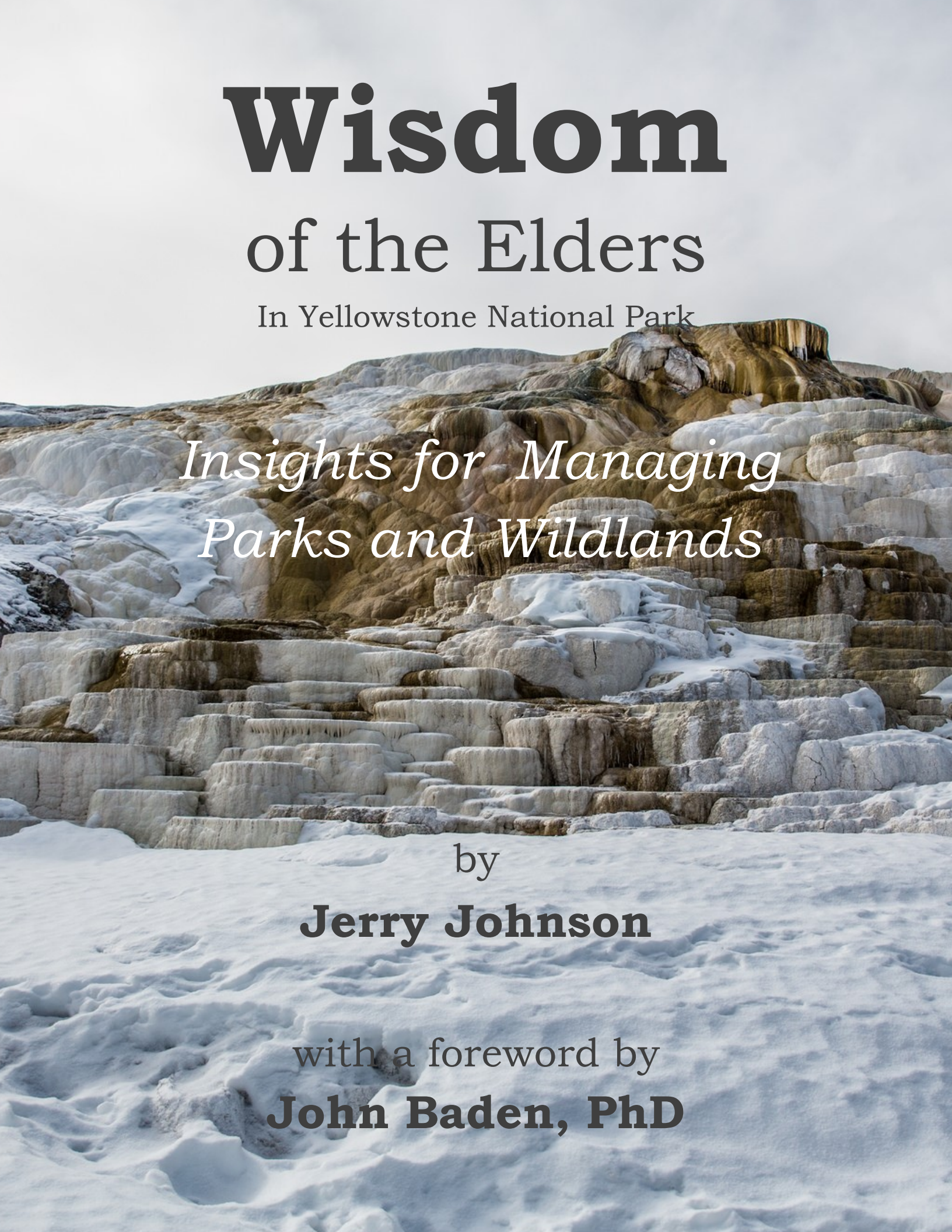
Wisdom

of the Elders

In Yellowstone National Park



Insights for Managing Parks and Wildlands

by

Jerry Johnson

with a foreword by

John Baden, PhD

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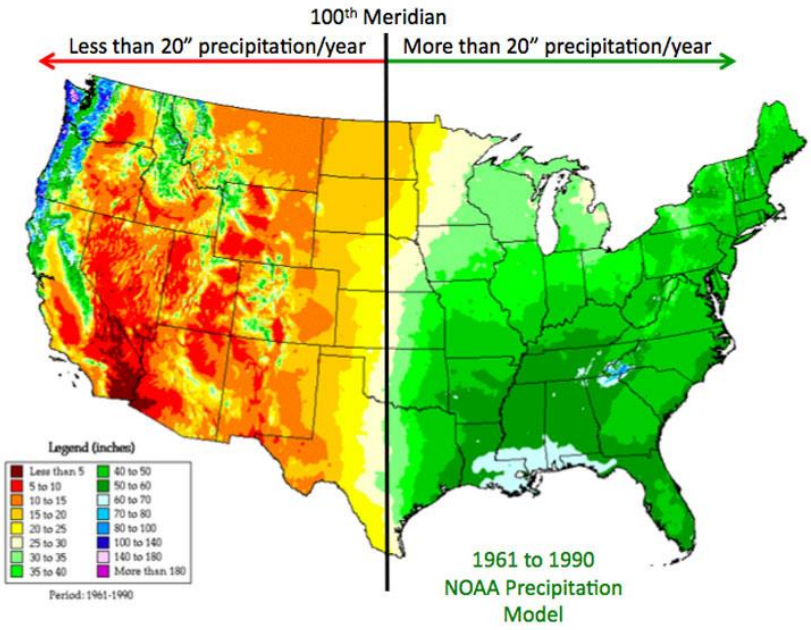
Introduction

