

Yellowstone Science

A quarterly publication devoted to the natural and cultural sciences



Wolves for Yellowstone
A Barbie Retrospective
Making Bears Behave
GYE Brucellosis

Volume 3

Number 1



Predators

The arrival of the first wolves in Yellowstone adds another element of interest and complexity to our upcoming Third Biennial Scientific Conference on the Greater Yellowstone Ecosystem, to be held September 24-27 here at Mammoth Hot Springs. This conference, entitled "Greater Yellowstone Predators: Ecology and Conservation in a Changing Landscape," has ambitions beyond the well-known large carnivores that get most of the headlines.

Invitation to submit an abstract (see page 21 for details) is extended to anyone studying any animal that eats any other animal. Too often, at least in most popular portrayals of wild settings, the only

consumers the public hears about are the large ones, the ones that look best on color posters and T-shirts, or the ones whose management is the most controversial. And, though the arrival of the wolves reminds us of just how significant (ecologically and socially) those big animals can be, Yellowstone provides us with countless other examples of predatory appetites that are important to this ecosystem. Fish, birds, reptiles, and amphibians all prey on a variety of smaller animals, and all of us, whatever species, seem to have at least a few insects after us.

Recent research has also revealed a nearly incredible complexity among Yel-

lowstone scavengers, too. Dozens of species of animals, ranging from the largest grizzly bears to tiny beetles, take their share of each elk carcass. Our goal for this conference is to have as much of that spectrum of appetites represented as the available information permits.

There is more to this than the ecological setting, though. The social sciences, from archeology to environmental history to wildlife economics, have important contributions to make to our understanding of predators and how they fit in a rapidly changing modern world. We hope to hear from many of these disciplines in September.

PS

Yellowstone Science

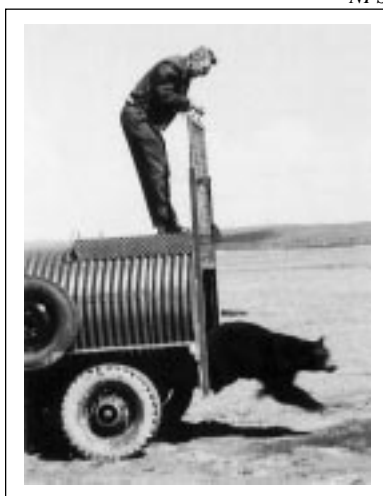
A quarterly publication devoted to the natural and cultural sciences

Volume 3

Number 1

Winter 1995

Table of Contents



NPS

See page 2

Editor

Paul Schullery

Art Director

Renée Evanoff

Associate Editor

Sarah Broadbent

Editorial Assistant

Ursula Weltman

Research

Mark Johnson

Printing

Artcraft Inc.

Bozeman, Montana

On the cover: Wolf #7, a 77-pound puppy, in her shipping container the day she arrived in Yellowstone. See the story on page 17.

Opposite: The Crystal Bench Pack on January 13, the day after their release into the pen. Both photos by Jim Peaco/NPS.

Aversive Conditioning of Grizzly Bears

2

Greater Yellowstone grizzly bears continue to challenge managers' skill and ingenuity in the endless quest to keep bears and people at a respectful distance.

by Colin M. Gillin, Forrest M. Hammond, and Craig M. Peterson

A Bee in Every Bouquet

8

In September of 1994, Robert D. Barbee completed an 11-year stint as superintendent of Yellowstone. A veteran of Yellowstone's most turbulent years, Bob looks back on what it all means and ponders where it's all headed.

interview with Robert Barbee

Brucellosis and the Future of Greater Yellowstone

15

Last September, managers, scientists, and interest groups gathered for the first regional brucellosis symposium. The full spectrum of opinions and positions was represented, and perhaps some progress was made in coming to terms with this complex and controversial disease.

by Mark S. Boyce

News and Notes

17

Wolves return • Eagle and osprey doing well • New chiefs for Yellowstone's U.S. Fish and Wildlife Service project, Cultural Resources, and Wolf Project • Wild Trout V

Yellowstone Science is published quarterly, and submissions are welcome from all investigators conducting formal research in the Yellowstone area. Editorial correspondence should be sent to the Editor, *Yellowstone Science*, Yellowstone Center for Resources, P.O. Box 168, Yellowstone National Park, WY 82190.

The opinions expressed in *Yellowstone Science* are the authors' and may not reflect either National Park Service policy or the views of the Yellowstone Center for Resources. Copyright © 1995, the Yellowstone Association for Natural Science, History & Education.

Support for *Yellowstone Science* is provided by the Yellowstone Association for Natural Science, History & Education, a nonprofit educational organization dedicated to serving the park and its visitors. For more information about the Yellowstone Association, including membership, write to P.O. Box 117, Yellowstone National Park, WY 82190.

Aversive Conditioning of Grizzly Bears

Can bears be taught to stay out of trouble?



by Colin M. Gillin, Forrest M. Hammond, and Craig M. Peterson

Humans have probably encountered bears in the Greater Yellowstone Area for thousands of years, but increasing human activity in bear habitat and a re-

covering grizzly bear population are two factors responsible for an apparent increase in human-bear conflicts in recent years. To reduce these conflicts, man-

agement agencies have implemented aggressive public programs involving law enforcement, education, and sanitation policies.



Bears that receive an easy human food reward or become habituated to the presence of people may learn habits that are difficult to break. Generally, managers use three approaches to resolve conflicts between people and bears. The first approach is to remove the attractant, a strategy that often works. The second approach is to relocate the nuisance bear to another part of the ecosystem. Finally, as a last resort, the bear may be destroyed.

Often, relocation of a bear does not prevent the problem from recurring, either because the bear returns or a new bear discovers the attractant. Some bears become repeat offenders because of continued availability of unnatural food or other attractants, and often these bears are removed or destroyed.

Public disapproval of the destruction of bears has compelled state and federal agencies to explore alternatives. One method proposed involved the modification of bear behavior by conditioning bears to avoid humans. This technique, called aversive conditioning, involves conditioning a bear to avoid people and the attractants associated with people.

Aversive Conditioning in Practice

During aversive conditioning, a negative reinforcer (for example, the painful stimulus of being hit with a rubber baton)

Historically, Yellowstone's black bears (above) and grizzly bears (opposite) have paid a heavy price for their indulgence in human foods. NPS photos.

is used while the bear is engaged in undesirable behavior, such as approaching a campground to acquire food. Nonlethal projectiles fired from a gun have been used with some success to modify undesirable behavior of polar, grizzly, and black bears in other parts of North America. In these other places, bears tended to avoid specific sites (backpack camps, trailer or truck camps, etc.) following aversive conditioning.

During a 4-year study, researchers from the Wyoming Game and Fish Department, working with Yellowstone National Park personnel, evaluated aversive conditioning methods for discouraging grizzly bears that frequent developments or campsites. The effectiveness of different aversive conditioning techniques, including the use of sound, were evaluated.

Nuisance grizzly bears were captured, radiocollared, and released on site. Bears

engaged in nuisance behavior were those attempting to acquire nonbear foods in developed areas, or "habituated" bears that used areas near people and showed no fear of them. Bears that were known to cause excessive damage or act aggressively were not used in these trials, nor were small cubs.

During actual aversive conditioning trials, when a nuisance bear approached an attractant site, an unfamiliar bird call was played over a loud speaker. Several seconds later, the bear was struck with the rubber bullet. Following several trials, bears were expected to respond to the specific bird call alone, fleeing without the rubber bullet even being fired. Taped bird calls were of species that do not occur in the Yellowstone ecosystem.

A different bird call was used as a control test, to determine if the bear distinguished between calls. This different bird call was played at a later time, also without hitting the bear with the rubber bullet. Researchers presumed that the bear would ignore this unfamiliar sound.

The same individual bear was tested throughout an evaluation period to determine if the bear learned from the experience. Researchers fired at bears from the safety of tree stands, truck cabs, or buildings. Activities and behavior of the bear were recorded throughout the trials.

We used two gun systems during test-



Wyoming Game & Fish

Among the methods used to move bears from an area is firing "cracker shells," which explode like a firecracker near the bear, as shown above. These were not tested in the study described here. The authors experimented with a combination of rubber bullets (right), water-filled cartridges, and recorded bird calls that were intended to condition the bear to flee at the sound of the call without being shot at again.



ing, in order to compare differences and provide an alternative firing system if one proved inadequate. One gun system employed the Thumper gun, a Model 267 Smith and Wesson gas and flare gun that fires plastic bottles filled with water. The projectile was powered with black powder.

We also used factory made plastic "Bear Deterrent Cartridge" projectiles (AAI Corporation, Hunt Valley, MD 21030). The Bear Deterrent Cartridge rubber bullet was fired from a 12-gauge shotgun.

Tests Using Rubber Bullets

Five female grizzly bears, including two accompanied by their cubs, were used in aversive conditioning tests from 1986 to 1989. A total of 41 shots were fired and bears were hit 27 times.

