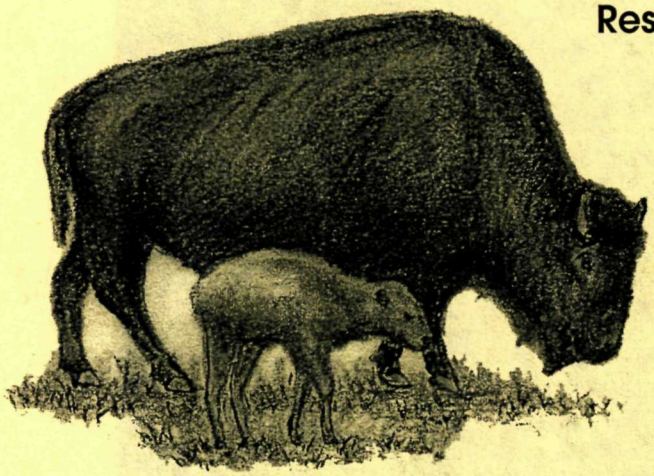
The Buffalo Chip

Resource Management Newsletter
Yellowstone National Park
April/May 2004



What's inside

Bison Release Goes Smoothly

Adapted from a PAO News Release

On Tuesday, April 6, 2004, 198 bison, held since mid-March at the Stephens Creek facility along the park's northern boundary, were released back into the park. Factors in the timing of the release included the melting of snow cover, which exposed residual forage, sufficient amounts of new forage, and the impending birth of calves. Calving season typically begins in late April.

In 2004, operations related to the Interagency Bison Management Plan (IBMP) resulted in the capture of 464 bison. Of those captured, 198 bison tested seronegative and were temporarily held at the Stephens Creek facility. One adult bull bison tested seronegative and was released after testing earlier this spring; 207 bison tested positive for exposure to brucellosis and were transported to slaughter; 1 bison died while awaiting transport to slaughter; and 57 were taken to slaughter without being tested. One adult bull bison was lethally removed.

Upon release from the Stephens Creek facility, all 198 bison moved rapidly toward the park's interior ranges, heading south into the foothills below Sepulcher Mountain toward the Old Gardiner Road. They crossed the road, descended into the Chinese Gardens area, and followed the Gardner River past the Boiling River swimming area. The group then traveled to higher ground near Blacktail Deer Plateau, and for the most part, have remained there since their release.

These bison are being closely monitored during their re-acclimation process. At the time of release, five radio-collared bison were among the group. A little over a week later, two collared animals remained in the Blacktail area, and three had moved deeper into the interior of the park, possibly headed for Hayden Valley.

The last time bison were held at the Stephens Creek facility for subsequent release was in 1997. When conditions allowed, release operations went smoothly, with approximately 125 bison moving south into the park with little prompting.

NPS/WAYNE BREWSTER

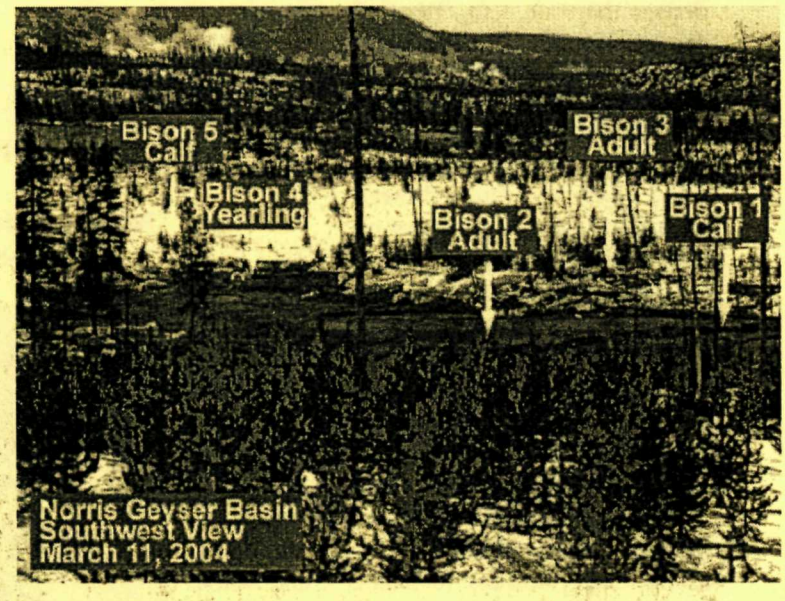
Above, bison released from the Stephens Creek holding facility near the park's northern boundary head for the interior ranges. Below, the bison continue south along the Gardner River.

NPS/JIM PEACO

Weird Bison Deaths at Norris

by Hank Heasler, Cheryl Jaworowski, Susan Chin, Travis Wyman, and Alice Wondrak Biel

In a very rare event, a combination of concentrated toxic gases (hydrogen sulfide and carbon dioxide) and unusually cold, dense air appears to be the most probable cause of death for five bison found at Norris Geyser Basin by Bear Management Office (BMO) staff on March 10, 2004. BMO personnel noticed the animals while doing routine research in the area. The bison, estimated to have been dead for approximately a week, were found lying on their sides, with their feet perpendicular to their bodies (Figure 1). The unusual position of the carcasses indicated that the bison died very rapidly, as a group.



Overview of the bison carcasses along the Gibbon River.

It seems likely that the bison (2 adults, 2 calves, 1 yearling) were grazing and resting in a snow-free ground depression along the Gibbon River near multiple geothermal gas vents in the Norris area; they died downstream and downhill from gas vents along both sides of the river. Areas with multiple gas vents are typically associated with thermally-baked ground, minimal vegetation, and sulfur deposits. Cold, still air from a cold front that passed through the area around March 1 probably caused the geyser basin's steam and toxic gases to remain close to the ground, overwhelming the animals.