Jerry Johnson & John Baden

A sign near Blunt, South Dakota tells you you've reached the 100th Meridian – a mythical line of longitude 100 degrees and half a world away west of Greenwich, England. The line runs north and south through the Dakotas, Nebraska, Kansas, the panhandle of Oklahoma, and through the middle of Texas. To geographers it is an expression of east or west. To the west, the climate is characterized by semi-arid or arid lands. Generally speaking, to the east, the land receives warm moisture from the Gulf of Mexico, and as a result, the lands there are productive without supplemental irrigation. To westerners it is an almost perfect demarcation of their lifestyle where the well-watered prairies give way to high plains almost within sight of the Rocky Mountains; and in their rain shadow. This is a land of large rivers and large dams, wide open spaces and barbed wire.

The explorer John Wesley Powell noted the geographic demarcation and suggested in 1876 in his report to Congress that the region was not fit for agriculture due to the lack of water. Further, state boundaries, if there were to be any, should follow watersheds rather than political maneuvering that favored parochial agendas. Congress and the railroads disagreed and continued to pass Homestead Acts up through 1909. The 100th meridian is where the west begins.



The lands west of the 100th meridian are largely arid and require elaborate water management strategies that depend on snow pack and massive water storage (dams) and canal systems in order to produce viable agricultural economies. Much of it was so arid that homesteaders failed to make a living. Today, much of the arid west is owned and managed by federal land management agencies. (Source data: NOAA)

If we divide environmental policy into "romance" and "sludge", west of the meridian we are dealing with romance lands. America's most iconic parks, wildlands, wildlife, quality habitat, and spectacular vistas lie mostly in this arid zone. While there is a good deal of romance land to the east, most is in the West. For westerners this is our home territory; it provides the context and substance of our lives and our cultural founding.

What is the West? Based on the census of 1890, Frederick Jackson Turner declared the American western frontier officially settled and to be gone. Full-scale economic development of the west was well under way and few places remained unexplored. He believed our great western frontier shaped the American individualist nature and the American character. That thesis is still debated in academic circles. He wrote of the role of the American frontier that the struggle with wilderness made Europeans into Americans. Expanses of free land and abundant resources created a free and independent people. Historians Richard Etulain and Michael Malone augmented that view in their book The American West. Patricia Limerickchallenged the thesis with her book The Legacy of Conquest. She, and others, reflected on the role of others in the western drama. Read a short review of the debate here. The conversation is important because of the political and social

culture(s) that pervade the western states today. In many ways the tensions over public lands management is found in the differing western cultures as well as differences with our eastern cousins.

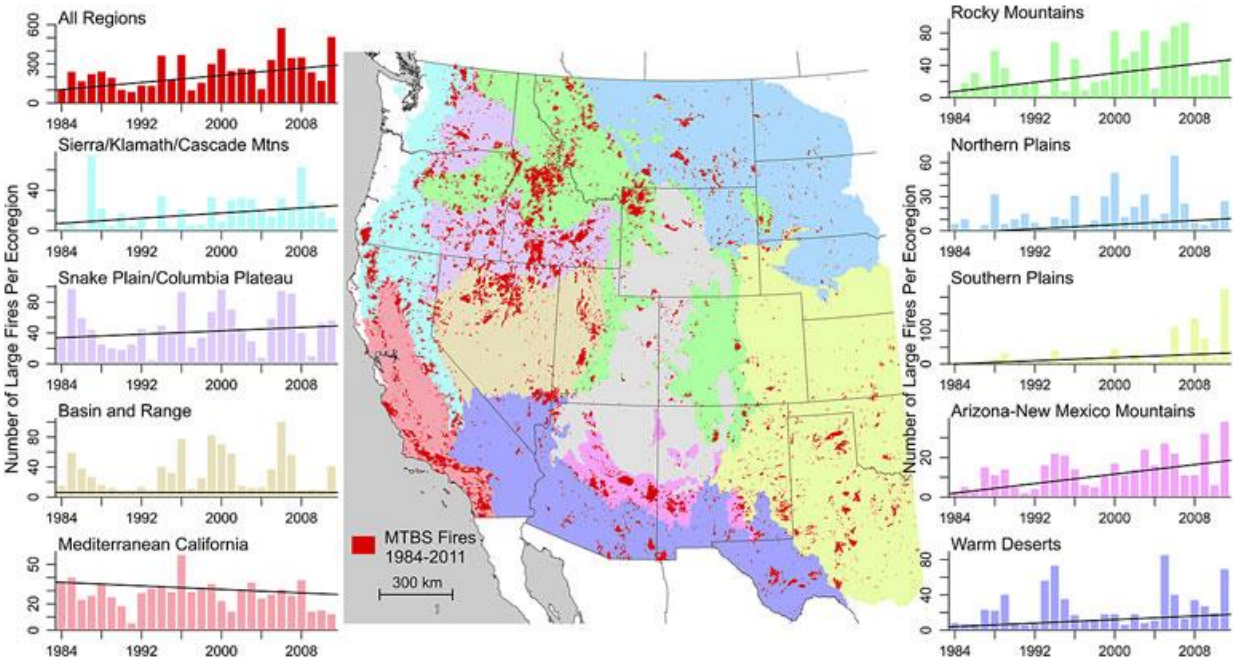
The discovery of gold, silver, and other precious minerals in California in 1849, in Nevada and Colorado in the 1850s, and in Idaho and Montana a decade later, drove a migration of prospectors and miners into the nooks and crannies of the Rockies and in the process made westerners of migrants from Europe and Scandinavia. The timber industry followed - wood was needed to build mining communities and provide timbers to prop up mine shafts. Like churches in medieval villages, a triangular sawdust burner stood in nearly every small town where gold and silver was mined. Timber made the railroads even richer as they logged off lands given to them to encourage westward expansion. A class of natural resource robber barons Charles Wilkinson called "the Lords of Yesterday" was born. Today that economy is mostly gone replaced with second homes and tourists. The idealizeed western culture persists.