During 1986, bears at 8 trial sites were shot at 11 times and hit 6 times. All bears ran from the trial site when fired upon. Generally, bears would not reenter the site while the researchers were present, and often would not return to the site for 2 to 4 weeks.

In 1987, natural foods were plentiful and human-bear conflicts were uncommon. The only aversive conditioning used involved two habituated female bears that fed near well-traveled tourist routes.

Both bears fled from their immediate trial sites when fired upon, but continued to forage near the road soon after the experiment. Due to concerns for tourist safety, both bears were captured and relocated to remote backcountry areas.

Drought and extreme fire conditions made 1988 a poor food year for grizzly bears. During 1988, one subadult female and three adult female grizzly bears were subjected to aversive conditioning trials. Bears were fired upon with Thumper bullets and Bear Deterrent rounds on 27 occasions and hit 19 times. Two adult female grizzly bears responded favorably to the tests by moving immediately from the test site.

A third adult female did not respond favorably during trials conducted on her and her two cubs-of-the-year. They began frequenting lodges and campgrounds near the East Entrance of Yellowstone National Park, and obtained unnatural foods from a major trail head, horse corals, campgrounds, and an open sewage lagoon. The adult was hit twice with Thumper bullets and three times with Bear Deterrent bullets during six different episodes without permanently deterring her from test sites. One problem during tests was human foods and sewage were available to the bear throughout aversive conditioning trials.

Another unsuccessful episode occurred with an underweight subadult female, lacking upper incisors from a birth defect. This bear showed chronic habituation to people and was conditioned to human foods. The combination of drought conditions, overall natural food shortage, and displacement by nearby forest fires likely contributed to the bear's dependence on human foods. This bear was struck with Thumper or Bear Deterrent bullets on multiple occasions and responded each time by leaving the test area but returning later. Application of the aversive agent was determined to be ineffective and she was relocated to a remote area.

An exceptional food year for bears was recorded in 1989. This was partially due to a high yield of whitebark pine nuts (a preferred food item) observed throughout the ecosystem. In 1989, no bears were conditioned due to the lack of human-bear conflicts.

Throughout testing, candidate bears displayed no aggression toward researchers. In every case, bears fled the general vicinity of the test site when fired upon, regardless of whether they were struck with the rubber bullet.

Also, five adult male grizzly bears were captured for nuisance behavior during the study. Four of the captured males



Special Project Biologists Carrie Hunt and Kirk Inberg of Wyoming Game and Fish waiting atop a campground restroom for a problem bear to arrive at a campground where it will be shot with a water bottle launched from an improved Smith & Wesson gas and flare gun.

avoided humans and unnatural food sources following their release. The fifth adult male was a 5-year-old that appeared to be in poor body condition when captured. This bear caused extensive property damage and was removed from the population before aversive conditioning was initiated.

Behavior Responses of Bears to Rubber Bullets and Bird Calls

Prior to aversive conditioning trials, bears were involved in a variety of activities including walking through camps, foraging along roads, or running to an attractant. When rubber bullets were fired, all bears ran from the test site. During 10 of 42 trials, bears showed some hesitation before leaving the trial site.

When the training bird call (or bird call associated with the rubber bullet) was played to the bear without firing the rubber bullet, the responses were mixed. During three of the trials the bears continued their activities (walking, foraging, or nursing young). When the control bird call (or unfamiliar call not associated with the rubber bullet) was played, bears did not react to the unfamiliar sound and none fled the trial site.

The rate of response to the rubber bul-

let was usually immediate (41 of 42 trials). Training bird call responses were not as conclusive, as bears either delayed before leaving (4 of 8 trials), showed no response (3 of 8 trials), or reacted immediately (1 trial). There were no differentiating responses by the bears during all control bird call trials.

Conclusions

Our results indicate that under some conditions, free-ranging grizzly bears may be conditioned to avoid specific sites within their home ranges. It appears that each individual bear's response to aversive conditioning may depend on a variety of factors including the level of habituation to humans, level of food conditioning, sex and age of the bear, breeding status, physical condition, natural food availability, and "food-reward" during aversive conditioning.

We attempted to determine if bear behavior could be altered following a conflict with humans by using aversive conditioning. We found that providing an unpleasant experience to grizzly bears only altered their nuisance behavior temporarily. This technique did not appear to be a long-term solution with the sex and age classes of bears we tested.

It appears that the difficulty in condi-



Unlike the days of open garbage pits, many of today's bear problems stem from bears eating natural foods, but doing so too close to developments.

tioning female bears may be related to their small and sometimes restricted home ranges. Female grizzlies selecting home ranges in close proximity to humans predictably have a greater chance of encountering humans. These female bears may not be able to avoid people, and may not have the option of altering the size or shape of their home ranges if adjacent areas are fully occupied by other grizzly bears. Because female subadults often select home ranges adjacent to or overlapping their mother's, their ability to move to areas where they might avoid humans is also limited.

Subadult males were not involved in nuisance behavior during the study, though this age class has been involved in such behavior at other times. Young bears would likely learn nuisance behavior from their mothers and one would expect them to be involved in similar taught behaviors. Generally, subadult males disperse great distances in search of home ranges that are unoccupied by other bears. By moving to unoccupied habitat, the probability of encountering humans may be less than that experienced in their mother's home range by chance or they may select poor habitat in proximity to humans because it is the only habitat available and not occupied by other bears. If these young bears become involved in nuisance behavior, aversive conditioning may be an effective tool if it is applied during the bear's initial encounter with humans and in the



The circa-1930 rangers (above left) probably would have appreciated the greater ease of operating and moving the modern trap (above right and following page), but they got the job done despite their primitive equipment.

unfamiliar surroundings of their new home range.

In 1988, all individual bears required more than a single treatment, particularly at different conflict sites. This suggests that initially, bears had to be hit at each site because they failed to associate the negative experience from the first site with the next site. Following several hits, bears appeared to recognize specific stimuli related to the unpleasant experience at a trial site (truck, tent, or odor) and avoided them at other sites.

One factor affecting success of conditioning experiments during 1988 was the severe shortage of natural foods caused by drought conditions. When natural foods are less available, problem bears are often more persistent and determined about acquiring unnatural foods. During normal to good food-availability years, problem bear situations will be limited, provided unnatural food sources are made unavailable and important bear habitat components are maintained.

Instilling a fear of humans in habituated bears that might otherwise become dangerous was also evaluated. Bears involved in aversive conditioning displayed no aggression toward researchers

or the public. In fact, they ran from the trial site when fired upon with the rubber bullet on every occasion, regardless of whether they were stuck with the projectile. Even during trials using just the training bird call, bears generally responded by leaving the area. Although we were not able to demonstrate a correlation between the bears' behavior and a fear of humans, the general avoidance response exhibited by bears to being hit with a rubber bullet (and possibly relating the experience to a unique sound) suggests that if aversive conditioning is applied often enough and under ideal circumstances, fear could be established in habituated bears.

Management Use of Aversive Conditioning in Yellowstone National Park

In some circumstances, aversive conditioning may be used as a management option to allow bears to exist in areas they are normally not tolerated. Aversive conditioning may well produce "sneaky" bears or bears that attempt to return to a site when people are not present. Such a behavior change may

help resolve a particular conflict and avoid the need for further management actions. Examples include changing the activity patterns of a bear feeding on a roadside during the day to nocturnal feeding habits or conditioning a bear to use areas near campgrounds and trail heads when people are absent.

We were unable to document when or how long bears in our study had been habituated to humans or how often they were food-rewarded prior to aversive conditioning. If a bear returns to an incident site following its first encounter with humans and is not food-rewarded but is aversively conditioned, successful conditioning should be more likely.

Certain situations will generally be considered unacceptable for using aversive-conditioning techniques due to uncontrollable external factors. For example, aversive-conditioning techniques should not be used when human food attractants can not be removed or made unavailable, such as sewage lagoons or dumping sites. Therefore, the logical first management response when handling nuisance bear problems is to rectify the cause of the problem, realizing that nuisance bears are only a symptom. Fur-



thermore, if unnatural food sources cannot be eliminated, it is unlikely that successful conditioning of problem bears can be achieved.

Aversive-conditioning techniques will probably be used most often during poor food years when nuisance behavior increases. However, these techniques are potentially less effective on bears in poor condition, which they are more likely to be in years when natural foods are limited. In such years, areas where bears concentrate to feed on natural foods (such as trout spawning streams and army cutworm moth sites), should be managed to keep human activity from displacing bears to other areas where chances for human-bear conflicts may be greater.

Several adult male grizzlies that were not habituated to humans and were food rewarded on only one or two occasions may have been conditioned to avoid human attractants. By removing the attractant in association with the trauma of being captured and released on-site, these bears ceased their nuisance behavior.

From our experience with one small female grizzly, sick or injured bears do not make good candidates for aversive conditioning. Other noncandidate bears will usually include adult age-class bears that have been repeatedly food rewarded and cubs-of-the-year. Cubs are too small

to safely use these techniques on without risk of physical injury. From a human safety standpoint, relocation or removal of bears exhibiting aggressive behavior are generally the most appropriate management actions.

