

Greater Yellowstone Science: Past, Present, and Future

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Even though my friend John Varley told me I was being invited to talk this evening because you guys would need something light after a day of heavy scientific lifting, I still feel very honored to get to talk to you. A day like today, listening to all of you, is exciting for me even if so much of the news about global change and exotic species seems to be lousy. But the honor for me remains. Besides, when it comes to lightness I suspect that I will in fact succeed beyond John's wildest expectations.

Greater Yellowstone science is fascinating. Of course many of us are convinced that we are fascinating individually, but we are even more so as a group. To make that case, I'm going to pretty much ignore the administrative and legislative history that I could have easily filled thirty minutes with, and follow a few historical threads that suggest the often unappreciated richness of science's place in Greater Yellowstone during the past one hundred and thirty-seven years. I should also assert, just in case someone here is interested in pursuing the matter, that science's historical place in Greater Yellowstone is ripe for study. The scientific side of Greater Yellowstone history deserves deep interdisciplinary examination, not only by historians but by others, including sociologists and anthropologists. Maybe even a few psychiatrists wouldn't hurt. What I would like to do tonight is give you a few examples of why I believe the subject is so worthy of scholarly and popular attention.

A few years ago a forest service friend—a scientist—and I were comparing notes on the research traditions in our respective agencies. I explained that for much of the history of the National Park Service, our agency's researchers have worked directly beneath park managers in a single chain of command. This, I suggested, led to a tradition of kneejerk skepticism among park critics and the media, who habitually branded park service science as tainted because our scientists were under the thumb of managers whose motivations were openly policy driven—and probably evil as well.

My forest service friend explained that by contrast he and his forest service science colleagues operated in an administrative environment that was bureaucratically distinct from management. This separation, he felt, gave forest service scientists a fine sense of professional purity. Church and state were clearly separated. He then explained that while this setup kept forest service scientists happily aloof from the day-to-day murkiness of real-world management, it also meant that managers just ignored them. We were awestruck at how two such different systems achieved such qualitatively similar results.

Our little stereotyping exercise only begins to suggest the complications of science in a social and political arena as complex as Greater Yellowstone. The forest service and the park service are only two of the many institutions and agencies in Greater Yellowstone who engage in the scientific enterprise. Each of these numerous organizations has what, for want of a better term, we tend to think of as its own culture. Not surprisingly, each culture has not only generated its own style of practicing science, but its institutional direction has naturally tended to select for scientists who were most comfortable with that style. (I confess that I use

the word "style" here to avoid using words like "values" and "ideals," which may distract me from getting on with my point.)

And there are plenty of styles to choose from. The histories of the park service and forest service remind us of the harsh historic reality that these cultures can diverge very fast. Until relatively recently, long-time observers of some of Yellowstone's famous controversies could track the genealogy of the various institutional positions of agencies, university departments, and advocacy groups back through three or more generations. The apparent heritability of scientific viewpoint is only one of many things that make the saga of Greater Yellowstone science so worthy of study.

About twenty years ago, when former Yellowstone Superintendent Bob Barbee, John Varley, and I were dreaming up the quarterly magazine *Yellowstone Science* and our biennial scientific conference series, one of our fondest ambitions was that these two initiatives would help awaken the scientists who live and work in this region to a heightened sense of themselves as members of a research community. Back then my abysmal failure to attract many state or forest service researchers to write for *Yellowstone Science* or to participate in our conferences made me wonder if we were a community after all. That is why after a day at a meeting like this, I can hardly express how grateful I am, and how grateful you all should be, to live in a Greater Yellowstone where a workshop like this one just seems like the obvious right thing to do. It wouldn't have been nearly so obvious just one short generation ago. Those who remember the political catastrophe of the infamous *Vision Document*, whose twentieth anniversary we are pointedly *not* celebrating this year, will know what I mean.

Dark memories aside, I have arrived at the first historical thread in the saga of Greater Yellowstone science, the very old idea that there actually *is*

something called Greater Yellowstone. Science in fact gave us our first clues that we needed to think big about this region.