In the investigation following the deaths, YCR geology staff measured hydrogen sulfide gas (H_2S) in some vents exceeding 200 parts per million (ppm), far above safe limits for humans or animals. H_2S is classed as a chemical asphyxiant, similar to carbon monoxide and cyanide gases. It inhibits cellular respiration and uptake of oxygen, causing biochemical suffocation. With a vapor density of 1.19, hydrogen sulfide is approximately 20% heavier than air, so this invisible gas may collect in depressions in the ground and in confined spaces, especially on usually cold, still nights. Humans, who can easily detect the smell of the gas even at the minute level of 1 ppm, are typically able to escape an area well before it reaches a toxic level. From 1–30 ppm, humans recognize hydrogen sulfide's characteristic rotten-egg smell. From 30–100 ppm, humans recognize H_2S gas as "sickeningly sweet." Above 100 ppm, a human's ability to detect H_2S is impaired. Prolonged exposure can lead to bronchitis, pneumonia, headaches, irritations of eyes, nose or throat, dizziness, nausea, shock, convulsions, coma, or death. However, the fairly constant winds in the Yellowstone area generally dilute and disperse gases, making it almost unheard of that a park visitor would be overcome by toxic fumes as the bison were.

Figure 1. Bison lying on its side with feet perpendicular to its body. All five bison were lying in a similar position.

Another toxic gas that occurs in geothermal areas is carbon dioxide (CO_2). At 10%, carbon dioxide paralyzes a human's respiratory system. The result is fatal,

with no evidence of an agonal struggle. The ratio of carbon dioxide to hydrogen sulfide in most geothermal areas ranges between 1,000:1 to 100:1. Also denser than air, CO_2, like H_2S, can accumulate in topographically low spaces during periods of cold calm. No weather station exists at Norris, but an electronic temperature logger deployed at the Norris Museum showed unusually cold temperatures on the evening of March 1 and early morning of March 2, 2004 (Figure 2, -17°C, [1°F] at 2:56 AM MST). Also, the elevation of the mapped gas vent is approximately 20–30 feet higher than the elevation of the bison carcasses, making it possible that the bison were asphyxiated by CO_2 and/or H_2S gases when the unusual set of conditions coalesced.

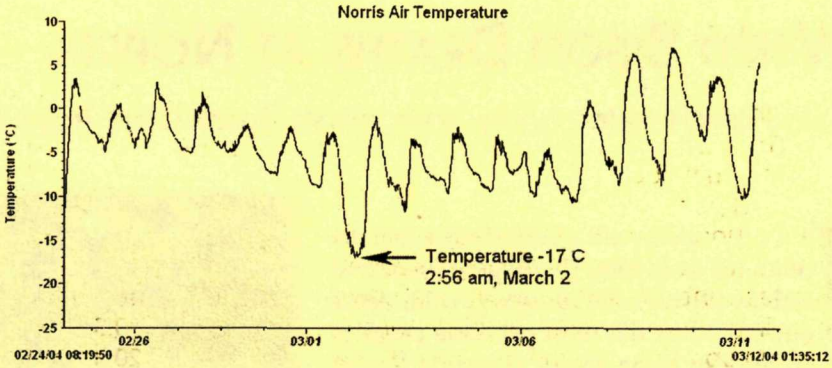


Figure 2. Air temperature at Norris Museum, February 25–March 11, 2004.

Although rare, incidents such as this have occurred previously in the park. In 1889, several dead animals (6 bears, 1 elk, some squirrels, pikas and other small animals and insects) were found by geologist Walter Weed in an area known as Death Gulch in the upper Lamar River valley. A second geologist, T.A. Jaggar, visited the area in 1897 and noted seven dead bears (see right). In *Death in Yellowstone*, YNP historian Lee Whittlesey recorded both a near-death and a death resulting from noxious gases in the park. Lillie Henderson, daughter of assistant superintendent G.L. Henderson, nearly succumbed to carbon dioxide fumes in the basement of her Mammoth Hot Springs home in 1883. In 1939, Bureau of Public Roads employee Bill Nelson was overcome by gas (likely hydrogen sulfide) when he fell into a 26-foot pit while in the process of attempting to resuce a co-worker who had lost consciousness while being lowered into it. The worksite was across the Yellowstone River just east of Tower Junction; two other pits dug in the near vicinity showed no signs at all of the gas, the smell of which had been noted by Nelson's co-worker when he reached a point about eight feet from the bottom of the pit. A cursory survey of Yellowstone Research Library data indicates that many other people have recognized the dangers of toxic gases within Yellowstone.

Climbing through this trough, a frightfully wierd (sic) and dismal place, utterly without life, and occupied only by a tiny streamlet and an appalling odor, we at length discovered some brown furry masses lying scattered about the floor of the ravine about a quarter of a mile from the point where we had left Cache Creek. Approaching cautiously, it became quickly evident that we had before us a large group of recumbent bears; the one nearest to us was lying with his nose between his paws, facing us, and so exactly like a huge dog asleep that it did not seem possible that it was the sleep of death...One huge grizzly was so recent a victim that his tracks were still visible in the white earthly slopes, leading down to the spot where he had met his death. In no case were any marks of violence seen, and there can be no question that death was occasioned by the gas.

—Dr. T.A. Jaggar, 1897,
quoted in Paul Schullery's "The Bears of Yellowstone"

Table 1. Gas concentrations.

Feature	H_2S (ppm)	O_2	Temperature (°C)
Gibbon River	Not measured	Not measured	7.9
Thermal spring	Not measured	Not measured	55.9
Thermal pools	1	Not measured	13.5
Mud pot	177	20.6	82.5
Ground	Not measured	Not measured	93.4
Gas vent	>200	16	Not measured
Gas vent	>200	Not measured	83
Air	56	20.8	Not measured
Hilltop	0	20.8	Not measured

Data summary

On March 10, Bison Ecology and Management Office (BEMO) personnel collected incisors and tail hair from the bison. BMO personnel collected samples of blood, lung, liver, and windpipe, and examined body fat and bone marrow for each carcass. Body fat was present on all bison. Bone marrow was pink and solid for four bison. One calf had red and gelatinous bone marrow. These results support the idea that cause of death was gas asphyxiation, rather than malnutrition or disease.

