may require extensive testing or forbid import of cattle from Montana, Wyoming, and Idaho. Controlling and eliminating a disease in free-ranging wildlife distributed over an immense area will not be easy.

Roffe is exploring the potential for eradicating brucellosis in wild elk and bison through a vaccine.

"Tom Roffe designed and helped implement some of the first statistically valid experiments to determine both the effectiveness and safety of cattle brucellosis vaccines in elk and bison," said Dr. Chip Groat, Director of the U.S. Geological Survey. Groat said that "solid and sound" information resulting in more accurate wildlife disease transmission models is the result of Roffe's other research, done in collaboration with other agencies, on how brucellosis originates and develops, as well as on the epidemiology of the disease in free-ranging bison—that is, the incidence, distribution and factors related to disease in a population. Before Roffe's research, scientists had to use less reliable cattle data to model how the disease might work in free-ranging bison.

- Yellowstone held the fifth in a series of conferences, designed to encourage the awareness and application of scientific work in the greater Yellowstone area, October 11–13, 1999, at Mammoth Hot Springs. The theme of this year's conference was **Exotic Organisms in Greater Yellowstone: Native Biodiversity Under Siege**.

Greater Yellowstone has been subjected to the intentional and accidental introduction of species spread by humans, and their effects on native species can range from being economically beneficial to biologically benign or highly disruptive. Dozens of scholarly presentations addressed non-native species such as lake trout, whirling disease, New Zealand mud snails, white pine blister rust, brucellosis, and invasive plants and how to manage their effects on Yellowstone cutthroat trout, grizzly bears, and other native plant and animal communities.

The conference opened with a workshop entitled *Mountain Goats: Charismatic Transplant or Natural Invader?* Featured panelists include Bruce Smith from the National Elk Refuge in Jackson, Wyoming; Cat Hoffman, Chief of

Natural Resources for Olympic National Park; Tom Lemke, biologist with the Montana Department of Fish, Wildlife and Parks; and Paul Schullery, historian and author from Yellowstone National Park. The opening keynote speech was given by Dan Simberloff, Scientific Advisor to the President's Executive Council on Invasive Species. Other featured speakers included Daniel Botkin from the University of California at Santa Barbara, author of *Discordant Harmonies: A New Ecology for the 21st Century* and *Passage of Discovery: American Rivers' Guidebook to the Missouri River of Lewis and Clark*, who presented the Superintendent's International Luncheon Lecture; Holmes Rolston, author of *Environmental Ethics* and *Conserving Natural Value*, who presented the Aubrey Haines Luncheon Lecture; and Barry Noon, a systems ecologist from Colorado State University, who gave the A. Starker Leopold Lecture.

- On August 12, 1999, NPS Director Robert Stanton announced a **major effort to substantially improve how the NPS manages its natural resources**. *The Natural Resource Challenge: The National Park Service's Action Plan for Preserving Natural Resources* addresses the challenges of caring for our country's natural heritage within the complexities of today's modern landscapes.

NPS Historian Richard West Sellars' 1997 *Preserving Nature in the National Parks: A History* brought attention to the challenges threatening natural resource preservation, such as urban development, habitat destruction, non-native species invasions, and air and water pollution—things that could not have been imagined by the early pioneers of the NPS—and inspired the Service to develop this renewed commitment to preserving America's natural heritage.

The five-year strategic action plan emphasizes that the NPS will make resource preservation and conservation an integral consideration in all management actions, while maintaining if not

improving the outstanding recreational and educational experiences embraced by visitors. The plan calls for substantially increasing the role of science in decision-making, revitalizing and expanding natural resource programs, gathering baseline data on resource conditions, strengthening partnerships with the scientific community, and sharing knowledge with educational institutions and the public. It addresses habitat protection for endangered and native species, targeting non-native species for removal, inventorying natural resources and monitoring their condition, monitoring air and water quality, collaborating with other natural resource experts, and using parks as scientific laboratories and classrooms.

Specific actions to be taken immediately include implementing an environmental leadership program to reduce the impact of park operations on the natural environment, implementing a new and uniform scientific research and collecting permit process, merging resource preservation into mainstream park planning, and establishing a Sabbatical-in-Parks program for visiting scientists.