From 1872, when Yellowstone National Park was established, until the early 1900s, the people who thought hard about the park's ultimate meaning and eventual purposes were unconstrained by much pre-existing regional bureaucracy, which is to say that they were not much hampered by a boundary mentality. Many of the best of these thinkers didn't even live here, and were free to see the region *as* a region. These people may never have heard the word "ecology," but they routinely thought in ecosystem terms. George Bird Grinnell, the Yale-trained zoologist who was perhaps the park's most visionary and effective national defender until at least 1900, certainly lacked our terminology, but he had his own words that worked just as well. Grinnell was especially fond of using the term "reservoir" to characterize the role that the park should play in the region.

For example, he believed that the park's forested landscapes, left unharvested, moderated the runoff of snowmelt and precipitation, making the park a valuable servant of a host of agricultural and urban interests far downstream. Some of you will recognize that this same landscape-as-water-reservoir argument also helped protect the Adirondacks of upstate New York at that same time.

For another example, Grinnell saw the park as a reservoir of wildlife. As long as the summer ranges and calving grounds of the park were protected, the park would provide a steady, perpetual flow of game animals onto surrounding lands.

There's no overstating the extent to which the park's early champions thought beyond the boundaries. They perceived the seasonal and annual flows of natural forces up and down these long drainages. For many of

them, the creation of the nation's first forest reserves adjacent to the park in the 1890s was simply a *defacto* extension of the park to further improve the efficiency of the living reservoir system that was an as-yet un-named *Greater Yellowstone*.

But ultimately, other efficiencies conflicted with this open-minded perspective. At the dawn of the twentieth century, the progressive era, so vividly symbolized by Grinnell's close friend Theodore Roosevelt, promoted what historian Samuel Hays referred to as a national gospel of efficiency, a gospel that inherently favored the quantifiability of natural resources over the less formally measured qualities of actual nature. As Gifford Pinchot's new U.S. Forest Service, founded in 1905, took hold, the human-drawn boundaries between the park and the surrounding forests hardened. Soon the only talk of flowing resources involved repeated campaigns by agricultural interests to construct dams on many of the park's rivers to irrigate Montana wheat and Idaho potatoes.

By 1919, when the term *Greater Yellowstone* was first coined in print, it was already too late to honor Grinnell's ideals in a landscape of ever more impenetrable boundaries. Several decades would pass, and American attitudes toward nature would undergo dramatic changes, before the scientific and management realities of grizzly bears, elk, and fire would literally and permanently put *Greater Yellowstone* back on the map.

But the point is that it was science, even the fairly limited science of Gilded Age America, that launched those first tentative ideas of this thing called *Greater Yellowstone*, and it would be science that would finally bring Grinnell's ideal back to its current eminence.

A second historical thread paralleled this one, and it is the extent to which many scientists have openly engaged in the politics of *Greater*

Yellowstone. One of science's great and essential internal debates is over the proper role of the scientist in public dialogues over policy and management; as I mentioned earlier, scientific credibility is closely tied in the public mind to scientific neutrality. And yet from the time of Yellowstone's creation in 1872 on, generations of prominent scientists have been outspoken in advocating not only a scientific perspective on the park, and not only the preservation of Yellowstone's wildness, but also specific policies that they believed would work best. These people amount almost to a roll call of Greater Yellowstone's most famous scientific voices, from Ferdinand Hayden and Arnold Hague, to Charles Adams and George Wright, to Adolph and Olaus Murie, to John and Frank Craighead, to a growing number of others since then. They did not always agree among themselves, but they were willing to put their professional reputations on the line for Yellowstone and, because so many of them thought and worked across boundaries, for Greater Yellowstone.

Those of you who saw Ken Burns' big film on the national parks in September must have noticed the unusual extent to which scientists were even cast as heroes. My own favorite example of such scientific advocacy made it into the film. It was National Park Service biologist George Melendez Wright's eloquent recommendation, in 1933, "that the rare predators shall be considered special charges of the national parks in proportion that they are persecuted everywhere else." And only a few years later, Aldo Leopold himself recommended the restoration of wolves to Yellowstone. Anyone who knows much about the history of land management in the American West will agree that science, at least wildlife science, has rarely gotten more socially subversive than these statements by Wright and Leopold.

But rather than quoting a bunch more historic scientists, I think you only need to hear from one—one that you may have never heard of, a geologist named Theodore Comstock. Comstock visited and studied the park at its beginning, in 1873, with the Jones Expedition, and published several foresightful papers that reached far beyond his specialty. We ought to name a mountain or a microbrewery or something for this guy.