Based on this study, we felt aversive conditioning should be considered prior to relocating or destroying nonaggressive bears. When nuisance bears are removed from areas near human developments, the opportunity exists for reoccupation of these habitats and home ranges by other bears that may be involved in similar or more serious conflicts. By training a bear to avoid humans at an early period in the bear's life, coexistence may be attainable even where human developments have encroached on bear habitat.

Yearling through subadult age-class bears that are conditioned during their initial exposure to humans and human food sources are likely the best candidates for successful aversive conditioning. Bears that have never been food conditioned are also potential candidates. This situation will usually occur in national parks where tourist safety is of high concern. Bears feeding on natural vegetation along heavily trafficked roadways would be likely candidates.

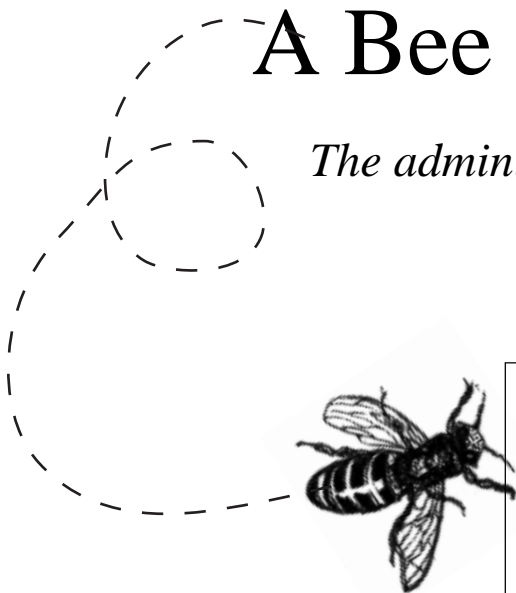
The concept of aversive conditioning free-ranging wildlife is relatively new,

with great opportunity for improvements in methodology and equipment technology. However, the underlying reason for needing reaction-oriented management practices, such as aversive conditioning, is that humans have encroached on and altered bear habitat. Therefore, we must take responsibility for creating situations that lead bears into nuisance behavior. Bear management should be primarily people management. In areas of predicted conflict between humans and bears, resource management and planning should include actions to reduce or eliminate attractants of bears and limit human contact with bears in areas determined to be critical habitat.

Colin Gillin and Forrest Hammond were employed as grizzly bear biologists for the Wyoming Game and Fish Department during this research project. Gillin is currently at Tufts University School of Veterinary Medicine, Massachusetts. Hammond is finishing a black bear study in southern Vermont for the Vermont Fish and Wildlife Department. Craig Peterson is a psychologist with the Vancouver School District, Washington. This article is an abridged version of a paper appearing in Proceedings of the Ninth International Conference on Bear Research and Management.

A Bee in Every Bouquet

The administration of science in Yellowstone



NPS Photos



This interview is something of a departure for Yellowstone Science. We originally adopted an informal rule that we would interview only researchers in this series, rather than managers. But Robert D. Barbee, who served as superintendent of Yellowstone National Park from 1983 until his departure in early September 1994, has been central in too many scientific and resource-management issues here for us to pass up the chance to interview him, which we did in late August. Ed.

BB: Ask me a penetrating question. You know, like the journalists who start with something like, "Give us an anecdote about the West."

YS: Well, Bob, here in Yellowstone, you've presided over the largest and most

complex science program in the National Park Service. How do you feel about that?

BB: It's neat.

YS: This is going well. Let's try a more specific approach. In Yellowstone's unique blend of politics and emotion, with so much at stake and so many controversies simmering along, how do you go about administering a science program so that it amounts to something?

BB: You surround yourself with a bunch of smart people, smarter than you are if you're lucky, and support them, and then you hope that they don't lead you off onto a rabbit trail.

YS: So where's the payoff? Science is notoriously expensive, inefficient, and inconclusive. Where's the payoff for a manager?

BB: That's a good question. That's where things become vague, because at any given time, you've got a lot of questions that aren't answered, and decisions still have to be made. Managers like answers, and science doesn't always give answers, especially right away.

But look at all the issues we've dealt with in Yellowstone where science is involved. Whether it's geothermal resource development near the park boundary, or northern range issues, or grizzly bears, or fire management, or any of the others, you have no choice but to get help from science. Look at the gutpile we've gotten into over brucellosis; science is going to be essential in sorting that out.

It might be that the real question is, what's the alternative? There was a time when land managers could make seat-of-

the-pants decisions, but that's not regarded as a good idea by most professionals any more. Science isn't perfect, but it's sure to give the best information at the moment, and that's what you must have to make decisions, or at least influence decisions. Without it, you're falling back on lesser resources, what we hear called barroom biology, or even conventional wisdom, which is often not very wise.

YS: So the payoff is that you get something beyond barroom biology and conventional wisdom?

BB: That's the payoff, but the payoff is elusive, far more so than most casual observers might think. Science doesn't give you answers, it gives you information. Scientists don't give you answers, they give you interpretations of data.

We must have good science. That said, I can't overemphasize the complications of dealing with the scientific community. First, on an issue of any substance at all, the scientists will almost certainly disagree. Sometimes they will gather conflicting data, sometimes they'll just disagree over what the data means, but as an issue matures, you can be sure that they will agree less and less. The more complex the subject, the less agreement you get.

On the one hand, it's a comfort to know that stuff like that is going on—that scientific dialogue is sorting out a complex question. But on the other hand, it's kind of a dilemma, because the level of sophistication of scientific inquiry is greater and greater all the time. Over here you have scientists producing the kinds of quantification that goes into making sure it's valid science, and over there you have the managers, with little patience or understanding about what goes into it.

YS: Hasn't that changed? Among all the people who would be called managers in the National Park Service, have you seen a change, say in the past ten years, in their level of responsiveness to science?

BB: Servicewide there is a greater empathy and understanding for scientific inquiry. I have some doubts about how a lot of managers view it, but there has been a lot of progress.

YS: Now, the cynical manager...

BB: Which of course I'm not.

YS: Right. But the cynical manager—

and by the way, we don't know how you avoid cynicism—could point out that every time there's an issue, the advocates on both sides can trot out their own scientists to make equally plausible arguments. That kind of stalemate happens with park issues all the time and all the manager is left with is some kind of Captain Kirk alternative: to try to intuit himself or herself through the mess by appealing to some inner wisdom or savvy. How should managers strike a better balance between the clamor of the scientists and their own so-called better judgment?

BB: They start by keeping in mind that most scientists are advocates. Many don't like to admit it, but it's true, and actually it's an admirable trait in them. They put years of their life into studying some resource, and they care deeply about it. After all that work and time, it just isn't human nature to be able to say, "Well here's the science, I'm done, and it's up to the managers to decide what to do." I've seen very little of that kind of emotional remoteness in scientists.

A classic example of that was the situation that developed here in the late 1960s surrounding the pioneering grizzly bear research of the Craigheads. Look what that did here. The scientists produced their work, the managers didn't agree with it, and so we had a 15-year war over grizzly bears.

Or look at the issue of the cross-boundary geothermal connections down here at Corwin Springs [*a private landowner drilled a well into a hot-water aquifer a few miles north of the park*. Ed.]. We asked the scientists to tell us if drilling just north of the park would affect park geothermal features. What we got was a fine big report from the U.S. Geological Survey (USGS) that even their scientists didn't agree on, and a sort of alternative report from our own agency. The USGS report said limited withdrawal of hot water was okay, and our report said that no risk at all should be taken. Where did that leave us? Well, it left us realizing that sometimes scientists just can't answer our questions absolutely.

And here's another important question: where did that leave the public image of science? How many people read all this in the news and wondered why we asked the scientists to help in the

first place? Most people have a pretty low tolerance for technical haggling.

But that's a dilemma that managers and the public are going to have to learn to live with. Maybe the real answer is that our expectations for science are too great. We tend to want quick, definitive answers to complex questions.

YS: So if you would write a manual for managers who find themselves in situations like that, what would you tell them to look for if they want to get the most out of the science they're spending so much money for?

BB: Look for someone you trust. You have to find someone you can put confidence in, because you know you're going to run into these technical quagmires, and you better have someone to translate what's going on and keep your decisions balanced.

I know that may sound like I'm saying that someone else is going to do your job for you, but how many managers have the background or the time to delve into the fine points of some of these highly technical controversies? Take brucellosis. There is an authentic quagmire of technical scientific debate. Some scientists, including our own, hold one set of very persuasive views, and some others, including those affiliated with the livestock industry, hold another. Where does that leave the manager? Well, maybe I as the manager in that case should just feel lucky that I seem to have some scientists on my side at all. That might be more comfort to me if it was even clear what my side was.

