

Box 65: Commentary from the GWS Office and Our Members

Finding Value in Creatures Great and Small:
Just Another Year in Yellowstone National Park

After a summer of pomp and ceremony over its 125th anniversary, Yellowstone National Park faces the same contentious issues of previous years. So did the 125th really mean anything to Yellowstone? Minimally, it was a nice chance to reflect on the “national park ideal.” But for Yellowstone’s bison—and for natural resource management in general—Yellowstone’s 125th might be remembered as a turning point. To see why, picture three scenarios from last summer in Yellowstone.

First, imagine a birthday party for the 2.2-million-acre park. From a podium strategically placed in front of some recognizable icon (say, Old Faithful or the Lower Falls), politicians and conservationists speak about the history and meaning of Yellowstone. They recall that Congress protected the area in 1872, making the park *the* grandparent of thousands of parks and protected areas throughout the globe. They emphasize that Yellowstone National Park and its vicinity constitute the greatest concentration of relatively undisturbed habitat in the Lower 48. And they remind the audience that it took the novel idea of a “national park” to protect the world’s greatest concentration of hot springs and geysers from vandalism, energy development, water extraction, and commercial use.

Second, imagine the inside of a car. The passengers—let’s say a family of four—are cursing themselves for

spending their summer vacation in Yellowstone National Park. They came to enjoy the natural scenery, view the wildlife, and just get away from it all. But instead they find themselves trapped in their vehicles, stuck in interminable road congestion caused by endless construction, axle-eating potholes, monster Winnebago “elk traffic jams,” and the 3 million other visitors that come to the park each year—and perhaps even the onrush of people celebrating the park’s 125th anniversary.

Third, imagine a herd of bison surrounding a colorful, bubbling hot spring away from the roads. The earthy spectrum of Yellowstone’s hot springs is caused by hundreds—possibly thousands—of thermophilic (“heat-loving”) microbial “species.” Because they can live at the boiling point and in highly acidic or alkaline conditions, these microbial species are of special interest to the biotechnology industry. And although the bi-

son are not aware of it, the thermophiles are particularly important for their own conservation: one of these microbes, *Thermus aquaticus*, could soon help protect bison from needless destruction.

These three scenes represent the achievements, the perils, and the promises of America's national parks. In the first, our celebration of Yellowstone demonstrates the deep sense of pride we have in our national parks. A oft-cited quote from the summer's celebrations states that national parks "are the best idea the United States has ever had." From Gettysburg to Yosemite, the historical, natural, and spiritual values of the national parks remind us of who we are, what we care about, and why. As cliché as that sounds, it is uniquely true for each of the country's 376 park units.

Yet at the same time that we celebrate our national heritage, those trapped in their vehicles symbolize a growing population grasping for a shrinking amount of wilderness, wildlife, and solitude. There's no real puzzle to what's happening: more and more people are looking for less and less open space. What you end up with is environmental degradation with serious consequences for human health and fulfillment.

Conservationists have long pointed out this dilemma—that we are "loving our parks to death." These problems are not intractable, but the solutions are not easy. Mass transportation through the parks is not appreciated by a car-loving cul-

ture. Controlling development around the parks is thwarted not only by mining and timber operations, but by nature-lovers who want a second home in a beautiful place. Reducing both local and national population growth may not be a taboo subject anymore, but talk has not halted overcrowding in the parks. And in the face of these challenges, harnessing public support for protecting the national parks has never been a simple task—even though public opinion polls indicate strong and consistent support for them.

In short, protecting America's national parks will remain a never-ending series of arduous battles, some of which will undoubtedly be lost. But conservationists will also find surprising ways to protect the parks. The third scenario—the hot spring, bison, and thermophilic microorganisms—demonstrate that national parks can "help themselves" in protecting the country's natural heritage, thereby leading to tremendous societal benefits.

The full story began in the mid-1960s, when scientists Thomas Brock and Hudson Freeze discovered the microbe *Thermus aquaticus* in Yellowstone's Mushroom Hot Spring. Two decades later, other scientists found that heat-stable enzymes from *T. aquaticus* dramatically enhanced the polymerase chain reaction (PCR), which is the basis of "DNA fingerprinting." While the average person has never heard of PCR, many doctors, lawyers, and biologists consider it an indispensable tool in

medical diagnostics (PCR can detect the presence of infections), law (PCR evidence has resolved numerous criminal cases), and evolutionary studies (PCR has been instrumental in changing our understanding of the tree of life).

The success of PCR results substantially from research conducted in Yellowstone—research that occurred because the U.S. Congress and the American public protected the area through the novel mechanism of a “national park.” This year, PCR and the *T. aquaticus* enzyme are returning to Yellowstone. In an ongoing pilot project at Yellowstone, microbiologists are working on protocols for the application of PCR to the detection of the bacterium *Brucella abortus* in bison. Due to fears that *Brucella* could be transmitted to cattle, approximately one-third of Yellowstone’s bison were shot while leaving the Park during last winter’s brutally cold and icy conditions. (Another third succumbed with the park to the unprecedented winter conditions.) Whether bison could transmit the disease is a matter of contentious debate between land managers, conservationists, the state of Montana, and the cattle industry. While many biologists believe that such a risk is negligible, the ranching industry has not stood still in the face of a potentially disastrous economic situation. The end result has been “natural resource management” via rifle.

Unlike current detection techniques that only discern whether the bison have the antibodies to *Brucella*

(in other words, were exposed to *Brucella* at sometime in their lives), PCR could quickly detect the actual presence or absence of *Brucella*. If the project is successful, there will be no reason to kill unaffected bison if and when they walk out of the park in future winters. There is a nice symmetry to this story: seemingly obscure research on thermophilic microorganisms in Yellowstone in the 1960s could result in the protection of a charismatic macroorganism (i.e., bison) in the 1990s. Hopefully, the ultimate closure to this story will be better protection of our country’s last remnant of free-roaming bison population.

But there is a larger meaning to this unusual episode. When Congress protected Yellowstone in 1872, it had no idea—nor could it have even imagined—exactly what it was saving. Microbiology was the *terra incognita* on the intellectual map of the time; genetic fingerprinting wouldn’t even be on the map for a century to come. Rather, Congress’ reasons for saving Yellowstone 125 years ago were to establish a “pleasuring ground” for the “benefit of” the American public, to protect unique features, and to provide a money-maker to the rail lines and local economies.

These were and still are good enough reasons to protect America’s national parks. But our protected areas are now much more than pleasuring grounds. National parks (and other protected areas such as wilderness areas and wildlife refuges) constitute unfathomably extensive

repositories of potential knowledge and understanding. Despite centuries of examining our natural history, we have only glimpsed the complexity and diversity of our continent's biological heritage. Investigation into this biological diversity will not only teach us about the world around us and our place in it, but will give us the tools to protect ecosystems, species, and genetic resources from a myriad of threats facing our country's natural heritage. The story of PCR and *T. aquaticus* serve as but one reminder of the importance of such understanding and action.

The celebrations of the summer are over, the family of four are back home (next year: Disneyland), and Yellowstone's bison prepare for another winter. Unlike the 125th, Yellowstone's 126th could pass without the bison trapped between impossible winter conditions and a gun. Perhaps the winter won't be so harsh. Perhaps the state of Montana will see tourism dollars as lucrative as cattle dollars. Or perhaps, just perhaps, the destiny of Yellowstone's largest creature will become inextricably woven with that of one of its smallest.

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