Remember that Comstock worked and wrote in the fierce propwash of the Darwinian revolution. We can barely imagine the mood of his times. The publication of both *On the Origin of Species* and *The Descent of Man* were current events to him, and his awareness of their sudden impact on science and society is reflected in this plea for the preservation of Yellowstone's authentic wildness—a plea so modern that one of us might say it at this meeting.

Momentous questions are now agitating the scientific world, calling for experiment and observation which are daily becoming less possible, owing in a great measure to the obliterating influence of modern civilization. Thus it would almost seem that the present difficulties in the way of the solution of many questions, bearing upon the process of natural selection, will soon become insurmountable if some means are not employed to render more practicable the study of animals in a state of nature.

Of course Yellowstone provided those means, and Comstock, perhaps more fully than Hayden or any of the other early scientific pioneers of the region, articulated the case for the park as an unparalleled and perpetual opportunity to learn about wild nature.

But Comstock had more. In what seems to me prescience bordering on prophecy, Comstock sensed and predicted the breadth of opportunities the park would some day provide for study, in what even today still seem to be nearly fabulous realms. The first time I read this 136-year-old statement, it gave me chills.

There is one young but active science—microscopy,—which has as yet scarcely entered this field, but which, I firmly believe, will discover within the limits of the Park most valuable treasures. The act of Congress providing for this reservation insures the preservation of the greater portion of whatever may be available for this purpose.

Among the most interesting objects for the microscope, will be found the colloidal and filamentous products of the hot springs, the minute vegetable and animal life of both hot and cold springs, the animal and vegetable parasites, and the numerous crystalline deposits of the hot springs and geysers.

So with his phrase "most valuable treasures" haunting my historical consciousness, I will let Comstock speak for all of those later scientist-advocates who have fulfilled his dream so magnificently, and move along to one more historical thread in the story of Greater Yellowstone Science, the least considered but maybe the most far-reaching of all.

In the early days of NASA, when the Mercury spacecraft was unveiled to a public conditioned by Hollywood's fanciful portrayals of shiny and graceful rocket ships, the reaction was predictably negative. People thought this Mercury thing looked clumsy, like a garbage can, and, I suppose, a little too much like a coffin. But John Yardley, the McDonnell

Aircraft engineer who had overseen the creation of the Mercury capsule, had all the answer anyone needed. He said, "Pretty is what works."

Certainly the idea that beauty can be a product of function is not new. For millennia we have admired finely made devices, whether a watchwork or a weapon, in which something's function was at least in part a result of its being beautifully made—a quality that was easily translated in our minds to being, just, beautiful. If you want a magnificent illustration of this historical reality, go down the street to the American Computer Museum—you should go there anyway, because it's a fascinating place—and spend a few minutes staring at their replica of the ancient Antikythera mechanism.

But long before the rise of the modern scientific sensibility, the beauty of the natural world—the very Creation itself—was often perceived as a function of its imagined mechanical perfection, and of course of the beautiful wisdom of the Creator. But the application of this notion, that pretty is what works, and that what works could be pretty by *virtue* of how well it works . . . well, the application of that notion to ecological process still had something historically fresh about it, and something revolutionary, when it was applied in the wild setting of Yellowstone and the other national parks.

It has taken American society and American government more than a century, but we have come to realize how profoundly right Comstock was, that the highest value that a park has for us, whether we are scientists or artists or just regular visitors, is in the authenticity of its wildness—in the rare opportunity it gives us to learn and be awed by the way that nature makes its own decisions. And here is the delightful surprise of a new social and even aesthetic role for science. Science, by providing a yardstick to the wildness and consequent authenticity of a landscape, in effect gives us

permission to admire things we used to be shocked by. It exposes us to a new, broader, and far richer idea of beauty.

We have had to overcome a lot of cultural, emotional, and religious conditioning to get here. But once that perceptual door was opened and we stepped through to the broader view, we were overwhelmed by the extravagantly perfect beauty we now choose to find in Yellowstone's wildness—from firestorms to debris flows to predation to winterkill to the unexpected ecological elegance of a buffalo chip.