The point is, the manager has to be able to go to a professional intermediary for coaching and briefing on the fine points. That's why it's so important for managers to be dealing with someone they have a great deal of trust in, someone who speaks the language of science. That person can't be a technical expert in all areas—that's impossible—but they can translate some of this stuff for you. In my case, that's where John Varley [*Director, Yellowstone Center for Resources*] and others on the staff come into play.

We have the luxury here in Yellowstone of having had a full operating science division, with an administrator who, because of his strong background and experience as a scientist, has a clue about

what all these hundreds of scientists who do work here are up to. His role is to watch my decisions, and when he gets worried, to say to me, do you really want to do this? Do you realize the implications of this?

YS: You make the administration of science sound like a pretty complex job.

BB: I think that's true everywhere. I also think that sometimes the scientists make their own mess. They paint rocks pink or turn rivers weird colors or give us animals with radio collars and ear tags and missing teeth. In a lot of parks, there's sort of a backlash against intrusive science. Maybe that's because we've failed to explain the value of what is being learned. We don't put ear tags in animals just for the hell of it. We're gaining some information that we hope is pretty valuable.

YS: Elaborate on this idea that scientists sometimes make their own mess. What's another example of that?

BB: Well, take computer modeling. I think there's a bee in that bouquet. In principle it's a great thing, and we all look forward to the day when it can really settle an issue now and then, but that's not where it is today.

There's this whole notion of cumulative effects modeling in grizzly bear management, for example. Scientists tell us about the quantification of all the complex sets of variables out there, that leads to overlays in a formula that ultimately could be factored down to a certain kind of actionable result in the loss of one tenth of a bear or half a bear in the system over five years. I am highly skeptical of that, and I think most people of the management mentality are also. And yet I see us heading into it more and more, and I can assure you that science and management are on divergent paths here. There's great skepticism in offices like mine, and a great infatuation with the science of modelling among the scientific people.

YS: Are you proposing abandoning modeling? That sounds like a return to conventional wisdom.

BB: I didn't say it was a return to conventional wisdom. I said I'm skeptical about where it's taking us. It's a perpetual motion machine. It's a big money sump. I think it's gimmicky and it may deserve more respect, but I'm telling you that it

doesn't have that respect in the management community. A lot of managers might keep their mouths shut because they don't want to admit how absolutely ignorant they are about all of this new technology.

YS: But doesn't the science routinely outrun the management? Yellowstone has probably had about 2,000 research projects since you came here as Superintendent. It would appear to some that there is far more science being done than can properly be assimilated by managers.

BB: Probably true. If you were to ask me if I had even the vaguest knowledge of what half those projects were specifically, I'd say probably not. I have a general idea of where we are. That's why we have the John Varleys of the world. Even John Varley can't have his finger on the pulse of all these things, but it's generally a value on the plus column to know more and more about all the stories that this park has to tell. It goes into the gestalt, so to speak. It helps put it all together.

So you generally foster a climate that favors that instead of being hostile to it. You recall that one of the great criticisms of the National Park Service in 1983 was that we were insular in our research program—that we needed to open it up to the outside world more, make it more accessible to research, not just mission-oriented research that would serve some management need, but pure basic research. So we talked about that and basically opened the doors. That doesn't mean that anybody who comes along with any idea will automatically get approved for research here—we have to care for the resource too—but we tried to foster a climate that provided that opportunity.

One of the real purposes of the national parks is their value to science. There are lots of other values, but their value to science is clear and unmistakable and they ought to be fostering opportunities. **YS:** When you arrived in 1983 there were about 90 authorized research projects underway in Yellowstone. Now there are more than 300. Does that mean you achieved your goal of fostering opportunities?

BB: I suppose we did. I rarely hear the criticism that we are insular, or that we only allow researchers in here who we

have in our pocket or have absolute control over. All that sort of rhetoric, which I never really believed anyway, seems to be a lot less common.

But however many researchers are working in the park, we still hear lots of opinions about the scientific issues here. We don't always agree with them, but they keep us on our toes. Don't they?

YS: They seem to. During your tenure here you launched several other initiatives. The quarterly publication *Yellowstone Science* wouldn't have happened if you hadn't championed it with the Yellowstone Association. And we're now in the planning stages for the third biennial scientific conference on the Greater Yellowstone Ecosystem, which was your idea in the first place.

BB: Virtue is not its own reward. John D. Rockefeller's PR man said that. This whole idea of communication, of getting the word out on all this science, whether it applies to one of our hot issues or not, is very important. Think what an opportunity these conferences have given the scientific community to communicate with each other, and with the public. I've always been a big promoter of that. We did it when I was superintendent at Hawaii Volcanoes, and we were starting it when I left Redwoods National Park.

YS: You once got a lot of press for saying that you can't even move a picnic table in Yellowstone anymore without causing a controversy. That suggests a dramatic change in the way business is done in the national parks.

BB: The world anymore is largely governed by process. You don't just have a bunch of czars sitting around. Maybe we never did, but I suspect once we did to a greater extent here in Yellowstone. In 1954, 40 years ago, I suspect the superintendent could just say, "This is the way it shall be," and that was it.

YS: Even 20 years ago.

BB: Even 20 years ago. I'm not saying that the change is all bad, but with all the legislation and executive orders, and all the process that stems from them, and all the people that are perched out there ready to pounce on you if you do something they don't like, especially if they detect a vulnerability, science has moved into the forefront even more. That's because if we find ourselves involved in



Bob Barbee taking the media heat during the fires 1988 (left); and with Secretary of the Interior Donald Hodel, who visited twice during the 1988 fire season (right).

litigation, which we constantly are, we have to be able to say, look, we didn't just wing this, this wasn't just a dream we had one night and we got up in the morning and decided to do it this way. We tried to base this on the best information that we had, and that's within our discretionary authority to do. There it is—another vote for science.

YS: So given what you just said about process-oriented decision making, then having good science in any national park is almost a command performance.

BB: It's absolutely necessary. Sometimes I think we try to pin too much on it, maybe try to let it make our decisions for us. That's where we get into problems. It's too easy to lay too much responsibility on the information, and not enough on the manager. We can say, well, you know, scientists say such and such, and kind of sidestep the issue. But if we're responsible about it, and say that this is the best information we have on this subject, and it suggests that we ought to head in this direction with our management, and we are deciding to do just that, then science is a good tool.

YS: How did science help with the fires? At one point it apparently gave you a huge dilemma.

BB: Which was?

YS: Don't you remember your appeal to quit telling the happy-face story? There were your scientists and naturalists out there, talking to reporters and the public,

going on and on with great enthusiasm about how wonderful fire was, while the whole rest of the world seemed to see it all as some gigantic tragedy.

BB: That was a matter of poor timing. The scientists were right, and were proved right in the spring of 1989, but in the summer of 1988, people had other things on their minds. As we said at the time, we have 50 years to tell the happy-face story, but now we probably better talk about the brave firefighters. Let's do the brave firefighters story now and do the happy-face fire ecology story when all the little green plants are coming up.

And you know, that's another problem with how we explain Yellowstone to the world. We send out confusing signals. The fires are a good example of it. Fire is awful because it threatens all these buildings and people's livelihoods and so on, but at the same time, fire plays a role here, it's part of the system; it's as important as sunshine, rain, and frost and all the other things that drive this ecosystem.

That's where Bill Mott [*NPS Director in 1988*] got in trouble. He was trying on the one hand to recognize that we had to deal with this fire so it wouldn't burn up a lot of valuable structures. On the other hand, he pointed out that there's no ecological downside to this fire: it's part of the system, so don't really worry about it. That's a pretty confusing message to send to the public, especially when it has to travel through the simplification filters of

the media.

YS: Does this mean that the American public can't even understand a complex story?

BB: This may sound crass, but it depends upon how the message is packaged. If you could sit people down in this room and work through a dialogue about this whole thing for a couple hours, most intelligent people would probably walk out with an understanding of why fire matters so much. But you're dealing with 15-second sound bites by some reporter who's interested in divisiveness and high drama and hyperbole and everything else. I think the media can sway public opinion on these issues, but I also think that if you can get into a real dialogue with people, they will understand. They may not agree, but they will see that you're following some sort of professional standards, and they'll stop thinking that you're just nuts.

YS: But the surveys carried out after the fires suggested that the public wasn't entirely fooled—that they didn't just buy everything they heard on the news.

BB: That's good news, of course, because you're always concerned about the public, including our own internal public, by the way.

You'll recall that in June of 1989, when everything came up bright green and it was obvious that the fire ecologists knew what they were talking about when they told their happy-face story, we had Easter in Yellowstone—we had resurrection.



Presidential hopeful Michael Dukakis visited the park to view the fires in September of 1988.

First, in 1988, the media buried us, and announced that Yellowstone was destroyed. Then, in 1989, on their way home from the big Exxon oil spill, they stopped by Yellowstone for the rebirth story, to celebrate the phoenix rising from the ashes. They said the rumors of Yellowstone's death were greatly exaggerated, as if they hadn't been the very people to start those rumors the year before. I'm glad they finally got it right, but it was quite a show.