The Park and surrounding lands provides an ideal subject through which to view romance. Most everyone knows of Yellowstone and those who have visited inevitably fall in love with the landscape and charismatic animal life. Many return multiple times. Some move here and make a life around its nature and beauty. How many understand the policy evolution that left large expanses of public lands - especially Yellowstone, and the people that made it happen?

The frontier ethic shaped by seemingly limitless land and untold wealth had a profound economic impact still felt today but, in the rush to develop the storehouse of riches on public land, we were terribly wasteful and careless. A series of laws gave away resources to those who would develop them – water, minerals, timber, and land was there for the taking by entrepreneurs and industrialists alike. In the process, rivers were destroyed by hydraulic mining and whole forests were clear cut. By 1900, over 50 million American Bison had been wiped out, almost driving the species to extinction. The post civil war years were indeed a tragedy of the commons on an immense scale. There is still a good deal of cleanup to be done following those decades of development. Consider the mine runoff accident on the Animas River in Colorado in 2015; there are over 48,000 similar mine waste sites throughout the Rocky Mountains.

The initial movement toward conservation was embedded within the Progressive movement of the turn of the 19th century. Where resources were essentially free and

unregulated, Progressives favored dropping these laissez-faire practices in favor of a more active federal role in managing the economy. The Progressives were about solving problems and the way to do that was using the best available science. Forestry and silviculture would recover the forests; wildfires would be fought by the recently established U.S. Forest Service. The new forest rangers were recruited from forestry schools housed in the Ivy universities of the east and so were assumed to know best. Congress poured money into the effort and, by 1935; the head of the Forest Service — a veteran of the Big Blowup, Gus Silcox — declared that all forest fires should be extinguished by 10 a.m. the following day. The Forest Service created its own army to fight fires, replete with ground troops to dig trenches and set backfires. They trained elite smoke jumpers to parachute into remote areas and maintained an air force of tankers, reconnaissance planes and helicopters. Of course now we know that, in addition to other factors, the unremitting war on forest fires contribute to the massive fires that burn across the west in the 21st century.



In the western U.S. the number of large fires is increasing. The analysis is based on a database capturing large wildfires (> 405 ha) in the western U.S. between 1984 and 2011. The trend is most significant for southern and mountain regions, coinciding with trends toward increased drought severity. (Source: Dennison, et al. 2014. Large wildfire trends in the western United States, 1984-2011. Geophysical Research Letters)

One result of the scientific management era is seen in how we managed wildlife. Up through 1900 wildlife were managed as any other common pool resource. Unregulated market hunting resulted in massive slaughter of shore birds for

plumage, extermination of the passenger pigeon for food and, commercial hunting of elk and deer. Some populations were wiped out, others nearly so. Passage of the Lacy Act in 1900 and the establishment of a system on national wildlife refuges helped many populations recover. Notably however, in the eyes of wildlife managers, there were now good animals and bad animals. The Predatory Mammal Control Programestablished in 1931 ensured that "pests" (mountain lions, bears, wolves, coyotes, bobcats, fox, etc.) were eliminated in favor of agribusiness and "good" wildlife defined as elk, deer, turkey, and similar charismatic and utilitarian species.

U.S. Army Soldiers display a wolf pelt killed near Soda Butte Creek in YNP in 1905. (NPS photo)

The national parks too were subject to the Progressive culture of wildlife management. Feeding bears garbage so the public could enjoy them was common as early as 1889 in Yellowstone and the 1930s in Yosemite. The emphasis of park management during those early days was on public enjoyment rather than conservation. The last garbage dump in Yellowstone was closed in 1970.

To say that management of public lands and resources has undergone a radical transition in favor of the natural world would be inaccurate. Rather, science has changed how we view the natural world and, for the most part, natural resource managers adapted because of emergent public demand for a clean environment and healthy ecosystems. Predators are no longer seen as the limiting factor for game animal populations indeed, to enlightened wildlife managers they are a necessary element for healthy herds of prey and game species. Tourists demand to see bears

and wolves in thier natural environment. Fires are allowed to burn when property is not at risk and forests are cleansed of fuel buildup. We understand that a forest that burns is a healthy forest. We no longer spray DDT in the parks and we often think hard and long before adding to the permanent human infrastructure in our national parks. Roads that gave access to visitors are now understood as barriers to animal migrations.