The President's FY 2000 budget includes nearly \$20 million in increases that would help complete natural resource inventories so that park managers have critical baseline data available for informed decision making and increase funding for large-scale preservation projects, restoration of threatened and endangered species and restoration of areas damaged due to human disturbance. Future budget requests will increase park base-funding, expand the air quality monitoring network, establish water quality monitoring stations in 75 park units, and enhance capabilities to prevent and prosecute resource crimes such as poaching.

- Mike Finley was involved with a winter use conference call with Grand Teton Superintendent, Jack Neckels, along with Assistant Secretary, Don Barry of Fish, Wildlife and Parks, and others discussing **snowmobile use in park areas**. Twenty-eight other parks have snowmobile use and an analysis on regulations and liability has

never been done. There will be a summit with these other parks and Yellowstone/Grand Teton to determine just what the impacts and liabilities are, and what the definition of "natural values" actually means.

Thermal

- Old Faithful is still a very regular geyser, with only three short intervals and three over 100 minutes between October 24 and 27. Beehive is back on track at 13–18 hours, and the indicator is not aberrant. Nothing else striking on Geyser Hill. Castle is extremely regular, and Tilt is back to having non-eruption events. Sawmill is very much in charge, with two eruptions of Penta in the last month. After a dip in its interval down to 8 1/2 hours at the end of September, Grand has returned to intervals of just under 12 hours. Rift is

erupting once every 13 3/4 hours. The biggest change is next, as both Beauty and Chromatic are about 6" or greater below overflow, and along with a drop in the Economics and Wave, the area has cooled dramatically with very dark bacterial mats seen in all. Oblong chugs along with full pool eruptions as frequent as every four hours, and Giant sits there. The average interval on Daisy is now over two hours, and no sign of Splendid. Grotto has recently had a marathon duration of about 20 hours, with 9 marathons in 20 days and up to 6 regular eruptions between marathons. Norris pool and Spiteful have had long periods of inactivity. Nothing from Fan and Mortar or "Victory" has been noted. Black Sand, Biscuit, and Midway are much the same. The Pink Cone area remains much the same, as does Fountain with its great regularity and impressive bursts.



NEWSBRIEFS FROM CULTURAL RESOURCES

By Laura Joss

Dr. Ann Johnson has joined our staff as the park's permanent **Archeologist**. Ann was duty stationed at Yellowstone from the Rocky Mountain System Office in 1997 and made herself indispensable!



She will continue to be the park's primary coordinator for archeology, and oversee ongoing National Register inventory and evaluation of the park's archeological resources.

Nez Perce National Historic Trail.
On July 24, 1999, repre-

sentatives from the Nez Perce tribe and Yellowstone's ranger and cultural resources programs rode a segment of the Nez Perce National Historic Trail that runs through Pelican Valley. During the ride the tribal members told family stories about the 1877 flight of the Nez Perce, and park staff shared information about the trail's location through Yellowstone.

On October 18, 1999, Stan Hoggatt, Nez Perce National Historic Trail historian and outfitter presented the "Nez Perce Triumph at Clark's Fork Canyon" science seminar at the park. Stan has extensively researched the location of the Nez Perce trail on the east side of the park, and presented a great deal of new information.

American Indian Government-to-Government Consultation meetings were held at Yellowstone October 6–7, 1999. Consultations were held for the *Draft Environmental Impact Statement (EIS) for the Interagency Bison Management Plan for the State of Montana and Yellowstone National* and the *Draft Winter Use Plan/EIS for Yellowstone and Grand Teton National Parks and the John D. Rockefeller, Jr., Memorial Parkway*. Over 80 tribes from across the country have expressed concern about the park's bison herd, and all were invited to send designated representatives to the meeting. Twelve representatives from nine tribes and tribal organizations attended, coming from as far away as Wisconsin. The Intertribal Bison Cooperative, which represents almost 50 tribes, presented a consolidated tribal position on the bison issue. The park has offered to hold a Winter Use EIS on-site consultation at the park during the winter season, and will continue to hold future Bison EIS and Winter Use EIS consultation meetings twice a year. A community dinner was held to welcome the tribal representatives. Many tribal members took the opportunity to explain the personal connections they have to bison, and the importance of bison to their tribes. Tribes historically affiliated to the park (Blackfeet, Confederated Salish and Kootenai, Crow, Eastern Shoshone, Gros Ventre and Assiniboine, Kiowa, Lakota/Sioux, Nez Perce, Northern Arapaho, Northern Cheyenne, and Shoshone-Bannock) were invited to discuss current issues and projects. These included updates from planning, cultural resources, and fire management, and a special focus session on diversity recruitment efforts.