Within the thermal area, concentrations of hydrogen sulfide (H_2S) varied from a high of greater than 200 ppm to 0 ppm (Figures 3 and 4, Table 1). Concentrations of greater than 200 ppm H_2S were found at a vent immediately upstream from the bison carcasses (Figures 3 and 4). A second vent in the thermal area emitted steam with 177 ppm of H_2S (Table 1). Within the thermal area, the air contained 56 ppm of H_2S (Table 2). On top of a small hill (Table 1), the gas meter measured 0 ppm H_2S in the gentle wind. Downstream from the thermal area, the gas meter measured 1 ppm H_2S (Table 1). Oxygen varied from 16% (within a vent) to 20.8% within the air. On the morning of March 11, there was a gentle breeze mixing the air.

Ground and water temperatures varied from 27°C to 93.4°C at 4 cm depth. In places, yellow crystals of native sulfur were visible around vents. Water temperatures of a small seep (13.5°C) and thermal spring (55.9°C) were greater than the temperature of the Gibbon River (7.9°C) in the area of the bison carcasses.

Conclusions

In an ongoing effort to learn more about the gases in the Norris Geyser Basin area, park staff plan to continue taking random air and vent samples of gases. Because few of Yellowstone's thermal areas are in closed depressions that would concentrate these gases, the likelihood of a fatal exposure is remote. However, a reconnaissance of gases will be undertaken in the entire Norris area. This will include random samples of hydrogen sulfide, carbon dioxide, and oxygen. Both air and vent samples will be taken. All vent samples will include temperature measurements and a digital photograph.

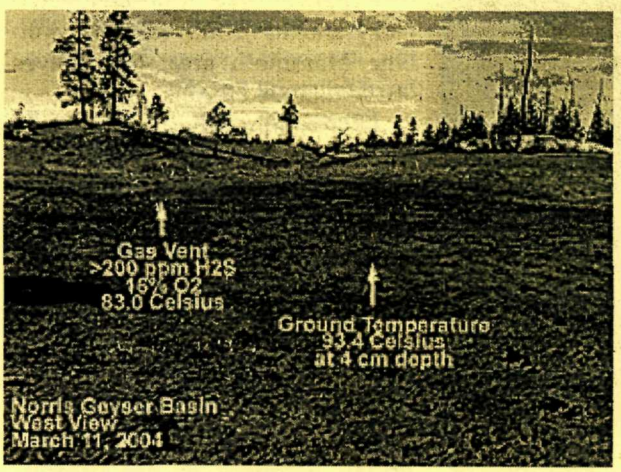


Figure 3. Thermal area upstream from the bison carcasses.

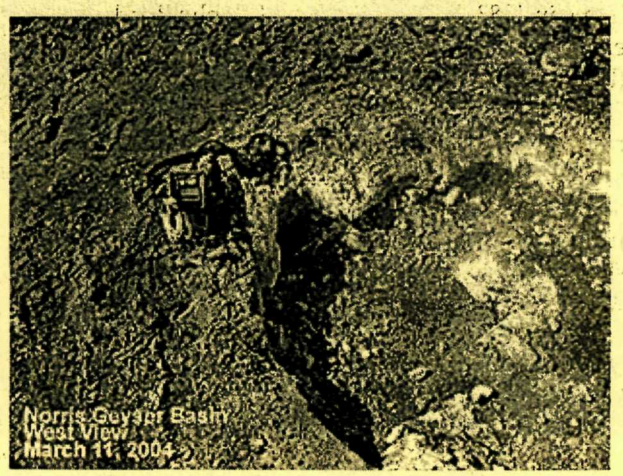


Figure 4. Close-up of steam/gas vent in Figure 2 and gas meter. H_2S emissions from this vent were greater than 200 ppm.

Living with Wolves

by Doug Smith

On the evening of February 23, a meeting was held at the Mammoth school about living with wolves. This was done because the Swan Lake pack has recently been in the Mammoth area, and four elk were killed close to buildings. We thought it would be beneficial if the notes from that talk were reprinted in the Buffalo Chip, *in order to give people the information they need to deal with a similar situation, should it occur, elsewhere in the park, and to put wolf/human interactions in perspective.*

Background

This winter, as has been the case for the past couple of years, a wolf pack has been observed in close proximity to Mammoth. Most activity is at night, although the wolves are sometimes seen during the day, as well. They have killed four elk near buildings; two of the carcasses had to be moved. Several people have expressed concern for human safety, and wondered how to respond to the wolves' presence in a developed area. Others are concerned about what the wolves might do. What can we expect when wolves are close to where we live and work?

The wolves

The wolves most commonly frequenting the area are from the Swan Lake pack. This pack typically ranges around Swan Lake Flat and Gardner's Hole, but their territory includes the north side of Sepulcher Mountain and the Mammoth area. This pack started when a female from the Leopold pack (whose territory is the Blacktail Deer Plateau) left and paired with a male in 2000. They have produced pups every year since, and the pack has hovered around 10–12 individuals. Currently, it has 11 members. The Swan Lake pack is unique in that it is one of only two packs out of the roughly 31 that occupy the Yellowstone ecosystem that are all gray (the other is the Nez Perce pack, north of Old Faithful). All the other packs in the GYA are a mixture of gray- and black-colored wolves. Five of the Swan Lake pack are radio-collared, which allows us to follow their movements and learn more about them.

Lately, a new group of wolves has been spotted around Mammoth. This group recently formed during the breeding season, a time of year when we expect such associations. One of these, a black female, has a limp, which sets it apart from the Swan Lake wolves. The other two wolves in this pack are radio-collared (two grays, one male and one female); the limping wolf is not radio-collared. Although this pack has been reported in the Mammoth vicinity, its wolves have not been reported in as close proximity to Mammoth as the Swan Lake pack, nor have they killed any elk in the Mammoth area.