Cultures of management and visitors change in some predictable ways. Quality attracts quality whether money, goods and services, or people. The process is autocatalytic; greater quality attracts money and money attracts quality but alas, not all good things go together. Amenity towns like Bozeman, MT or Flagstaff, AZ exemplify this process. Many lament the changes to their small slice of heaven on Earth while valuing better grocery stores, medical care, restaurants, cell phone service, and air transportation that accompanies growth in the local economy and population. The solution, some conclude, is to simply close the gate after they arrive.

The same is true for our national parks. More visitors from all over the world increasingly visit our national parks - especially Yellowstone, Grand Canyon, and Yosemite. This places greater pressure on park managers to control traffic, crime, and wildlife encounters. Unfortunately, as in amenity communities, the increased revenues cannot possibly keep up with infrastructure demands and maintenance.

The future of our parks and public lands holds a good deal of uncertainty but new thinking and new wisdom will inform it. Where Bob Barbee was the first of a new generation of natural resource managers trained in wildlife management and ecology, those of the future may more closely resemble Yellowstone's current superintendent Dan Wenk – a man well versed in forging alliances with nonprofits and whose expertise lay in creative public fiscal management. Where the issues of large predator management may become a thing of the past, the future of progressive park management may be in entrepreneurial experiments like public/private partnerships or as freestanding non-profit land trusts partnering with the park service. These are potentially risky endeavors that require a new sense of administrative entrepreneurship.

Most people associate entrepreneurs only with for-profit enterprises. However, entrepreneurs with high social capital also create novel institutional arrangements to achieve social and environmental goals. They discover innovative ways to organize and mobilize people and other resources to produce things people value far more than financial returns. Examples are good habitat for wildlife, social welfare

organizations, and civic institutions. They need not invent things, few do. Creativity is the common denominator; it is the key to the success in every case. Bob Barbee used his personality and depth of knowledge, along with a willingness to take risks, to become a successful bureaucratic entrepreneur.

Park management has evolved and will continue to do so. From its designation as the world's first national park in 1872 until 1919 the U. S. Army was assigned responsibility for its development and stewardship. John Stoddard was a Williams College graduate who went on to Yale Divinity School. He was a professional traveler and lecturer who toured Yellowstone in the 1890s. Stoddard observed and defended the position that only the Army could manage this responsibility.

This made sense in context. Yellowstone was a commons whose exploitation needed control to protect its many values. Poaching and looting were genuine and observed threats. Today the Park Service manages and protects but the balance continually shifts. In view of likely developments, that model too may be obsolete. Why? Constraints on the Federal budget constraints pose a looming threat.

America's federal debt as a percentage of our annual GNP is growing because of fiscal promises for Social Security, Medicare, Medicaid and similar statutory obligations; these are necessary and valuable for our nation's well being. They are non-discretionary expenses with a powerful and broad constituency. A financial crunch is inevitable and as much as Americans love their national parks and other environmental amenities, hard trade-offs linger on the horizon. And then what? Managerial entrepreneurship is one answer. New fiscal tools are another.

The shift in management requires bureaucrats to take risks – both political and fiscal. Such behaviors are antithetical to most in large public and private organizations alike. Our conversations with Bob Barbee and his contemporaries demonstrate what a non-risk adverse manager can achieve. The hard problems of bear management and wolf reintroduction provide lessons for those who chose public service. Let’s learn from our elders what risk and reward look life from their point of view. Let's think about what future management might hold in store for our nation’s crown jewels.

The Elders

In Native American culture tribal members often turned to the wisdom of their elders for leadership and vision. Elders were not always the oldest or even the wisest. They were irreplaceable keepers of oral history, tradition, and the legacy of knowledge. Here, we present six people with irreplaceable perspectives on the history and management of three cornerstone issues for Yellowstone National Park: bears, wolves, and fire. Two of these individuals were there at the beginning – Bob Barbee as superintendent from 1982 to 1994, and John Varley, his chief scientist in the park. They saw the controversies as insiders from start to finish.

In the twenty five years since wildfires burned over third of Yellowstone there have been papers, books, and remembrances; a partial list can be found at in the reference portion at the end of this work. Grizzly bears and wolves have also attracted their fair share of attention. The fires of 1988 were a spectacular ecological lesson that have been variously interpreted as either a bureaucratic failure that resulted in the ruin of one of America's great treasures or, the success of brave park personnel that persisted in allowing the park to be managed by nature rather than politics. The truth, as usual, is somewhere in between and inevitably, involved some luck and the fortuitous timing of a September snowstorm that put the fires to rest.

The management of large predators in the park has been covered from a wide spectrum of political viewpoints going all the way back to at least the 1943 when the last wolf was killed within the boundaries of the park. The discussion of the management of wolves and bears is mostly focused on a myriad of complex questions related to ecosystem science and human tolerance: To what extent should they exist in the park, How do we coexist with large predators that can easily kill us, Is the reintroduced wolf a "super wolf", How many bears are enough, How can an ecosystem be said to be complete without a full complement of predators, Is modern resource management really a thinly disguised "War on the West"? These are important and difficult issues that will be debated for many years to come. The story that has not been told, and the reason for this work, is how and why Yellowstone

National Park officials decided to manage the two keystone predators they way they did.