Yellowstone Museum Partnership. This group of 18 museums, historical societies, preservation agencies, and national parks representing the greater Yellowstone ecosystem continues to meet quarterly to share partnering ideas. At the group's fifth meeting October 22, 1999, at Yellowstone, the group agreed on an informal organizational structure and vision statement. Ongoing

partnering projects include linked websites; joint museum displays; shared conservation services; disaster response plans; brochures; traveling exhibits; and educational programs for the national and international visitor to learn about and become more aware of the significance of the greater Yellowstone area. Planning also continues for new collection storage facilities for many of the partners. The group spends time at each meeting discussing building blueprints, floorplans, and other facility plans to ensure that efforts among our members are not duplicated.

Heritage and Research Center. The planning process for a museum and archival collection storage facility at Yellowstone continues. In May, a Choosing By Advantage exercise was held, and examined current sites under consideration. At the conclusion of the exercise, four sites in Mammoth and Gardiner (NPS land) were rated most highly. These sites will all be included in the environmental assessment for the project. Other planning this winter will include the production of a comparability study using program information from recent NPS and outside museum construction projects. Current site information, program needs and square footage estimates will be reviewed by a curatorial team at the park in January 2000. The team will consist of representatives from the Rocky Mountain Support Office, the National Capitol regional curator, a Smithsonian Institution program manager, private architects and a museum consultant. A value analysis for the project will be held in spring 2000.

Paleontology. Paleontologist Bill Wall and his Georgia College field crew continued their paleontological survey of Yellowstone July 4–11, 1999, with the assistance of cultural resources technician Elaine Hale. During the week of August 2–6, 1999, numerous cultural resources branch staff joined paleontology volunteer Lisa Wernick on surveys of known and potential fossil sites in the northern part of the park. Nancy Ward, Elaine Hale, Susan Kraft, Kara Mills, Jon Dahlheim, and geology volunteer Bill Moore all participated in

these surveys that produced many new finds, particularly of fossil leaves.

In August 1999, Laura Joss, Elaine Hale, Ann Rodman, Colette Daigle-Berg, and Kara Mills were led by mountain lion researcher Craig Whitman on a grueling hike to survey a portion of the upper reaches of Mt. Hornaday. Matt Smith, director of the Natural History Exhibit Hall in Livingston, joined the group to provide paleontological expertise. The group hoped to find additional remains of the tentatively identified *Titanotheres* jawbone fragments that Craig had found in 1998. This rhinoceros-like dinosaur lived in the area during the late Eocene period 37–50 million years ago. While the group found some petrified tree segments, only a few tiny fragments thought to be from the *Titanotheres* were found. Elaine Hale is cataloging the 1999 fossil finds.

Oral History Projects. Three oral history projects were undertaken in 1999. Cultural resources assistants Charissa Reid and Sally Plumb will continue a Fee Demo-funded project to interview important figures in the park's management of natural resources. Their 1998 project resulted in 12 interviews, and they hoped to interview 15 individuals in 1999. Yellowstone's former chief biologist, Glen Cole, a pioneer of natural regulation in the NPS, was able to attend the Fifth Biennial Scientific Conference and was interviewed twice during his visit.

Two private groups proposed to interview members of American Indian tribes affiliated to Yellowstone in 1999. Ehnamani, led by Crow/Santee Scott Frazier and Ojibwe John Potter planned to work with Crow historian Lawrence Flatlip to gather Crow oral histories about the park and potential ethnographic site information. The Idaho Mythweaver group planned to work with high school students on the Nez Perce, Confederated Salish and Kootenai, Shoshone-Bannock, and Crow reservations. The group trained students in oral interview techniques, which they will use to interview their elder family members. This information will be presented to the park for use in interpretive programs and exhibits. It will also provide important ethnographic resource information for the park's cultural resources program and archives on place names and past tribal uses of the park.

Historic Structures Inventory. The three-year parkwide inventory of Yellowstone's historic buildings is drawing to a close. In November, the consultant delivered individual inventory forms and photographs of the park's historic buildings. The forms will enable cultural resource staff to quickly retrieve information on the current and recommended National Register status of most buildings. As time permits, consensus determinations of eligibility will be sought from the appropriate State Historic Preservation Officers.