An important point to remember is that wolves are around Mammoth for the elk—not because they are tame, looking for a handout, or already habituated to humans. Elk have largely left the main part of the Swan Lake territory and have moved down into the Mammoth area; the wolves have followed the elk.

Eventually, the wolves will leave the Mammoth area; they will not den there. Wolves are fairly traditional "denners," and their den is not near Mammoth. The denning season is April, but we expect the elk to move out of the Mammoth area before then; this will likely cause the wolves to move as well. The trio of wolves that were around Mammoth on Friday, February 20, has already left the area.

NPS/JIM PEACO

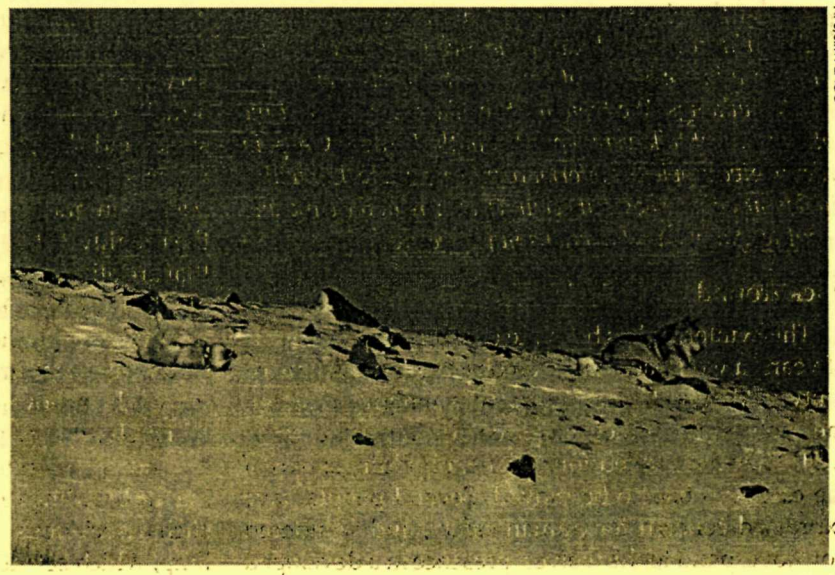
A group of wolves, drawn to the Mammoth area by the presence of elk, interact on the hillside behind the Pagoda.

History of wolf attacks in North America

Contrary to what you may have heard, wolf attacks on humans are very rare—fewer than for any other North American carnivore. Living with wolves is not a new thing; people in Minnesota, Alaska, and Canada have been living with them for a long time. Two studies have tallied the number of non-rabid wolf attacks in North America during the twentieth century—this has proven difficult because virtually no records on wolf attacks exist, so it becomes a job of summing up oral history—which total 19–21 human attacks (the two studies report slightly different numbers of attacks). Virtually all of these attacks (which involve non-fatal bites) were from wolves that have become conditioned to human foods. Six of the 20 or so bites were inflicted on Alaska pipeline workers who were feeding wolves sandwiches from their lunch. There were six incidents of wolves biting small children. Five of these bites were inflicted by wolves in Algonquin Provincial Park (Ontario, Canada) that were habituated and tearing apart backpacks, going into tents, and hanging around campsites. One bite was inflicted on a small child by a food-conditioned wolf in Alaska that was drawn in by a dog. None of these 20 or so wolf bites have been fatal, and rabies has never been observed in the park.

In Yellowstone, bison, bears, elk, and even coyotes are much more likely to interact with and injure people than wolves. In the 20 years from 1980 to 1999, bison charged and made contact with people 79 times, inflicting 61 injuries, including one fatality. During this same time period, there were 24 bear-inflicted human injuries, including two fatalities. Between 1990 and 1999, coyotes made contact with people 16 times, inflicting 8 injuries. Elk charged people too many times to count, making contact at least once. Remember that these numbers compare 10–20 years of records inside Yellowstone National Park to 100 years of records throughout North America.

Interestingly, the wolf literature is filled with more stories of people approaching and trying to befriend wolves rather than wolves trying to attack people. In fact, many people have perfected the technique (some canoe guides in Canada, for example) of finding wolf dens, approaching them, and digging out the pups for clients to play with. No one has ever been hurt by an adult wolf defending its den; they always run off. Needless to say, this has been reported to be the most popular activity in 30 years of guiding for one guide service.



NPS/JIM PEACO

These wolves were identified as members of the Swan Lake pack. A radio-collar is visible on the wolf to the left.

What you can do to reduce the already small risk

First, don't allow wolves to become conditioned to human foods. Do not ever feed a wolf or any other wildlife. Do not leave human or dog food or garbage outside unattended. Make sure the door is shut on the garbage dumpster when you deposit a bag of trash. Second, treat wolves with the same respect that you give any other wild animal in the residential area. If you see a wolf, do not approach it. Never leave small children unattended. Third, if you have a dog, control it. Do not allow your dog to run loose (since no dogs are allowed off-leash in Yellowstone, this should not be an issue). Do not leave your dog tied up outside your house all day or all night unattended. Dogs sometimes attract wolves, especially during mid-winter when wolves breed. Fourth, should something happen to cause you to be concerned—the wolf is too close, hanging around, not showing sufficient fear of humans—do not run. Stop, stand tall, and watch what the wolf is going to do. If it approaches, wave your arms, yell, and flare your jacket. If it continues, throw something at it. If someone is with you, stand close together to appear bigger. Think ahead; if you see a wolf, stop, see where it is headed, and what it is going to do, and then avoid it if you can. Finally, report all

close encounters or any wolf behaving strangely. It also doesn't hurt to report the presence of wolves in the area, or any kills they may have made.

Management response

The Yellowstone Center for Resources and the Ranger Division have had excellent communication about wolves across the park, especially around the Mammoth area. There is an approved plan, *Management of Habituated Wolves,* signed by the superintendent, allowing swift response to any situation should it be necessary. This plan is available to everyone, and discusses in detail both the response to dealing with close encounters with wolves, and what park management is prepared to do should a problem wolf develop. The first response will likely be some form of hazing and/or aversive conditioning. Should this not solve the problem, the wolf will be removed from the population *proactively.* This underscores the importance of communication so managers can accurately assess any potential situation.