YS: What makes things like the fires so hard to explain?

BB: I think that people by and large have trouble with deep time, and with change. We don't recognize that the way we should; we could do a lot better job than we have been doing portraying that these are dynamic places where it's okay to see disruption, it's okay to see blackened forest, it's okay to see a mountainside that's been ravaged by an avalanche, because that's how the system works.

I often hear people who visited here long ago say that it's not like it used to be. I always say, well, it wasn't like it used to be when this conversation started, either, because it changes constantly. The fires just sort of put it on fast forward. Real fast forward. I'm still not confident there's a great deal of support out there for big-time ecological shifts.

YS: Another big thing that happened during your watch here was wolves, which went from a non-issue to almost happening before your departure.

BB: I feel good about that, but I'll feel better when the paws are on the ground. Remember that when I first came here, G. Ray Arnett [Assistant Secretary of the

Interior for Fish, Wildlife, and Parks] had just told me that the politics of wolves was not going to be in my realm, and if I got caught with even the suggestion of bringing wolves back here, I would be transferred to South Yemen or someplace like that. We've come a long way since then.

But you know who I give full credit for the wolf campaign? Bill Mott. He's the one who pushed that rock off the cliff. He didn't know where the rock was going to land, but he used the influence of his office at considerable personal peril to push that issue into the forefront, and I'm not sure any other person in our world had the power or identity to do that.

YS: Some people believe that the big reports to Congress, *Wolves for Yellowstone I-IV*, were the cause of his demise.

BB: I suppose you could argue that his support for wolves was not career-enhancing, but he told me that when you're 79 years old, you don't have to worry about being enhanced. He wasn't buck-

ing for a new job somewhere. He was wonderful. We were here to jump in with him and to take advantage of that circumstance.

There were a lot of other important players in this too. Lorraine Mintzmyer, with her wolf-education task force. Renee Askins. Defenders of Wildlife. It's a long list. None of these things happen by the force of only one personality.

YS: Let's try another very visible Yellowstone issue. There's more and more concern that the place is getting too full of people. Can science play a really significant role in this issue, the way it did with wolves, or is it too social and cultural an issue, so that its sense of direction is going to have to come from somewhere else?

BB: Well, scientists can certainly help us with what they're good at, and that's resource limitations and that sort of thing. There is a point at which campgrounds get too trampled, or trails get too beat up, or other resources get overused, and you can make some decisions based upon resource impact. It's quantifiable.

YS: But the challenge with carrying capacity has to do with more than direct resource impacts. It has to do with the quality of the human experience, and determining if that quality is being degraded by the huge numbers of people we all share that experience with now.

BB: Right, and that's almost a religious argument. What's my dogma may be your sacrilege. And yet, you know, we were implored by [legal scholar] Joseph Sax to come forward with the best definition we can of what that experience should be. We're the professionals, and based

President George Bush's June 1989 visit highlighted the "rebirth" news stories during the first spring after the fires.



on our legislative history and experience and even some sociology, this is what we believe. But we don't do that. We hedge and dodge around that.

This is an issue that makes nice grist for interpretive programs and so on, but when we're making management decisions we generally dodge it and say something indirect, like, well, our fuel capacity is stressed, and there's no more room at the garbage pit, and we can't process any more sewage, and we have a drinking water quality problem, and the road's too narrow, and we're having too many accidents. By hiding behind all those specific problems, we dodge the central question, which ultimately, when you get down to carrying capacity, is experiential.

Now John Varley thinks that the answer is to hire some sociologists to go out and talk to people and learn what they want and need. My opinion is, that's good and I think we ought to do that, but we pretty much know that public attitudes are going to range clear across the waterfront. Some people think the experience today is an abomination, and other people think it's wonderful. That being the case, how do we decide on the sociological trigger? How do we define the acceptable experience, so we know exactly when to close the gates? How do we quantify it so that we can announce one day that sorry, no more people today, because the experience will be trashed if we let ten more snowmobiles in, or X number of cars in?

YS: The problem is, the longer we wait, the worse the condition that becomes the status quo. When you start deliberating on a subject is when you tend to establish

Karen Armstrong, of Edmond, Oklahoma, and her daughter Michele, of Rock Springs, Texas, were honored as Yellowstone's 100 millionth visitors on June 22, 1993.



your baseline, but for all we know the real baseline should have been 1920.

BB: So what are we trying to achieve here with the Yellowstone experience? Some kind of contrast with everyday life? Rediscovery of elemental kinds of things? And why do people come to parks, other than to eat some really nice meals and get some really neat fudge?

Is it our job in the National Park Service to offer a great contrast to the rest of the world, and be exemplars of environmental quality? We think so, and we think that we as an agency should be able to say something about that with relative impunity. But we aren't. At least not yet, not in any precise way.

We know we're advocates and spokespeople for an extremely important good cause; national parks have a central role to play in the future of the global environmental movement. But this is a dangerous area because for all our knowledge and experience, we don't dare forget that we're public servants, not oracles.

If we try to tell the public what they should like, we're stretching any definition of our authority, and getting into the father-knows-best syndrome. We have to be really careful there.

The biggest resource issue in the next decade will be how to deal with the numbers of people. There are more every year. How long can this go on? It just can't. We decided to deal with it by starting with winter. We have the same problem in the winter time. That's a little smaller bite, more containable, more confinable; maybe we can take on that part and then, when we've sorted that out, we can work on summer. We're eating elephants in small bites.

YS: What do you see as the biggest issue facing us ecologically?

BB: I think the big ungulates. There is all kinds of heartburn and confusion over the northern range and its ungulates, and though elk have had center stage in that controversy for decades, the future may belong more to the bison.

It's an ecosystem problem. We have to recognize that we have a big and very complex problem out there, and that's what this EIS [Bison-management plan EIS, currently being written cooperatively by several state and federal agencies] is supposed to get at least a partial handle on. But somewhere along the line there're going to have to be fewer animals.

YS: One of the things that the public absolutely hates is when there's a winterkill. And yet it's one of the fundamental processes in wild country.

BB: As everyone says around here, death is a hard sell, and it probably always will



Norris District Naturalist Sandy Snell-Dobert, Bob Barbee, and Secretary of Interior Bruce Babbitt talking with a park visitor, May 1994.

be. It's another example of too much happening at once. The public generally can appreciate seeing a predator take a prey, and understands intellectually the interrelationship of predators and prey, and how they support each other. But when the system makes a major correction, like 900,000 acres of fire, or several thousand dead elk, that's too much at once.

When I first came here, I called Jack Anderson, the superintendent in the late 1960s and early 1970s, just to sort of say hello. Jack was retired by then, living in Oregon. I asked him if he had any advice. Jack said, "Oh, you know, I don't have much to offer to you except one thing. Sooner or later you're going to have a big winterkill up there. There's going to be dead elk all over the place, 5,000 of them between Mammoth and Cooke City, and all hell's going to break loose. My advice to you is just hunker down. Because you're going to catch it."

And that's what we did in 1989, and it's going to happen again and again, as long as we have the kind of large elk herds we have now, and that this place seems to be able to support. Maybe it will be next winter, or two or three or four winters, but there's going to be another big winter and all these cow elk, these bags of bones with no teeth that have managed to limp through winter after winter, are going to die. And it will not be a pretty sight. But that's the way it is because winter's the great predator. You know there's going to be a lot of happy grizzly bears in the spring. And magpies and ravens and coyotes. And wolves, I presume.

YS: If that's the dark side of the future, what's the bright side?

BB: The ecological health of Yellowstone is arguably better today than it has been any time in this century. We've cleaned up our act. We don't have garbage dumps, and we don't have bears with their rear ends sticking out of garbage cans. We don't have roads up Pelican Valley and down to Heart Lake and in a lot of other places that most people today don't even realize there used to be roads.

Our overnight capacity—what the concessioners used to call the pillow count—hasn't increased for more than 20 years, and I don't think it ever will



Bob and Carol Barbee

again. The people who do stay here overnight are more contained, and do less harm to the natural setting than a lot fewer people used to. As far as disturbing this landscape, we probably reached our peak some time in the 1940s or so.

It's hard for people today to believe what went on here in the past. I talked to someone the other day whose father used to work at the Indian Creek slaughterhouse. This park was covered with ugly little developments. There were dairy herds all over the place, and huge numbers of horses eating grass that the elk were supposed to get. There were dumps behind every tree, poor sewage disposal, all kinds of things that would never be tolerated today. The progress here has been enormous.

YS: Going to miss Yellowstone?

BB: Yes. Big time. In fact I'm struggling with that right now.

YS: What are you going to miss most?

BB: The people, the place. Mount Everts in the morning. Tim Hudson [*Chief of Maintenance*] coming in with his hat cocked telling me about the latest sewage spill or some other godawful situation. Varley, Schullery, you know, the works. Wolves.