At various intervals between 2014 and 2016 I was lucky to spend time with the elders below. John Baden and I have been friends for many years and it was through his programs with federal judges I was introduced to Bob Barbee and John Varley. As I listened to them talk about their park careers it occurred to me that I had never heard their version of the story. In 2015 Bob and John, as well as Doug Smith and Scott McMillion, joined us in a dinner and taping session at the Baden ranch in Gallatin Gateway, Montana. We caught up with Dan Wenk at his home in Mammoth Hot Springs in the Spring of 2016. I had three goals for this work. My first intention was to pull together the stories of bear and wolf management from the point of view of the managers who were there, on the ground, making decisions on a daily basis. Bob's perspective on the role of Dick Cheney during early discussions of the wolf reintroduction will come as a surprise to most. Second, I wanted to try to explain why the two management efforts - rebuilding the Yellowstone grizzly bear population and reintroducing wolves to the region, has had such different political results. I focus on the types of institutions that governed each and the role they play in shaping public perception. Finally, I wanted to put a human face on management of these two watershed issues. I do so with the hope that those who follow Bob, John, Doug, and others can appreciate the importance of humility, honesty and personality so important to modern resource management. The obvious lesson is that resource managment needs good science but it also needs good people. I hope what follows satisfies a small portion of those goals.

Robert "Bob" Barbee

Bob Barbee in Yellowstone in 1987 (NPS photo)Robert (Bob) Barbee spent over four decades in the National Park Service trying to sort through the maze of conflicting values, weighing scientific findings with political reality, and learning how to

be a successful public servant. His job was to care for our version of crown jewels – our national parks. After serving in the U.S. Army, he began his career in the park system first as a seasonal ranger and eventually as the Superintendent of the world's first and most iconic national park – Yellowstone. Along the way he worked as a ranger at Carlsbad Caverns in New Mexico, several stints at Yosemite National Park and Point Reyes National Seashore in California, and Big Bend National Park in Texas where the Rio Grand forms part of the international boundary with Mexico. He was the superintendent of other important parks in the system including Cape Lookout and Cape Hatteras National Seashores in North Carolina, Hawaii Volcanoes National Park on the island of Hawaii, and Redwood National Park in California. After running Yellowstone for twelve years, he was named the Regional Director for the Alaska Region of the National Park Service, a system of twenty-three parks including Katmai, Denali, and Gates of the Arctic – over 54 million acres. He and his wife Carol retired to Bozeman, Montana in 2000.

John Varley, PhD

John Varely and President George Bush Sr. in 1989.(YNP/Jim Peaco photo)John Varley, PhD. John worked as a fishery biologist in Yellowstone from 1972 to 1980, returned to Yellowstone in 1983 as chief of the Division of Research. By 1993 he was the director of the newly created Yellowstone Center for Resources – an office to centralize the park's science and resource management functions under one roof. He retired from the Park Service in 2006. Immediately after retiring, John took on the role of executive director of the Big Sky Institute at Montana State University in Bozeman. In between stints at Yellowstone John was a fishery biologist for the State of Idaho and, before that, a fishery research biologist in Utah. When John arrived at the Park in 1983 the fishery was in poor shape, he and his research and management crew rehabilitated the cutthroat trout fishery and began dealing with the invasion of Lake Trout in Yellowstone Lake. John has stayed active in that effort

up to this day. In my experience, the word “gentleman” could have been invented for John Varley.

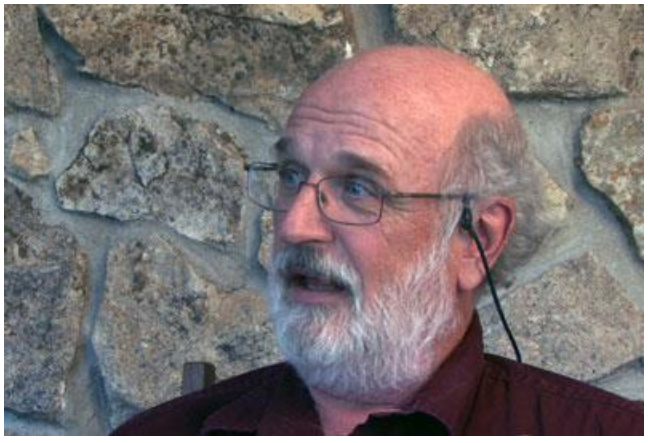
I have spent many hours now with both Bob and John in each others company. Their genuine respect to each other and their deep friendship is obvious. Barbee the politician and Varley the scientist are perfect foils for each others strengths and weakness. Together they made a formidable pair of bureaucrats (and I say this in the most positive manner possible) that hostile Congressmen or community member could face.

Dan Wenk

Yellowstone super-intendent Dan Wenk (Credit: Bozeman Daily Chronicle)Dan Wenk, Yellowstone’s current superintendent, initially came to Yellowstone when he was hired by Bob Barbee. Dan served as Deputy Director of Operations for the National Park Service in Washington D.C from March 2007 through February 2011, which includes 394 national park sites covering more than 84 million acres. It is an expression of the importance of Yellowstone that Dan became the superintendent after serving as the Acting Director of the National Park Service during the transition of the Obama Administration. Wenk received the Department of the Interior Meritorious Service Award in 1991 and Secretary Executive Leadership Awards in 2008 and 2009. Dan also received the Meritorious Presidential Rank Award in 2010. Dan is a landscape architect by training - a background he shares with some of the early pioneers of the national park movement.