Closing thought

Unprovoked, wolves are not dangerous. We're prepared, and you should be too. But keep in mind we do not expect anything more to happen than has already been observed. Why, then, have this meeting possibly making an issue of wolves? Because everything relative to wolves is a big deal. Rumors abound, and legend has it that wolves are dangerous. They aren't; I am personally more afraid of elk in Mammoth than wolves. But even though the chance of a wolf attack on you is almost zero, it is not zero, so be prepared—after all, you live in a national park!

For more information, contact Dr. Douglas Smith, Wolf Project Leader, Yellowstone Center for Resources, P.O. Box 168, Yellowstone National Park, WY 82190; 307-344-2242.

Plants Strike Back at Elk!

by Jennifer Whipple

Last month, over 300 elk in the Red Rim desert area 15 miles southwest of Rawlins, Wyoming, were found either dead or slumped to the ground, unable to rise due to apparent weakness in the leg muscles. Drought in the area has made the forage quite limited, and the dead elk were found to have significant amounts of lichen in their stomachs. The investigation followed several different leads, but eventually focused on the stomach contents of the animals. Two yearling bull elk were fed a lichen-only diet and rapidly showed symptoms of the disease, with the elk stumbling and going down.

The lichen in question was initially identified as *Parmelia molliuscula,* known as tumbleweed shield lichen or ground lichen. Occurring on the soil surface, this species is gray-green when dry and leathery when wet. As described by John M. Kingsbury in his 1964 publication, *Poisonous Plants of the United States and Canada,* the straplike expanses of thalli are irregularly dissected, and can become twisted and tangled into masses under some circumstances such as high winds, and accumulate into clumps. The toxic principle in tumbleweed shield lichen is usnic acid. In feeding experiments undertaken on cattle and sheep in the 1950s after livestock deaths on the range, it was found that a dose of 1% of an animal's weight per day for five days, or a single dose of 3.6% of an animal's weight, was lethal. At the time, apparently, there were no reports of deaths or paralysis in other elk or other native mammals. The lichen is toxic throughout the year, but most cases of poisoning in livestock occur when there is limited forage during the winter months. It has been suggested but not proven that the drought conditions cause a boost in usnic acid content.

Tumbleweed shield lichen is apparently the only species of lichen known to have caused poisonings in North America. The problem is that this species is not native to North America and is not known from North America! *Parmelia molliuscula* typically occurs in the southern part of Africa. The use of this name for North American material dates to the later part of the nineteenth century, and it has not been used by North American lichen experts in many decades. So what killed the elk? Roger Rosentreter, the state botanist for the BLM in Idaho and an expert in western North American lichens, has hypothesized that the elk were probably eating a lichen species complex. The likely suspects are in the genus *Xanthoparmelia,* and there can be two or three species growing together at one location. Identifying individual species is difficult, and often requires technical aids. The presumed poisoning agent, usnic acid, occurs in many species of lichens. An alternative hypothesis for the elk deaths, according to Roger Rosentreter, was the possibility of selenium accumulation in the lichens.

Could this happen in Yellowstone? Yellowstone

has several species of *Xanthoparmelia*, including one of the conspicuous lichens on the ground in the Stephens Creek area. Antelope are probably eating lichens in this area, since native antelope are known to eat lichens and have been found to have as much as 50% or more of their stomach contents comprised of lichen. Elk are also known to eat lichens out of trees with no deleterious effects, for example, *Usnea* spp. (old man's beard). It has been suggested that the elk that were killed in south-central Wyoming were outside of their regular wintering areas, which may have made them more vulnerable since the lichens of that area were not a regular component of their diet. Yellowstone's resident elk and antelope probably consume at least some lichen on a regular basis in their diets without incident. Without knowing exactly which lichen killed the elk, it is impossible to determine the likelihood of such an event happening in Yellowstone, but it is probably unlikely.

More Director's Awards for YNP

by Tom Olliff, Todd Koel, Doug Smith, and Alice Wondrak Biel

Bruce Sefton wins maintenance award

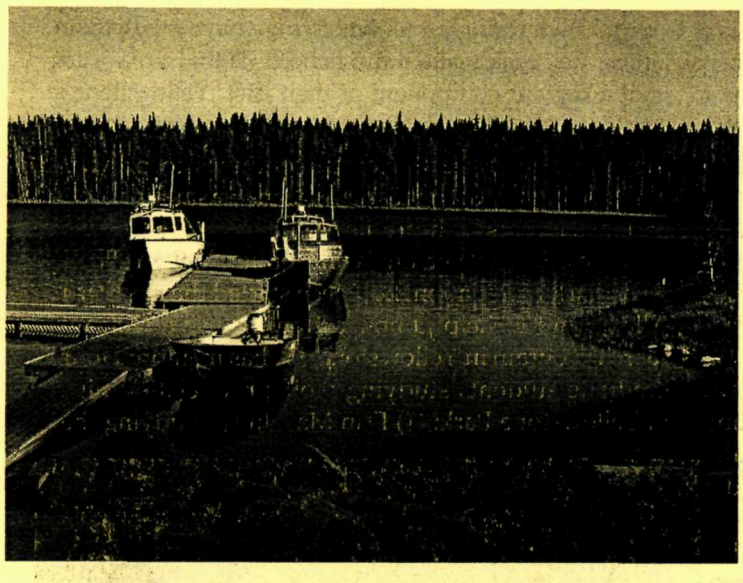
Lake District Maintenance Supervisor Bruce Sefton has been named the winner of the Director's Award for Excellence in Natural Resource Stewardship through Maintenance for 2003. Bruce was nominated for the award by YCR's Natural Resources Branch Chief Tom Olliff and Supervisory Fisheries Biologist Todd Koel because throughout his 15-year tenure as the Lake District Maintenance Supervisor, he has demonstrated a remarkable commitment to protecting resources, supporting resource stewardship programs, and working across division lines to ensure that the park's resource stewardship mission is achieved.