FORMER YELLOWSTONE RESEARCHERS HONORED FOR NEW BOOK

Information from the Public Affairs Office

Two former Yellowstone scientists, Dr. Mary Meagher and Dr. Douglas Houston, have won the prestigious Joan Paterson Kerr Award for their book, *Yellowstone and the Biology of Time*. The award was announced at the Western History Association's annual meeting in early October.

Yellowstone and the Biology of Time was chosen as the best illustrated book on the history of the American West for 1999.

By analyzing 100 sets of comparative photographs, *Yellowstone and the Biology of Time* reveals the dynamic nature of Yellowstone's

changing landscape. "Never before has the public had this opportunity to clearly see Yellowstone's ecological processes in action over the long haul," said YNP Superintendent Michael Finley. "This book is a milestone in our efforts to understand where this wild setting has been and where it's going." The photographic sets are followed by an extended narrative describing the geology, soils, and vegetation of the park, as well as a discussion of "the agents of change" that shape today's wild Yellowstone: climate, fire, wildlife, humans, and other forces still active in the park.

Most of the photo sets contain three pictures, with many of the original views dating as far back as the 1870s and 1880s, including a number of images by the well-known early Yellowstone photographers William Henry Jackson and F.J. Haynes. After locating the earliest available images of each area of the park, Drs. Meagher and Houston rephotographed the same locations in the 1970s, after the 1988 fires, and in some cases in the 1990s. They then studied the photographs to note long-term changes in vegetation and other features. Superintendent Finley notes, "This is a fascinating and important piece of scholarship. This remarkable book is an invaluable resource to park management and scientists, providing insightful data on changes—or the lack of change—to the park's flora and fauna, and even to the geology."

Dr. Meagher began her long association with Yellowstone in 1959 and held a variety of research-related positions, including several years as chief biologist. She retired in 1997 as research biologist for the Midcontinent Ecological Science Center, National Biological Service (now the Biological Resources Division of the U.S. Geological Survey), Yellowstone National Park. During her career in Yellowstone, her specialty was large mammal ecology, with an emphasis on bison, about which she published many technical papers and articles.

Following a research project on the Shiras moose in Jackson Hole, Dr. Douglas B. Houston studied ungulates in northern Yellowstone from 1970 to 1980. He is also author of the award-winning book, *The Northern Yellowstone Elk: Ecology and Management* (1982). He retired in 1997 as research scientist for the National Biological Service at Olympic National Park, where he studied mountain goats, salmon, and other ecological topics.

The Joan Paterson Kerr Award was established in 1992 by Chester Kerr in honor of his wife. The biennial award was originally established to recognize the best-illustrated book for a university press; last year that changed to include all presses. *Yellowstone and the Biology of Time* was printed by the University of Oklahoma Press in 1998.



THREE YELLOWSTONE MUSEUMS AT RISK

By Lon Johnson

The Secretary of the Interior included three Yellowstone buildings in his "America's Landmarks at Risk" annual report to the U.S. Congress. The Norris, Madison, and Fishing Bridge museums were added to the National Historic Landmarks "1998 Watch List." Landmarks are

included in the list because they exhibit potentially serious damage or may become seriously threatened. In the case of the museums, the report cited physical deterioration stemming from weather and deferred maintenance, extensive rodent problems, and



thermal activity at Norris. The report recommended that the park prepare condition assessments to better understand the buildings' needs.

Norris, Madison, and Fishing Bridge museums were designated national historic landmarks in 1987. The designation recognized the museums as the best examples of Rustic Style buildings in the National Park System. Designed by architect Herbert Maier in 1929, the Laura Spelman Rockefeller Foundation funded their construction through the American Association of Museums. The museums served as models for hundreds of buildings constructed throughout the nation, especially for projects under the auspices of New Deal programs of the 1930s.

National historic landmarks, a step above the more familiar National Register of Historic Places listing, have exceptional value in illustrating or interpreting the heritage of the U.S. in history, architecture, technology, and culture. Besides the three museums, Yellowstone's other national historic landmarks are the Old Faithful Inn, the Northeast Entrance Station, and Obsidian Cliff.