Doug Smith, PhD

Doug Smith carrying a wolf in the Rose Creek Pen during the reintroduction efforts in 1997. (YNP photo)Doug Smith, PhD, is an exemplar for the National Park Service. He is one of the world's experts on wolves and can answer most any question put to him about the ecology of Yellowstone. More than that though, Doug has passion for the National Park Service and his role in the agency. He has an obvious and deep respect for the Yellowstone ecosystem and especially its wolves. Doug is currently the project leader for the Yellowstone Gray Wolf Restoration Project in Yellowstone and his ability to communicate the nuance of wolf management in a rational and logical manner can disarm even the most intransigent opponent of wolves - people who represent all sides of the issue like and respect him. Doug has studied wolves for over a quarter of a century. Prior to coming to Yellowstone as the project leader, he worked as biologist for the Yellowstone wolf project from 1994 to1997 and has been with the program since its inception. Before that, he worked on Isle Royale in Michigan with wolves from 1979 to 1992 and also with wolves in Minnesota in 1983. He wrote his dissertation on beavers and continues to study them as well as otters and other small mammals in the park.



Scott McMillion

Journalist Scott McMillion 2015 (Dan Smith, Oolite Media photo)Scott McMillion is the owner and editor of the Montana Quarterly and is an expert on bears, fires, and the west in general. Scott grew up in Livingston, Montana. After graduating from the University of Montana, he knocked around the world

for a few years including spending enough time to become, in his words, "the most unpopular guy in Antarctica". He came home to stay in 1988 and took a job as a reporter for the local Bozeman Daily Chronicle. That summer Yellowstone began to burn and Scott was there to cover a story that took on international significance. His journalism and magazine has won dozens of awards and his book "Mark of the Grizzly" became an instant classic when it was published in 1999; it is now in its 13th printing and second edition. He's been a frequent guest on national radio and television news programs. His writing appears in magazines and newspapers around the nation.

John Baden, PhD

Ramona and John Baden (Baden Collection photo)John Baden has a depth of knowledge about the West, protected lands, and the politics that go with them that runs deeper than most. John is known as an ecological economist but is, in actuality, an anthropologist by training. He lived with and studied the political economy of the Hudderite communities on Montana. With Rick Stroup he was one of the primary founders of what became known as "New Resource Economics" and the use of an economic way of thinking about management of natural resources. In 1985 he founded the Foundation for Research in Economics and the Environment (FREE) an organization that has its roots in the Center for Political Economy and Natural Resources, which Baden helped establish at Montana State University in 1978. For over twenty years, FREE held seminars for Article III federal judges, and law and economics professors. This was in addition to seminars, writing books and opinion pieces. Over the last three decades John and Ramona have rehabilitated a small ranch near Gallatin Gateway - the rail terminus for travelers to Yellowstone beginning in 1927.

Bridger Range in the Greater Yellowstone Ecosystem (Jerry Johnson photo)

Bob's management expertise goes far beyond his travels in the national park system. His tenure was a success for many reasons – he has a scientific grounding for understanding the ecological issues, his Master's degree in Natural Resource Management from Colorado State University was a combination of natural and social science.

At one point in the early stages of his career as a park superintendent Bob found himself far from the west and the issues with which he was most familiar. His new assignment was mostly about managing sand. He turned it into a life lesson in management.

Bob is one of those rare individuals who has a deep grasp of the issues but takes the time to listen more than he talks. He has a keen ear for the local who feels insulted by the actions of federal bureaucracy and he has the political sensitivity to connect with a hostile congressman. He is a gentleman with a good sense of humor and even better sense of the art of the possible. His career and the lessons he absorbed are emblematic of the best of our public land managers.

Bob's time in Yellowstone between 1983 and 1995 was a period of intense growth and change. Visitation grew by 33% with the only dip being 1988 when much of the park was on fire. During those twelve years he presided over the management of three of the most significant political and scientific events in the history of Yellowstone and the National Park Service – helping bring the Yellowstone Grizzly bear back from the brink of extinction, managing the spectacular Yellowstone fires

Yellowstone Grizzly and cubs (YNP photo)

of 1988 and, laying the groundwork for the restoration of Grey wolves to the American public lands. A significant misstep and the politics of any of these issues could have cost him is job and career.

Between the 1920's and 1930's, the grizzly bear lost 98% of its habitat in the contiguous United States. By 1975, of the 37 known populations to exist in 1922, only six known populations of bears remained. Although no one knows the exact numbers, by 1975 the population of bears in Greater Yellowstone region was estimated to be around 250. It was that year that the bear was listed as endangered under the Endangered Species Act. By the time he arrived in Yellowstone in 1983, much of the responsibility of recovering and managing the great bear fell to Barbee.

Just five years later Yellowstone began to burn. Over the course of five months, in the driest period on record, one third of Yellowstone National Park was overrun by spectacular wildfires. Late autumn snows extinguished what 9,000 firefighters, over 4,000 military personnel, and $120 million in government expenditure could not. Members of Congress, fans of the Park, and locals were outraged. Again, Barbee was at the center of a national environmental controversy and earned the nickname – Bar-B-Q Bob.