Life is full of beginnings and transitions and endings. I do feel fairly good about Yellowstone and where it is and the people that have been working hard on all these issues. And sure, there's some unfinished business here. Nothing is ever finished here, it's one endless continuum.

YS: Is there a single thing or handful of things that you feel most pleased about?

BB: I hate questions like that.

YS: Would you answer it anyway?

BB: We removed almost all of a major park development, Fishing Bridge. It was a 5-year bloodbath in the political arena, but it may be the only time in the administration of the Endangered Species Act that something like that happened; not merely not building something new, but actually taking down something that existed.

We ought to feel pretty good about wolves, and that we're dealing with the bison issue. The interagency cooperation on bison and brucellosis is a remarkable step after so many years of little or no progress.

We've put tremendous effort into infrastructure issues here. That isn't a sexy science issue, but it's important. The facilities were absolutely coming down around our ears here, and through a tremendous effort with a great concessioner, and appropriations from Congress and so on, we really brought that whole thing around. We saved the Lake Hotel, which was virtually collapsing.

We've got the Yellowstone Center for Resources going, accenting resources, recognizing the importance of our natural and cultural resources organizationally.

Lots of other things. Outfitter policies that make sense. We've got a backcountry-management plan perched on the edge of happening. By most accounts we have reason to be cautiously optimistic about the grizzly bear and its survival. Lots of good stuff.

Brucellosis and the Future of Greater Yellowstone

*Summary of the National Brucellosis Symposium
September 27-28, Jackson, Wyoming
by Mark S. Boyce*



Brucellosis is a bacterial disease that infects a diversity of wild and domestic animals, and can cause serious, but easily treatable, disease in humans. In particular, *Brucella abortus* is a bacterium that infects cattle often resulting in abortion of calves. The disease is usually transmitted through ingestion of milk or placental fluids. Since the 1930s the U.S. Department of Agriculture (USDA) has supported an aggressive program to eradicate brucellosis from the United States; overall the program has been highly effective at virtually eliminating the threat of the disease in domestic livestock. As of 1994, only 200 livestock herds in the United States are known to harbor the disease. Protocol for eradication entails testing cattle herds in which the disease has been found, and slaughtering all that test seropositive for antibodies to the disease. If the disease persists, the entire herd of cattle must be slaughtered.

The bane of the brucellosis eradication program is, however, that bison and elk in the Greater Yellowstone Ecosystem (GYE) carry brucellosis and serve as a reservoir for the disease. Thus, it would appear virtually impossible to eradicate

the disease because existing technology does not provide a means by which brucellosis can be eliminated from free-ranging herds of bison and elk. The only alternative by which the USDA might possibly accomplish its eradication objective given existing technology is by depopulation of elk and bison from the GYE. Depopulation means slaughtering every elk and every bison over 18 million acres of the GYE—perhaps more than 100,000 elk and 4,000 bison! Given the learned migratory behavior of elk herds in the region, centuries would be required before the GYE would recover from such a drastic management scheme.

It is frightening to realize that there exists a precedent. During the 1920s, more than 22,000 deer were destroyed in the Stanislaus National Forest of California to control foot and mouth disease. Happily, according to Robert Keiter, professor of law at the University of Utah, the USDA's Animal and Plant Health Inspection Service (APHIS) does not appear to have jurisdiction over wildlife within Yellowstone National Park.

Dr. Paul Nicoletti (University of Florida) and I shared the responsibility of

summarizing the recent National Brucellosis Symposium that immediately preceded a meeting of the Greater Yellowstone Interagency Brucellosis Committee, September 28-29, 1994. The conference included 34 papers given during two days. There were presentations from politicians, ranchers, bureaucrats, epidemiologists, wildlife biologists, and veterinarians. The governors of Wyoming, Montana, and Idaho gave presentations, as did high-level representatives from the U.S. Departments of Agriculture and Interior.

Universal among the presentations by politicians and bureaucrats was a theme of how important it was for agencies and interest groups in the GYE to cooperate and compromise to resolve the brucellosis problem. Repeatedly, we were told how, given the apparent conflicting interests of the livestock industry and wildlife, it will be necessary for all parties to yield in some way in order to permit closure to the problem of brucellosis in the GYE.

Another theme emerging from the symposium was the party line expressed by administrators representing the USDA. Repeatedly, we were told that APHIS

was going to accomplish brucellosis eradication by 1998. Over the years, the federal government has invested \$3.5 billion in their mission to eradicate brucellosis, and to fail now, when so close to finishing the task, would to the minds of those involved constitute squandering of this investment. We were told repeatedly by officials from the USDA (but not scientists) that this goal of eradication by 1998 was practical and feasible, and that it would happen.

We were reassured by representatives from the Fund for Animals and the National Park Service that brucellosis was a non-problem. Brucellosis exists in wildlife, but does not seem to present a serious problem for wildlife populations. Resolution of the problem, in this view, should not be too difficult if we can simply avoid contact between potentially infected wildlife and livestock during critical times of the year.

But we were all taken aback by a rancher who dug in his heels and warned us that compromise was not on his agenda. He emotionally made a plea to the audience that rancher's livelihoods were threatened by brucellosis, or at least by the rules established by APHIS regulations. These regulations require extraordinary expenses for brucellosis testing and quarantine before any interstate shipment. The livestock industry is clearly very concerned. They are concerned because of a growing public intolerance of livestock grazing on public lands, and because of the serious risks associated with the Uniform Methods and Rules imposed by APHIS (curiously there seemed to be little concern about the risks associated with the disease itself).

Is there a comfortable solution to this problem? I believe so, and it requires that we step back to look at the big picture. We must recognize the extraordinary natural values of the GYE. But we must also acknowledge that we have 5.5 billion people on the planet. An appropriate model for sustainable development can be conceived for the GYE. Indeed, I believe that it is possible to have ranching and wilderness in the region. It may not be necessary to eliminate livestock from the GYE, because we can modify livestock use to minimize risk of transmission of brucellosis from wildlife to live-

stock. We know how.

The federal agency representing livestock interests, the USDA, sent its chief spokesperson, Lonnie King, to advise that the status quo is not good enough. He insisted that there absolutely must be compromise and we cannot permit the situation to remain as it stands today. No one at the conference proposed clear resolution to the problem, but it was clear that a number of things could be accomplished that would greatly alleviate the threat (whether real or perceived) of brucellosis in the GYE. These changes from the status quo will require compromises by all parties involved.

It was my reading of the symposium that action on the following objectives could substantially reduce the problem of brucellosis in the GYE.

1. Livestock at risk on elk and bison calving grounds should be appropriately managed so as to minimize the possibility of transmission of brucellosis. For example, Grand Teton National Park allows cattle grazing in the Elk Ranch Reservoir area while elk calving is in progress. Similar cases exist throughout the GYE, and these situations could be modified if agencies would adopt strict policies to minimize risk of transmission.
2. Reduce and eliminate elk feedgrounds wherever possible. Concentration of elk at feedgrounds facilitates transmission of the disease. Dr. Tom Thorne indicated that brucellosis is not sustained in elk populations except when concentrated by winter feeding.
3. Manage winter habitats for wildlife, and to keep wildlife away from cattle.
4. Reduce the high bison population in Yellowstone National Park by reducing snowmobile winter recreation in Yellowstone National Park. Improved access to foraging areas by bison afforded by travel along groomed snowmobile routes appears to have resulted in a large population size that increases the likelihood of a substantial exodus of bison from the park in the future (Dr. Mary Meagher's presentation). Permitting continued snowmobile trail disruption of ecological processes in Yellowstone would appear to be inconsistent with park policy.
5. Vaccinate livestock in all ranges within the GYE. This would seem to be a reasonable price to pay for imposing ex-

otic ungulates on this largely wild landscape.

6. More money must be allocated towards research on the epidemiology of brucellosis and the development of oral vaccines. Several participants in the symposium indicated that the risk of transmission from wildlife to livestock was seriously exaggerated, but sufficient data do not exist to evaluate this risk. A vaccine for brucellosis in bison does not exist.

7. Modify the USDA's unrealistic objective to eradicate brucellosis from the United States, and acknowledge that eradication is not feasible given current technology. Management of the disease is certainly feasible, and much can be done. But having an unrealistic objective interferes with making true progress with brucellosis management in the GYE.

8. Reevaluate APHIS's Uniform Methods and Rules with an eye towards realistic disease threats, and an appreciation of the esthetic value to wildlife resources in the GYE. It is not clear that we must slaughter every bison that leaves the park—even if it is infected with brucellosis. Treatment may be expensive, but it is certainly possible. If animal-rights groups feel strongly enough about saving the lives of these animals, perhaps they will finance alternatives to the draconian Uniform Methods and Rules.

Compromise on the part of agencies, ranchers, and interest groups is possible in the GYE in a way that will make the brucellosis problem manageable. But there is one thing that we must not compromise: the GYE is a global treasure. We must keep it forever really wild and really wonderful. Priorities for livestock management must not take priority over that need within the GYE.