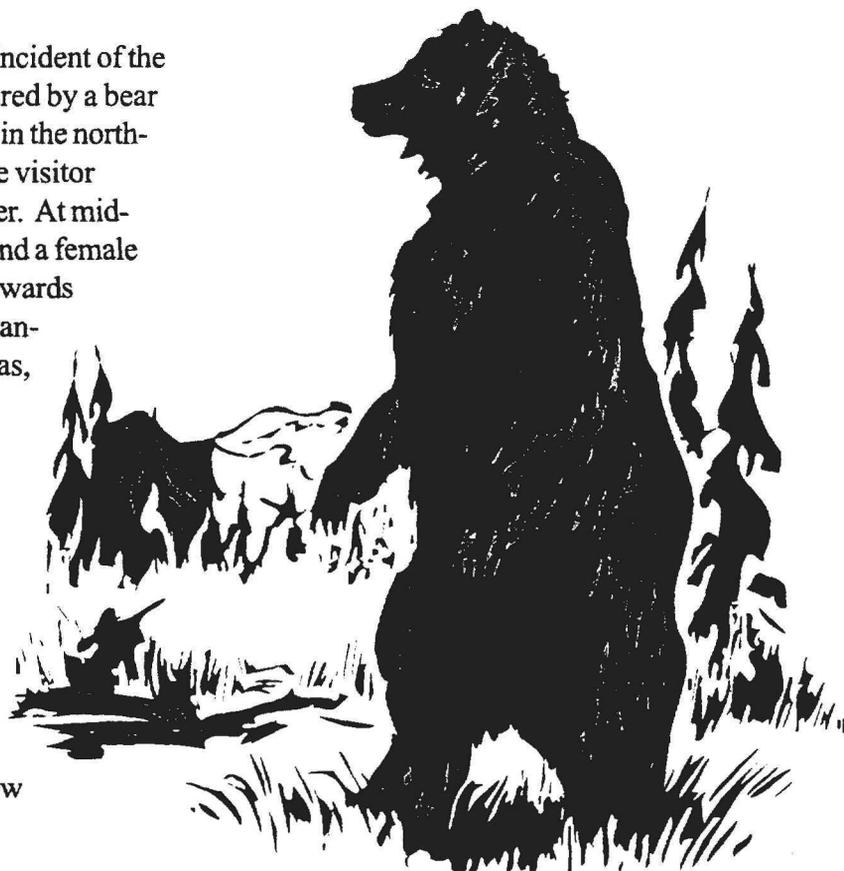
The Cultural Resources branch of the Yellowstone Center for Resources is preparing text for an interpretive brochure to explain the significance of the buildings to visitors. Funding sources to rehabilitate the buildings are being investigated and pursued.



BEAR INCIDENTS

Information from the Public Affairs Office

On August 27, in the first bear incident of the season in the park, a visitor was injured by a bear on the Skyrim Trail to Bighorn Peak in the northwest area of the park. A friend of the visitor notified park officials of the encounter. At midday, a male hiker from Switzerland and a female hiker from New York were hiking towards Bighorn Peak when they heard a moaning noise. Unsure what the sound was, and thinking the noise was farther away, they continued their hike. They had only taken a few steps when they saw a bear (by their description, probably a grizzly) approximately 10 yards away on a slope to the left of the trail. The woman stepped away from the bear and quickly dropped down on her lower legs into a ball position; the bear charged the woman, huffed a few times, but did not touch or harm her.



At the same time, the male hiker stepped uphill in the direction the bear was first spotted. He was approached, but not touched, by two yearlings. The male hiker deployed his pepper spray (he was unsure whether the spray hit the young bears), and the adult bear immediately turned away from the woman and charged toward the male hiker. The hiker continued to spray, falling on his back in the process, but the bear did not touch him. Thinking the adult bear was going to attack, the man raised his leg for protection. The bear swatted his leg, inflicting two gashes and other minor injuries. The adult bear then sniffed at the cloud of spray, retreated, but immediately returned. The two hikers—now out of pepper spray—remained on the ground, very still, until all three bears left.

Although the hikers had met a park ranger patrolling the area on horseback shortly before their incident, they chose to return to the trailhead and drive to Bozeman, Montana, for medical treatment.