What an ironic and amazing development—that science, so valued for its dispassion and supposed freedom from the subjective, should serve us as the only sure guide to the most emotional end of the spectrum of experiences we find in Yellowstone. Science empowered us to discard the refined artificiality that characterized earlier notions of the beauty of nature. Science said to us, if pretty is what works, then Yellowstone is indeed beautiful. Those of us who have embraced this ideal of wild authenticity as the guiding principle by which we should judge the success of our management of places like Yellowstone are now largely dependent upon science to lead us to wonder and beauty. I like to think that this would make Theodore Comstock very happy.

Let me wrap this up by invoking all this history in the cause of the subject of this meeting. Today we are both burdened and invigorated by a powerful sense of crisis, and I can tell you that in the history of the national parks, crisis is the highest form of peril. Crisis loosens *all* the cannons. Crisis by its very nature, and by the tone of its times, stirs panic and generates a vague but mighty need for urgent action if not desperate measures. Crisis does these things because the wise and crafty among us

also recognize that crisis is a rarified form of opportunity, when all stakeholders proclaim that their standing agendas are precisely the answer.

But crisis is almost a steady state here. Surely, one hundred and thirty-six years ago, when Theodore Comstock said that "Momentous questions are now agitating the scientific world," it was with a precisely accurate sense of the great crisis of his time. In some respects, Yellowstone has always made us feel, as historian Aubrey Haines put it in describing the park's management situation 40 years ago, that we stand "at a crossroad, faced by fearful decisions." There are always crossroads, always fearful decisions.

In that spirit, I would like to offer a few of the sweeping generalities that historians are so fond of, to characterize how Yellowstone has usually gone about its business at these crossroads, and perhaps even to suggest how we, today—though we are of course much smarter now, right?—must still operate.

First, pretty much every generation of us since Comstock's time has contained a majority of people, even among the scientists, who were absolutely convinced they knew all that was needed know in order to do right by Yellowstone.

Second, they were always wrong. This isn't to say that they always did the wrong thing. But it is to say that their confidence in doing whatever they did was rarely as warranted as they imagined. One of the most important contributions science has made to management dialogues around here in the past thirty years is to elevate the admission of uncertainty as a credible management stance. This workshop is all about uncertainty, and that's another reason it is hard to imagine it having happened very long ago.

Third, again and again, in our traditional confidence that nothing short of our own bold actions could "fix" whatever, on any given day, we felt was most importantly wrong with Yellowstone, we have sold nature short, underestimating its power, its resilience, its complexity, and its capacity to surprise us with unimagined consequences of our well-intentioned attempts to care for it.

Fourth, again and again, when the urge to step in and take Yellowstone's wildness in hand has pressed us hard and yet we have restrained ourselves, and have stood back and kept our hands off things, we have always learned more than we would have learned had we yielded to the temptation to meddle and tinker. And by the way, I am beginning to think that this may be the most important lesson of the so-called "natural-regulation" era of ungulate management in the park over the past forty years. We now know infinitely, *pricelessly* more about the function of this wildland ecosystem than we would know if we'd spent those same forty years continuing to manipulate, suppress, harvest, herd, and otherwise engineer whatever nature was trying to do that we were so afraid of.

And last, the rate at which we are still peeling away the layers of Yellowstone's wild character, and still coming to terms with the demands that its authenticity makes on us, can leave no question that there are more, probably many more, of Theodore Comstock's "most valuable treasures" still out there—still unrecognized—and still potentially vulnerable to the collateral consequences of our best intentions.

I don't intend the above generalities to advocate any exact position. I for one am inexpressibly grateful that we meddled enough to restore wolves, and have in other ways stepped in now and then when wisdom and opportunity provided what seemed at the moment like adequate justification.

Sometimes maybe we do know what we're doing, and we do get it right. I mean only to point out certain powerful tendencies we have, and to remind us to be careful out there.

Science finds itself in a historic and extraordinary position here. Managers and the public have never before depended upon scientists so much, not only for direction on how best to ride out each new crisis, but even for guidance in how best to find the fulfillment that Yellowstone offers each of us in such individual and personal ways. Yellowstone and science are now full partners. The stakes are as high as they get. As my generation used to say, the whole world is watching.

And personally, I just can't wait to hear what you're going to tell them.