Mark S. Boyce is Vallier Distinguished Professor of Quantitative Ecology at the University of Wisconsin-Stevens Point, and has conducted extensive research on GYE issues. He is the author of The Jackson Elk Herd (1989), and co-editor of North American Elk: Ecology, Behavior and Management (1978, with L.D. Hayden-Wing) and The Greater Yellowstone Ecosystem: Redefining America's Wilderness Heritage (1991, with R. Keiter).

Wolves Arrive: Legal Challenges Continue



Jim Peaco/NPS

Though the media in the Yellowstone region have covered the arrival of wolves intensively, some of our more far-flung readers may not have access to such abundant information, so we provide here an overview of events of the past few months.

After what may have been the most extensive public-involvement process in the history of the Endangered Species Act (ESA) and the National Environmental Policy Act, the final Environmental Impact Statement (EIS) on "The reintroduction of gray wolves to Yellowstone National Park and Central Idaho" was released to the public on April 14, 1994. The EIS proposed establishing experimental populations of wolves in both areas. The Idaho reintroduction would be achieved through "hard release," that is simply letting the animals go in the appropriate area. The Yellowstone reintroduction would be achieved through a "soft release" involving a period of several weeks in acclimation pens. Recovery for each population is defined as the presence of 10 breeding pairs of wolves (about 100 individuals in 10 packs) for three successive years. Recovery in Yellowstone is anticipated by the year 2002. A summary of the plan and the full EIS are available from the U.S. Fish and Wildlife Service, P.O. Box 8017, Helena, MT 59601.

The Record of Decision, which ini-

Bringing the first wolf to the Crystal Bench Pen: left to right, Yellowstone Wolf Project Leader Mike Phillips, Maintenance Foreman Jim Evanoff, U.S. Fish and Wildlife Service Director Mollie Beattie, the wolf, Superintendent Mike Finley, and Secretary of the Interior Bruce Babbitt.

tiates the process of reintroduction, was signed by Secretary of the Interior Babbitt on June 15, 1994, and by Secretary of Agriculture Espy on July 19. Draft special regulations (as required by the ESA) for conducting reintroduction operations, were published in the Federal Register on August 16, and formal public hearings on the regulations were held during the 60-day public comment period. On November 15, Assistant Secretary of the Interior for Fish, Wildlife and Parks George T. Frampton signed the final regulations for establishment of the Idaho and Yellowstone experimental populations, and these regulations were published in the Federal Register on November 22.

Three acclimation pens (each more than an acre in size, and each half a mile to a mile from the nearest road) were built on sites near or in the Lamar Valley. Cooperative efforts between the U.S. Fish and Wildlife Service (USFWS), the National Park Service (NPS), and the Alberta Ministry of the Environment, Fish and Wildlife Branch, were undertaken to livetrapped wolves from western Alberta.

Original plans were for the first wolves

to arrive in late November or early December, but on November 25, the Mountain States Legal Foundation, the American Farm Bureau Federation, and the Federation's Montana, Wyoming, and Idaho affiliates filed suit with the U.S. District Court in Wyoming, asking for a preliminary injunction. Such injunctions are intended "to prevent immediate and irreparable injury" and "to preserve the status quo until the case can be considered in its entirety." The attorneys for the plaintiffs argued, among other things, that the USFWS and NPS were ignoring evidence that native wolves still survived in the two areas, that the introduced Canadian wolves are not the appropriate species for the area, that private landowners were not adequately consulted, and that the USFWS and the NPS initiated wolf recovery efforts prior to the conclusion of the public comment period (by beginning purchase and construction of acclimation pens).

Delays resulting from this court action required trappers in Alberta to release some already-captured wolves, radiocollaring them so they could be relocated quickly. On January 3, U.S. District Court Judge Downes denied the motion for a preliminary injunction. He did not address the arguments of the plaintiffs regarding the various actions of the USFWS; that is, he did not decide on the rightness or wrongness of these arguments and accusations. Instead, he focussed on the issue of irreparable injury, reasoning that was the central issue at this stage, and the principal justification for an injunction.

Judge Downes concluded as follows: "The Court finds Plaintiff's arguments, concerning irreparable injury, unpersuasive. Plaintiffs offered only fear and speculation of some livestock depredation in the indefinite future. Plaintiffs' reliance upon anecdotal evidence from the turn of the century is insufficient when confronted with the Defendants' persuasive scientific testimony that the present circumstances surrounding the Yellowstone and central Idaho ecosystems are markedly different from those in earlier times."

Upon learning of the ruling, United States and Canadian trappers and other staff resumed operations, recapturing



some wolves and capturing others. On January 11, as the first load of 12 wolves began their airplane trip south, the same group filed an appeal with the U.S. Court of Appeals for the Tenth Circuit (Denver), requesting a “temporary stay” to block the wolf reintroduction. The Court granted this stay, which was to last until 5:00 p.m. on January 13, unless extended by the court.

The first 12 wolves, each in its own metal shipping container, had been transported by air from Hinton, Alberta, to Edmonton, Alberta (where they passed through Canadian customs), and from there to Great Falls, Montana (where they passed through American customs). At Great Falls, eight of the wolves (still in their individual containers) were loaded in an NPS horse trailer and driven to the park, and immediately taken to the acclimation pens. The wolves passed through the Roosevelt Arch at the North Entrance to Yellowstone National Park shortly after 8:30 a.m., January 12, amid considerable media attention, which was heightened by the ongoing legal issues.

One group of six (an alpha male and female plus four younger animals) was delivered to the Crystal Bench site, while the other two (a mother and daughter pair) were taken to the Rose Creek site. In accordance with instructions from the court, they were placed in the pens, but not allowed to leave their shipping containers. Media and public attention, as well as government legal response to the stay, focussed on the length of time the animals had now been held in such tight quarters (approaching 36 hours). Secre-

Above left: Gardiner School children watch NPS trailer with wolves enter the park just after dawn on January 12. Above right: the mule team that hauled two sled loads of wolves to the Crystal Bench Pen became almost as popular with media photographers as the wolves themselves. Right: One of Yellowstone's newly arrived wolves, a 77-pound female puppy that is also pictured on the cover of this issue.



Jim Peaco/NPS

tary of the Interior Bruce Babbitt and U.S. Fish and Wildlife Service Director Mollie Beattie were on hand to provide ceremonial assistance in accompanying the wolves to their pen sites, and both expressed great concerns over the ever-lengthening period of time the wolves were confined in the small containers.

In the early evening of January 12, the District Court dissolved the temporary stay because the “appellant failed to make the required showing.” Later that night, long after dark, park staff hiked into the two pen sites, opened the containers, and immediately left the wolves to step out onto the snow at their convenience. No wolves were observed leaving the containers at Crystal Bench, but as the crew was leaving the Rose Creek site (around midnight), they were able to observe the younger female running here and there through the snow in the enclosure. In a process full of historic moments, this

must be one of the most powerfully symbolic, as a wolf had now actually hit the ground.

Late in the evening of January 19, a second group of six wolves arrived in Yellowstone. They were held overnight in their containers at the Lamar Ranger Station. On the morning of January 20, one male was released with the two females (the mother was known to be in estrous) at Rose Creek, and the other five (a pack) were released in the third acclimation pen near Soda Butte. The wolves will be held in the pens for several weeks, and then released.

The legal appeal process will apparently continue. By January 20, a total of 15 wolves had also been released in Central Idaho. These reintroductions in Idaho and Yellowstone National Park are the first in a series of scheduled releases, which are expected to continue for three to five years.



Renee Evanoff

A Good Year for Yellowstone Bald Eagles

Bald eagle fledgling numbers continue to the rise in the park. This year a total of 13 eaglets fledged from 21 occupied territories—the second highest eaglet production in the recorded history of the park. In the record year of 1993, 17 eaglets were fledged from 18 active nests in the park. Since 1982, the park has annually averaged 10 fledglings from 13.5 occupied territories.

Occupied bald eagle territories have gradually increased each year since the 1988 Yellowstone wildfires, according to the park's bird management specialist, Terry McEneaney. "It looks as though bald eagles have responded positively to the effects of wildfires," McEneaney said. Other variables, such as favorable mild weather conditions, particularly during nesting, have also influenced the birds. He also pointed out that there are more bald eagles in the Greater Yellowstone Ecosystem than ever recorded before, thus compelling "floating" eagles to occupy new territories.

McEneaney warned that eagles will undergo an unstable phase in their nesting cycle as many of the burned trees from 1988 are uprooted by winds and begin to fall. "Nesting bald eagles will most likely be affected as a result of this natural event," McEneaney stated, "but I expect them to gradually adjust to this natural disturbance." A fire this year burned one bald eagle nest tree.

The Greater Yellowstone Ecosystem Bald Eagle Working Group (GYEBEWG) announced bald eagle production in the Greater Yellowstone Eco-

system (GYE) also continues to show positive signs towards downlisting and eventual recovery. A total of 93 eaglets fledged from 96 occupied territories in the GYE in 1994. Since 1982, bald eagle production has averaged 72.5 fledglings from 69.2 occupied territories.