In the second bear incident in the park this season, George Terry Langley, Jr., a 32-year-old from Seattle, Washington, was mauled by a female grizzly bear while hiking alone on the Black Butte Trail on September 22, 1999, in the early afternoon. Mr. Langley was hiking in a heavily forested, whitebark pine (whitebark pine nuts are an important fall food source for grizzly bears) area enroute to a campsite where he planned to spend the night. About four miles from the trailhead, he noted two grizzly bear cubs alongside the trail. He moved to the other side of the trail to avoid the cubs and was immediately charged and knocked down by the adult female grizzly bear; it is unclear whether Mr. Langley saw the adult bear before the attack occurred. The adult bear bit or clawed Mr. Langley, breaking his orbital bone and inflicting injuries to the left side of his face and the back of his scalp and right rib area. Once the bear left the area, Mr. Langley was able to walk out to the trailhead where he was able to get assistance from passing motorists.

The park received several calls reporting the incident at around four-thirty. Park staff immediately responded to the area and provided emergency medical care. The man was stabilized and life flighted to the Eastern Idaho Regional Medical Center, at Idaho Falls, Idaho, where he underwent several hours of surgery. No management action was taken against the female grizzly bear, which was displaying natural protective behavior when Mr. Langley came between her and her cubs.

A 180-pound subadult (2- or 3-year-old) male grizzly bear that had been frequenting the Indian Creek Campground and damaging personal property (tents) was successfully trapped close to the campground on the evening of August 22. The male grizzly bear first came to the attention of park staff on June 28 when it entered the Indian Creek Campground, brushed against a couple of tents, and damaged a third; no one was injured, and the bear did not obtain any human food. Park staff set up two traps in the area but removed them after three days when no bear was caught.

On July 9, the male grizzly again entered Indian Creek Campground and damaged another two tents. Again, no one was injured, and there was no evidence that the bear obtained any human foods, other than what it may have obtained from digging through fire pits. Trapping operations were initiated for five days, and a potential suspect bear—a subadult female—was captured, radio collared, and relocated out of the area. It was later determined the female bear was not involved in any of the incidents (tracking data showed the female grizzly was in another location at the time of the incidents).

On July 18, two subadult grizzly bears entered Indian Creek Campground. While one bear remained at the edge of the campground, the second entered a campsite and bounced on a tent, breaking the poles, ripping the fabric, and crushing the tent. Traps were again set for a period of seven days, but no bears were caught. At that point, Indian Creek Campground was temporarily designated for hard-sided camping units only.

On the evening of August 17, a group of people were camping in the backcountry at a site about seven miles from Indian Creek when a bear entered their campsite and began sniffing and pawing at their tent, bending and damaging the poles. The group spent the night around their campfire and left the next day. A short time later on August 17, a single camper at a backcountry campsite (less than one-half mile from the previous incident) was awakened by a bear outside his tent. He was able to frighten the bear away, but decided to climb a tree nearby in case the bear returned. The bear did return and jumped on the tent, breaking the poles and tearing holes in the tent and ground tarp; there was no food in the tent. The man spent the night in the tree, then hiked out the next morning and reported the incident. A bear trap was flown into the campsite and remained in place for three days; the trap was shut down when no bear was caught.

The bear was finally caught on August 22 after a decoy tent was set up next to the trap. The

bear stepped on, tore, and crushed the tent, and then entered the trap. While the animal was caught weeks after his last alleged offense, there is little doubt that the subadult bear is the guilty offender. DNA testing done at the University of Idaho on bear hair obtained from the incident sites matches the DNA of the captured bear. The chance of a genotype match with any other grizzly bear in the park was approximately 1 in 21,000; the total grizzly bear population in the Yellowstone ecosystem is approximately 600 bears.

The bear was deemed a danger to public safety as per 50 CFR 17.40 and was not considered suitable for release back into the wild. The bear was held in a commercial holding facility while a search for a suitable public zoological institution to house it was conducted and, once found, until the necessary permits from the California Game and Fish and U.S. Fish and Wildlife Service were obtained. Staff from the Wildlife Way Station of Sylmar, California, picked up the bear on September 27.



Happy New Year!

The *Buffalo Chip* is the resource management newsletter for Yellowstone National Park.
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We welcome submissions of articles or drawings relating to natural and cultural resource management and research in the park. They can be sent to Yellowstone Center for Resources, P.O. Box 168, Yellowstone National Park, Wyoming 82190, (307) 344-2208.

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