Bison during 1988 fires (YNP photo)

Wolf reintroduction (Credit: NPS)

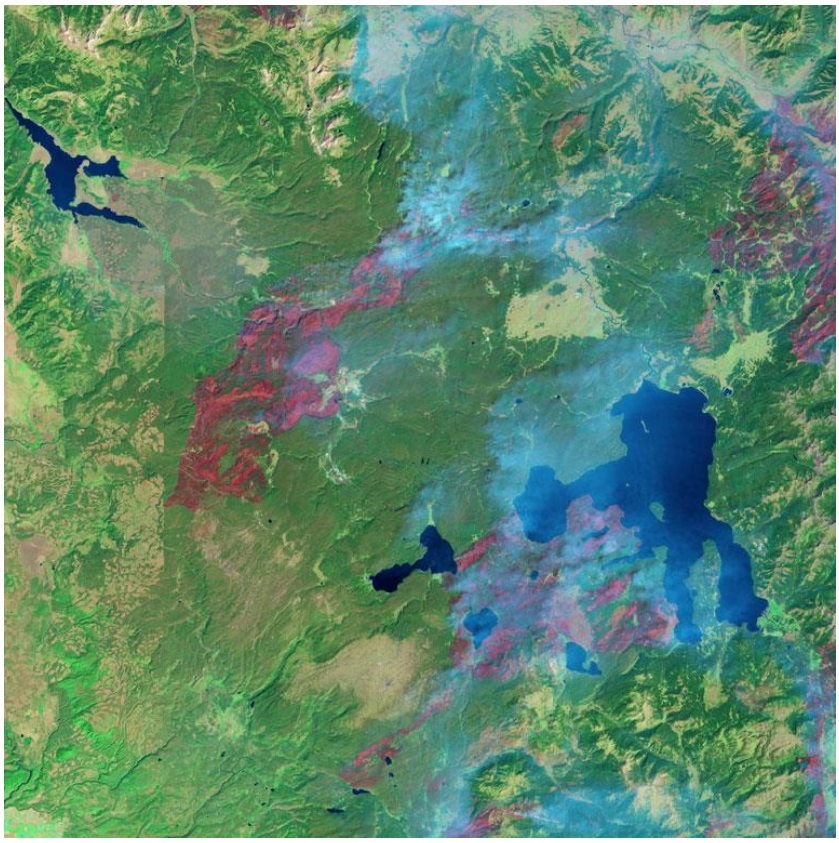
By 1943 the war on the wolf had been won. Leo Cottenoir, a sheepherder on the Wind River Reservation shot the last known Yellowstone wolf near the southern border of the park. Like the bear, the grey wolf was widespread across the whole of North America and, like the bear, by the 1930's it was all but eradicated in most of the contiguous U.S. In 1987, the US Fish and Wildlife Service proposed a recovery plan for the grey wolf to large and remote expanses of public land with Yellowstone at the core. After considerable political maneuvering, a reluctant Congress funded the first effort to restore wolves to their previous niche in Yellowstone. Once more, Barbee found himself managing people, wildlife, and politics.

Bob's central talent as a manager is simple – surround yourself with great people, listen to them and your constituents, understand the political context and, don't take criticism personally – even if it is. These lessons helped him negotiate the public land management hot seat for over four decades. Our hope here is that his lessons can be exported and applied for others who follow his career path in public service.

Barbee attributes his success to the benefits of working with a large number of talented and dedicated individuals in the Park Service and beyond – notable among them is John Varley – his chief scientist during his years in Yellowstone. He also understands that effective park management involves the political economy context of ecology – institutions and relationships matter. We believe that Barbee and his senior colleagues featured here have a good deal of wisdom to share. Our Wisdom of the Elders project preserves and shares an organized sample of the wisdom of Bob and a few of his many deserving colleagues.

An Island in the Rockies

In the heart of the North American Rocky Mountains is an island of immense ecological complexity. The island, Yellowstone National Park, is the core of a greater Yellowstone ecosystem and, like other great ecosystems of the world, is stellar place to come to terms with the earth's natural processes, the web of life, and the role of humans in the natural world. In Yellowstone National Park, those lessons are writ large across a landscape that, in 1872, was designated the world's first national park.



This landsat photo of the 1988 Yellowstone fires on August 23 shows the complexity of the topography of large scale public landscapes like Yellowstone. Such ecological complexity requires complementary administrative adaptability and expertise especially during highly poliitcal events like the 1988 fires. (Image based on Landsat 5 data from the United States Geological Survey, NASA)

Central to the establishment of Yellowstone was the preservation of the spectacular geothermal features, landscapes, and animal populations so iconic to the park today. The geysers and hot springs that give Yellowstone its name were originally thought to be a myth fabricated by early visitors to the region. When the first scientific expedition to the area was launched in 1863, scientists found not only the largest geothermal system in the world, they found a region inhabited by terrifying predators and large herds of grazing animals that migrated across large expanses of wilderness.