Specifically, Bruce and his maintenance team designed, constructed, and installed 60 floating dock units to replace dilapidated docks on Yellowstone and Lewis lakes. The new docks were designed to be built cheaply by local maintenance staff, withstand high water and severe winter conditions, and, most importantly, prevent pollution of Yellowstone Lake by replacing Styrofoam block flotation with non-friable flotation. For five years, members of the Lake maintenance staff, led by Sefton, spent virtually every spare moment working on the new dock units. The new docks replaced the deteriorating and increasingly unsafe docks that were installed in the 1960s. The encapsulated Styrofoam flotation material, which had exceeded its life expectancy of five to seven years five or six times over, broke down constantly, creating millions of minute waste particles that were deposited in a bathtub-ring fashion around the lakeshore. Repeated efforts to remove this litter, using teams of volunteers, were very labor intensive and frustrating because a clean stretch of beach could be subsequently polluted with Styrofoam after the next storm.

NPS PHOTOS

Mike Soukup, NPS Associate Director for Natural Resources Stewardship and Science, presents Bruce Sefton with his award.

Unable to find a dock that suited the park's needs at a price the NPS could afford, Bruce designed a dock that could be built by local craftsman and transported across the lake in sections. His design replaced the Styrofoam flotation with a polyurethane-encapsulated foam chamber, eliminating the source of pollution. By investing the sweat equity of his staff, Bruce was able to save $3,000 per dock unit compared to commercially-available units, realizing a total savings to the park



This new fisheries dock at Bridge Bay was designed by Bruce Sefton to replace deteriorating docks installed in the 1960s.

of more than $180,000. This non-polluting, inexpensive dock design could be incorporated in other NPS units with similar issues.

In addition, Bruce has been the champion of Yellowstone's greening initiative in the Lake area, converting to environmentally-preferred cleaning products, enacting a recycling and composting program to reduce solid waste, and converting the NPS fleet of unleaded vehicles to cleaner ethanol fuels. Yellowstone is the first park in the country to totally replace existing cleaning and janitorial products used by park and concessioner personnel with environmentally preferable cleaning products.

Since 60–75% of Yellowstone's waste stream is compostable, and solid waste has to be trucked up to 200 miles away, Bruce recognized composting as a potential cost savings and environmentally friendly practice. In 2002, we began trucking compostable waste to the West Yellowstone composting facility instead of to landfills. This composting effort aligns with the park's commitment to environmental conservation, community involvement, and illustrates the importance of partnerships. In 2003, the Lake District added recycling options for visitors to the existing recycling program for employees. This past year, the park's recycling quantities have increased 28% over last year. Bruce Sefton has led implementation of the recycling and composting programs in the Lake District, devoting staff time and energy to replacing long-standing maintenance practices with new, more sustainable practices.

Perhaps most importantly, he and his staff have ensured that the fisheries and aquatic resources biologists, wildland fire staff, and partner researchers based out of the Lake District have been provided with the housing, facilities, and logistical support they need to accomplish the park's resource stewardship objectives. Bruce has shifted housing priorities to accommodate the fisheries and research staff, including dedicating one 18-bed dorm to housing researchers, and one 10-room dorm to housing fisheries staff.

Bruce has also dedicated trailer spaces for research housing and has set up special hookups for researchers to bring in trailers to serve as labs and offices. Bruce and his staff open the fisheries offices and labs in the spring and winterize them in the fall; they have remodeled the fisheries office and lab space to make it more efficient; maintain five fisheries boats, including installing additional docks to moor fisheries boats at the Bridge Bay Marina; and shifted priorities to provide working space for repairing nets for the lake trout control program. Bruce and his staff also set up an entire wildland fire camp infrastructure during the busy 2001, 2002, and 2003 fire seasons, hooking up power, setting up and servicing dumpsters, providing water and outhouses, and installing signing to the camp. Throughout the four to six weeks that the camp was in place each summer, Bruce and his staff continued to support the infrastructure needs of the team, ensuring that the firefighters had a secure base from which to stage operations. This type of collaboration between the resources and maintenance staff is critical for carrying out research and monitoring of natural and cultural resources during the short summer season in Yellowstone. Bruce has been a leader in this interdivisional cooperation, at times sacrificing projects he was in charge of to support resource stewardship staff. Without this exemplary maintenance service, these programs and staff would be hard-pressed to meet stewardship goals.

Dr. David Mech wins research award

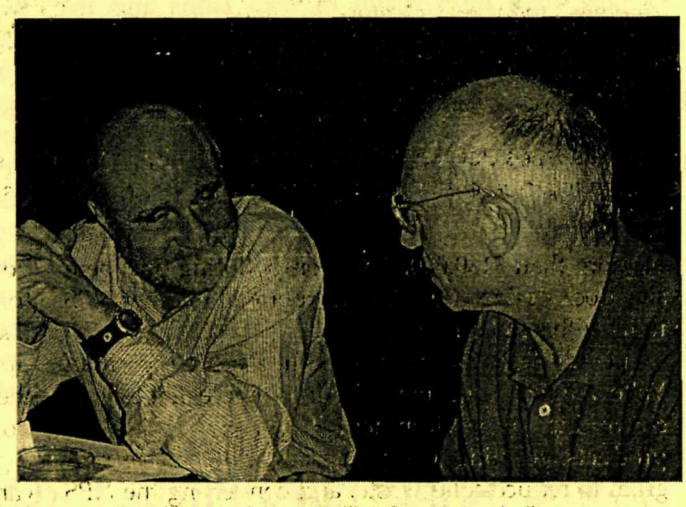
Dr. L. David Mech, Senior Scientist for the U.S. Geological Survey, was awarded the 2003 Director's Award for Natural Resource Research, after being nominated by YCR's Doug Smith and Tom Olliff. Dr. Mech, who is based out of the University of Minnesota, recently capped a 40-year career with the 2003 publication of the "new wolf bible," *Wolves: Behavior, Ecology, and Conservation.* He is the acknowledged leader

of the worldwide wolf scientific community, and almost single-handedly blazed the way for modern-day wolf research. Many of the contemporary ideas in the wolf scientific literature can be traced back to his thinking and concepts. Dr. Mech began his research in 1958, and many wildlife researchers view his work on wolves as the gold standard from which to judge their own work and professional progress. Scientifically rigorous yet eminently usable, his research and writings provide a basis of understanding for scientists and laypeople, and a worldwide framework for management of an entire species. The award also recognized Dr. Mech's long, distinguished career as a public servant, his longstanding partnerships with three national parks (Isle Royale, Denali, and Yellowstone), and his enthusiasm for wolves and wildlands.