Speaking for the GYEBEWG (we did not ask him to pronounce this acronym) McEneaney explained that "the overall status of the bald eagle in the GYE is very encouraging, but it still is not without its share of problems." Weather continues to play an important role in influencing annual bald eagle production (this year the ecosystem experienced a wet spring and a dry summer, resulting in favorable eaglet production). "Bald eagle nests on public lands appear to be well protected throughout the GYE; however outdoor recreational impacts are significantly increasing and creating conflicts, especially along popular rivers," McEneaney said. Private land development on the fringes of the ecosystem, especially along rivers, is exploding. The primary threat to the bald eagle and many other species of wildlife in the GYE continues to be uncoordinated, unplanned, sprawling development of private land. "We need to leave space for wildlife, or we will destroy the very thing that attracted us to the area in the first place—the wide open spaces," McEneaney explained. The working group is attempting to work with county planners and concerned private land owners interested in leaving space for wildlife, such as bald eagles.

The GYEBEWG is comprised of state

and federal biologists and independent researchers from Wyoming, Montana, and Idaho that actively work with bald eagles in the GYE. The Working Group was established in 1982 as part of an inter-agency coordination effort for successful recovery of the bald eagle in the GYE.

Osprey Aren't Doing Badly Either

Terry McEneaney also reports that "the number of osprey nesting pairs has skyrocketed" since 1988. According to McEneaney, "In 1988, there were 66 nesting pairs of osprey, whereas in 1994 a grand total of 100 nesting pairs were recorded." This year, because of mild weather conditions, 101 osprey chicks survived to the fledgling stage. Though osprey nesting depends on the presence of standing dead snags for nest sites (the sort of tree snags Yellowstone has in great abundance since 1988), McEneaney attributes the series of successful nesting years much more to hospitable weather conditions.



Renee Evanoff

Lynn Kaeding Named U.S. Fish and Wildlife Service Yellowstone Project Leader

Lynn Kaeding has succeeded the recently retired Ron Jones as leader of the U.S. Fish and Wildlife Service's Fishery and Aquatic Management Program in Yellowstone. Kaeding has been assistant project leader in Yellowstone since 1990,

and officially became project leader on September 18.

Kaeding has also worked with the Utah Division of Wildlife Resources as a fishery biologist and resource analyst (1976-1980), and with the U.S. Fish and Wildlife Service as head of endangered fishes research in the Colorado River, Grand Canyon National Park (1980-1982), and as project leader for the research program on endangered fishes in the Colorado River in Colorado and Utah (1982-1990).

Kaeding's acquaintance with Yellowstone fisheries dates to his graduate student days in the mid-1970s, when he did his M.S. thesis on the growth and diets of brown and rainbow trout in the Firehole River.

Laura Joss Named Chief of the Branch of Cultural Resources

The Cultural Resources Branch of the Yellowstone Center for Resources has its first full-time administrator, Laura Joss, who entered on duty October 3. Joss replaces Paul Schullery, who served as Acting Chief of Cultural Resources since March 1993, when the branch was created.

Joss has a B.A. in Anthropology from Indiana University, and an M.A. in museum studies from the Cooperstown Graduate Program. She is also a graduate of the Women's Executive Leadership Program and the NPS Rocky Mountain Regional Office Pilot Mentoring Program.

Joss started with the NPS as a volunteer in Mesa Verde National Park, and has worked as either staff or consultant at Glen Canyon National Recreation Area, Grant-Kohrs Ranch National Historic Site, Big Hole National Battlefield, The Children's Museum in Indianapolis, New York State Museum, Onondaga Historical Association, Buffalo Museum of Science, New Jersey State Parks, and the John Wesley Powell Museum.

In 1990, Joss was hired at the National Park Service's Rocky Mountain Regional Office as staff curator, and was regional curator from 1991 until accepting the Yellowstone position. She has also held key acting positions, including 3 months as acting chief of Interpretation in Yellowstone, 1 month as acting superinten-

dent of Bryce Canyon National Park, and 2 months as special assistant to the Department of the Interior Office of the Assistant Secretary for Policy, Management, and Budget.

Mike Phillips Wolf Project Leader

Anticipating the projected arrival of Yellowstone's first new wolves this winter, the Yellowstone Center for Resources has added a full-time wolf project leader to the staff. Mike Phillips, who arrived in October, spent the previous eight years as field coordinator of the Red Wolf Recovery Program at the Alligator River National Wildlife Refuge in North Carolina. Phillips oversaw the successful restoration of red wolves into the wild, and coordinated red wolf recovery in four other states in the southeast.

Phillips earned a B.S. from the University of Illinois, majoring in ecology, and his M.S. from the University of Alaska. His master's thesis addressed the cumulative effects of oil and gas development on grizzly bears.

Phillips' previous research experience includes studies of wolves and their prey at Isle Royale National Park and in Minnesota, working under Rolf Peterson and David Mech; a stint as a visiting biologist in Australia, where he studied relationships between native dingoes and introduced red foxes; and an assignment with the U.S. Fish and Wildlife Service at the Arctic National Wildlife Refuge.

National Brucellosis Symposium

On September 27 and 28, more than 200 people attended the national symposium on brucellosis, and heard a wide variety of positions and opinions on the management of that disease, especially as it exists in the Greater Yellowstone Ecosystem. The governors of Wyoming, Montana, and Idaho were all in attendance.

Long-time Yellowstone-area researcher Mark Boyce served as a conference summarizer, and his comments appear starting on page 15 in this issue of *Yellowstone Science*. There are plans to publish the proceedings of the conference, and we will keep readers informed as we learn more about that.

Wild Trout V Focuses on Big Picture

The fifth in a series of Wild Trout conferences, this one entitled "Wild Trout in the 21st Century," was held on September 26-27 at Mammoth Hot Springs. The Wild Trout conferences have been held every 5 years at Yellowstone since 1974. This most recent one was sponsored by Trout Unlimited, the Federation of Fly Fishers, the U.S. Fish and Wildlife Service, the National Park Service, the U.S. Forest Service, the Environmental Protection Agency, and the American Fisheries Society.

Conference topics included a growing emphasis on ecosystem management issues, the changing nature of public interests in trout and their environments (including concern over animal rights and conflicts between native and nonnative wild trout), and the fate of endangered species legislation as a tool in wild trout management. Keynote speakers included Secretary of the Interior Bruce Babbitt, National Wildlife Federation President Jay Hair, and Trout Unlimited President Charles Gauvin.

Two events will be of special interest to followers of Yellowstone's trout programs. First, Ron Jones, who recently retired as Project Leader of the U.S. Fish and Wildlife Service's Yellowstone team, was given the A. Starker Leopold Award in the professional category for his many years of service.

Second, a special evening session was held to discuss the invasion of Yellowstone Lake by nonnative lake trout, reported in the previous issue of *Yellowstone Science*. This informal session, hosted by the U.S. Fish and Wildlife Service, was attended by about 20 biologists and managers with a special interest in lake trout-related topics. The goal was to have a "brainstorming session," at which a variety of ideas might surface, and this goal was achieved to everyone's satisfaction. Perhaps the most important proposal, offered and expanded on by several people, was to convene a special panel or workshop of leading lake trout authorities this winter to develop a set of management alternatives based on the best science available. We will report on this process in future issues of *Yellowstone Science*.

Call for Papers

GREATER YELLOWSTONE PREDATORS:

Ecology and Conservation in a Changing Landscape



Third Biennial Scientific Conference on the Greater Yellowstone Ecosystem

September 24–27, 1995

Mammoth Hot Springs Hotel
Yellowstone National Park

—▶ *Greater Yellowstone Predators* ◀—

The third biennial scientific conference will take a broad look at predators and predation. We welcome papers not only on the large predators, but on all predatory species, whether mammal, bird, fish, or invertebrate. We welcome papers from fields traditionally associated with wildlife ecology, but also encourage submissions from other disciplines, such as sociology, economics, and environmental history.

—▶ *Submitting An Abstract* ◀—

The deadline for abstracts is May 1, 1995. Please submit a one-page double-spaced abstract. If possible, send both a hard copy and a WordPerfect or ASCII text disk. We will be publishing the accepted abstracts in the conference agenda booklet. Mail the abstract to Conference Program Committee, Yellowstone Center for Resources, P.O. Box 168, Yellowstone Park, WY 82190.

—▶ *Registration and Reservation Information* ◀—

Do not attempt to make reservations yet. Reservations and registration information will be forthcoming in future announcements. Watch for information in future issues of *Yellowstone Science*, or write to the Yellowstone Center for Resources for more information.

Please contact the program committee if you know of anyone else who might like to receive information on this conference.

Yellowstone Science
Yellowstone Center for Resources
P.O. Box 168
Yellowstone National Park, WY 82190

BULK RATE
POSTAGE & FEES PAID
National Park Service
Dept of Interior
Permit No. G-83