Dr. Mech's longest-standing research project, ongoing since 1968, involves monitoring wolf–deer relations in the Superior National Forest, determining the degree and manner of influence of each population on the other, and exploring the role of other factors, especially snow conditions and canine parvovirus, that influence the system. In the 1990s, Dr. Mech's research—freely given to Yellowstone and central Idaho—formed much of the scientific underpinnings for wolf restoration in Yellowstone National Park and central Idaho. His current research in Yellowstone concentrates primarily on wolf interactions with prey. In 2003, in conjunction with Yellowstone ungulate biologist P.J. White, he launched a three-year study to assess the specific causes of elk calf mortality. From 1986–2003, he led studies documenting the interaction between wolves, caribou, moose, and Dall sheep in Alaska's Denali National Park and Preserve. Forty-five years ago, when Dave was a graduate student at Purdue University, he was beginning the study of the wolves of Isle Royale in Lake Superior with the renowned wildlife scientist Dr. Durward Allen, a study that launched modern-day wolf research. He spent hours aloft, observing and photographing wolves as they stalked, chased, and killed moose. Among his important findings: wolves, far more often than not, fail in their attacks on large prey. Much of this work formed the basis of the longest running study of wolf ecology in history, and continues today.

Dave Mech's 45 years of research have defined much of what we know about wolf ecology and wolf interaction with prey, wolf disease, and wolf management (human and wolf interactions). Every NPS unit that has wolves has benefited from his research. With wolf restoration in Yellowstone Park and central Idaho only 10 years old, and still on the front page of newspapers at least every week during the winter months, and with wolves being declared "biologically recovered" and wolf de-listing beginning to move to the forefront, Dave's research continues to provide valuable information that helps managers understand and explain this high-profile issue.

With a $10,000 personal contribution to the Yellowstone Park Foundation, Dr. Mech started the Durward Allen Fund to help jump-start an intensive wolf research program in Yellowstone. He has mentored four graduate students studying wolf–prey relationships in Yellowstone Park: (1) Dan MacNulty, studying the behavior of wolves hunting elk and bison, (2) Amy Jacobs, studying wolf pack leadership, (3) Shaney Evans, adult female elk survival and movements, and (4) Shannon Barber, specific causes of elk calf mortality. All these students interact and amiably collaborate as if they were Yellowstone staff, as does Dr. Mech on his frequent site visits. These studies have and will continue to result in a direct understanding of different aspects of wolf–prey behavior, specifically the effect of wolves on Yellowstone's northern elk herd.



David Mech and Mike Soukup at dinner.

Dave Mech also pioneered the use of wildlife telemetry—a technique that has benefited wildlife management in many park units. Besides various publications on development of new radio-tracking technology and techniques, including his 1983 *Handbook of Animal Radio-tracking*, Mech and graduate student Shannon Barber completed a report to the National Park Service, *A Critique of Wildlife Radio-Tracking and its use in National Parks*, in February 2002. The report was commissioned by the NPS Biological Resources Management Division because of management concerns

about the impact of radio-tracking wildlife. The report presents an overview of radio-tracking, its benefits, costs, availability, advantages and disadvantages; considers less-intrusive research techniques; and discusses possible future improvements that will reduce the impacts of radio-tracking. Wildlife biologists who have to provide information to managers, and must consider the impacts of gathering that information, have found this resource to be very valuable.

In addition to authoring over 200 scientific publications, Dr. Mech founded the International Wolf Center (IWC) in Ely, Minnesota. The IWC advances the survival of wolf populations by teaching about wolves, their relationship to wild lands and the human role in their future. The IWC is the national focal point for information and education related to wolves (find it at *www.wolf.org* on the internet). Dr. Mech has a special interest in communicating with the public and debunking some of the myths that surround wolves. The intense public interest in wolves led him to help develop an exhibit, "Wolves and Humans," sponsored by the Minnesota Science Museum and currently permanently housed at a 17,000-square-foot-facility at the IWC. This traveling exhibit, which had a Yellowstone venue hosting 750,000 visitors, was a phenomenal success, viewed by more than 2.5 million people around the country. The exhibit was recently voted by the American Association of Museums as one of the top 20 most influential exhibits of the twentieth century.

The Natural Resource Awards were presented at the annual meeting of the NPS's Natural Resource Advisory Group, which provides feedback on natural resource issues to Mike Soukup, Associate Director for Natural Resources Stewardship and Science. Both Bruce Sefton and David Mech won the IMR regional award prior to winning the national award. As a result, both were forwarded to the WASO level competition and won. Previous Director's Award winners from YNP include wildlife biologist **Doug Smith** (Natural Resource Management, 2002); YCR deputy director **Wayne Brewster** (Natural Resource Management, 2001, also nominated in 1995); and former superintendent **Mike Finley** (Superintendent of the Year Award for Natural Resource Stewardship, 2000, also nominated in 1996). Other YNP winners of the Director's Award for Natural Resource Research include **Don Despain**, 1991; and **Francis Singer**, 1990. Former maintenance chief **Tim Hudson** was nominated for the 1998 Stewardship through Maintenance award, and researcher **Wayne Hamilton** was nominated for the 1992 Natural Resource Research award.

GYA Fuels Mapping Project

by Jim Napoli

Fire specialists use fire behavior to predict where and how a fire is going to burn under different situations. One model, FARSITE, is becoming the standard for wildlife fire modeling across the country. FARSITE is a fire growth simulation model that uses spatial information on **topography** (slope, elevation, and aspect), **fuels** (kinds of vegetation, age of tree stands, understory, and overstory composition), and **weather** information (precipitation, wind direction, and wind speed), to create an animated map showing predicted fire growth over time. The program uses existing fire behavior models for surface and crown fires, post-frontal combustion, and fuel moisture, and is deterministic, meaning that simulation results are directly related to inputs. FARSITE can also simulate air and ground suppression actions, and be used for asking multiple "what-if" questions. In action, the simulation shows a fire's predicted behavior through a series of concentric rings that grow in accordance with estimated time intervals; an example is available at *www.farsite.org/nav.mas?pages=farsite&mode=9*.

FARSITE is widely used by the National Park Service, U.S. Forest Service, and other federal and state land management agencies to simulate the spread of wildfires and fire use for resource benefit across the landscape. Unfortunately, it has seen only limited use in the Greater Yellowstone Area (GYA), due to a dual lack of consistent fuels data and employee training. Because this makes it difficult to model fires across administrative boundaries, the Greater Yellowstone Coordinating Committee recently funded the Spatial Analysis Center to develop GIS data layers to support FARSITE modeling across boundaries throughout the GYA.

To accomplish this, we contacted each U.S. Forest Service and NPS unit in the GYA to find out what fuels data was already available. If no fuels data existed, we asked for best vegetation data. The "best" available data varies widely, and includes a mix of classified satellite imagery, timber stand data, and mapping done by the Grizzly Bear Cumulative Effects Modeling Team (GBCEMT), an interagency group whose mis-

sion is to assess grizzly bear habitat conditions and the effects of human activities on grizzly bear habitat for the GYA recovery zone. Using the information gathered by the GBCEMT as the heart of our data, our task has been to piece together the spots around what they have found by comparing different data layers and conducting fieldwork. We sorted through all of it, selected the best information for each area, then "cross-walked" the vegetation data into a fuels model layer. We are still dealing with the edge-matching problems that happen when data that was originally collected for different reasons at different scales is joined. The final product will be a fuels map layer with one legend that is continuous across the entire GYA, making cross-boundary fire behavior predictions possible. To encourage people from the fire community throughout the GYA to use the data, we are planning a FARSITE workshop in May that will train staff from each national forest and national park unit in the GYA. Also, our finalized data will be available on CD. We hope the end result will be a community of savvy users that exchange information and work together to accurately model GYA wildfires in the future.

2004 Black Bear Capture Operations

by Virginia Warner

In cooperation with the Interagency Grizzly Bear Study Team, Yellowstone's bear management staff are conducting a study that looks at niche separation and differences in habitat between black and grizzly bears. In addition, collaring black bears in the northern range allows biologists to gather information about wolf–bear interactions.

On March 24, staff fitted a black bear sow with a GPS collar, and weighed her two cubs, born in late January or early February.

The study is in its third year. Stay tuned for more on this research in an upcoming *Buffalo Chip*.

NPS PHOTOS

Above, a bear meanagement staff member prepares a GPS collar for the adult black bear. Below, at approx. 6–8 weeks old, a black bear cub's paw fits in the palm of a human hand.

A 5–6 lb. black bear cub getting weighed with a fish scale.

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SPRING BEAR EMERGENCE REMINDER

As of March 15, 2004, the Bear Management Office has started receiving reports of bear activity within Yellowstone, indicating that bears are beginning to emerge from their winter dens to search for winter-killed wildlife and winter-weakened elk and bison, the primary sources of much needed food during spring. Visitors are asked to be especially cautious of wildlife carcasses that may attract bears, and to take the necessary precautions to avoid an encounter. Bears will aggressively defend a food source, especially when surprised.

The NPS is continuing the seasonal "Bear Management Area" closures in Yellowstone's backcountry. The program regulates human entry in specific areas to prevent human–bear conflicts and to provide areas where bears can range free from human disturbances.

Information on hiking in bear country is available at visitor centers and ranger stations.

OLD FAITHFUL INN CENTENNIAL CELEBRATION

In June 1904, the Old Faithful Inn first opened its doors to the public. In the ensuing 100 years, this National Historic Landmark has played host to millions of visitors. The National Park Service and Xanterra Parks & Resorts will host a celebration on Friday, May 7, 2004, to commemorate the 100th anniversary of the Old Faithful Inn.

Activities will begin around 10:30 AM when an entourage of mounted park rangers and historic vehicles (buses and a stagecoach) will process up the front road to the inn's porte cochere. The opening day ceremony will begin when the doors to the inn open to the public at 11:00 AM. Special exhibits, programs, and activities will be held following Friday's opening day celebration and will continue throughout the weekend as part of Xanterra Parks & Resorts' Heritage Days.

WEST ENTRANCE PROJECT ENVIRONMENTAL ASSESSMENT FONSI SIGNED

On March 19, 2004, Intermountain Regional Director Steve Martin signed and approved the Finding of No Significant Impact (FONSI)/Decision Notice for the *West Entrance Project Environmental Assessment* (EA).

The NPS plans to reconstruct the West Entrance station as outlined in the EA's preferred alternative. The new entrance will be located 800 feet further inside the park will feature an additional traffic lane (which will also be an express/employee lane), four new kiosks, a new administrative building for entrance station staff, and improved ventilation systems for all buildings. The existing canopy will be moved, reassembled, and remodeled on the new site. The visitor contact portion of the Chamber of Commerce will also be expanded. All new structures will be designed to be as environmentally sustainable and energy efficient as possible, in partnership with the U.S. Green Building Council.

Construction may begin as early as late 2004.

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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:

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