The Grand Prismatic Spring in the Middle Geyser Basin is the largest in the United States and one of the three largest hot springs on the planet. (YNP photo)

Yellowstone hosts over 3.5 million visitors each year. National parks are a place for tourists to get up close and personal with nature and wildlife but such interactions are increasingly a management issue for park personnel. (Jerry Johnson photo)

The idea of a national park was to preserve those natural wonders while providing for the use and enjoyment of resources for future generations. It is a balancing act still played out every day in Yellowstone by its managers and resource experts.

The park is home to key predator species (grizzly and black bear, grey wolf, mountain lion), prey species (elk, deer, moose), and a host of birds and smaller mammals. A mosaic of vegetation including coniferous

forests, arid shrub and grasslands add to the ecological complexity. Snowmelt from the park flows to the Mississippi, the Colorado, and the Columbia Rivers. Over 3.5 million tourists visit the park each year. Sit for a few minutes at the boardwalk near Old Faithful geyser and you will hear a dozen languages and see people from all walks of life. Yellowstone is indeed a global destination.

The concept of the park as an island within a larger context is important. The term Greater Yellowstone Ecosystem is a term first used by Frank Craighead in a document he and his brother John wrote in 1972; he also referred to it in a report to the Congressional Research Service in 1986. The park is clearly an artificial social construct meant to delineate administrative boundaries; wild animals, grizzlies and wolves included, do not respect such borders and freely move from parkland to national forest and private land. Enlightened management of large wide-ranging animals required acknowledgement of those movements and reconciliation of the differing administrative missions of the National Park Service and the US Forest Service would need to be considered.

The figure below shows the outer edge of their grizzly locations and so the expected historical range of the bear. Based on these data, the Craigheads introduced the concept of the Greater Yellowstone Ecosystem. The idea became central to bear management in the region and is still used 40 years later.

Public displays of nature and natural history were popular in 18th century Europe and America but conservation of biodiversity as a management concept came much later. The romanticism of early American conservationists like Thoreau, Roosevelt, and Muir inevitably gave way to rationalists in the mold of Pinchot, Leopold, and, in Yellowstone, John and Frank Craighead. In 1978, at a conference at the University of San Diego, scientists advocated for a discipline that would place conservation of large natural systems at the center of research and policy; it became known as conservation biology.

The science of conservation biology stems from the English tradition of the management of nature in all its forms. Like other institutional frameworks, conservation biology comes with a prejudice. In this case it places an emphasis on biological surveys that document the assembly of species and their interactions across multiple scales. Conservation biologists believe it is not enough to simply protect animals and their habitat, what is important is to preserve landscape scale processes; preserve the ecological interactions among the parts and you preserve multiple species and, the whole. Biodiversity, measured by number of species functioning in a given system, is the metric by which management is judged.

By extension, the bias reflected in conservation management is that if we can get the science right the maintenance and restoration of biological diversity will follow. Conservation biology is a prescriptive in the sense that the goal is a management plan for the conservation of biological diversity at every level of the natural community. Michael Soulé, the father of conservation biology, describes it as a "crisis discipline." He refers to a disciplinary focus on the rapidity of ecosystem change, the increasing rate of biological extinctions, and the global loss of biodiversity; conservation lacks the luxury of time if it is preserve the natural world. This is why initiatives like restoration of predator/prey relationships takes on a sense of urgency and ultimately – scientific advocacy.

This map depicts the Greater Yellowstone Ecosystem as defined by Grizzly bear habitat identified by John Craighead in 1972. The two national parks (Yellowstone and Grand Teton) form the core of the ecosystem; green depicts the outer boundaries of the ecosystem. The bold line outlines the Grizzly Bear Primary Recovery Zone under the Endangered Species Act. (National Park Service)

The iconic Yellowstone Grizzly (*Ursus arctos horribilis*) is a conservation milestone. Almost extinct in 1970, the bear is now considered fully recovered and is one of the Park's main attractions. Yellowstone National Park is unique in the lower 48 states of America because it holds the entire suite of large carnivores that were present at the end of the Pleistocene (11,000 years ago) together with healthy populations of large prey such as elk and bison. The Yellowstone Grizzly bear, the grey wolf, mountain lions, the wolverine, and coyotes, as well as eagles and peregrine falcons hunt their preferred food source in largely prehistoric conditions. (YNP photo)

Ecosystems are just that -- systems. The parts— species, habitats, and nutrients—connect with one another directly and indirectly at multiple trophic levels. Changes in one part of the ecosystem can affect other parts. Resiliency is the degree to which a system can tolerate disturbance to those connections such as loss of a key predator or limiting the ecological fire regime. It is a measure of how much disturbance a system can withstand without changing self-organized processes and structures that make up the whole. Ecological resilience is maintained by keystone structuring processes across a number of scales and metrics but fundamental is the idea of functional biodiversity. In the Greater Yellowstone, the keystone process is the predator/prey relationship where the major actors are wolves, bears, elk, and bison. The logic is that if these keystone species are intact within the loose boundaries of the Greater Yellowstone, most of the rest of the ecosystem will remain functional and healthy. The key ecological question for many scientists and policy makers is how far these processes can deviate from "the norm" before system collapse. When faced with choices about the makeup and number of predators or letting wildfires burn, park superintendents weigh scientific, political, and agency costs and benefits. This is the management dilemma faced by virtually all public lands managers the world over. A key to preserving biodiversity lies in the inherent complexity of ecosystems. Complexity can be found in the landscape in the form of "patchiness", the idea that other things being equal, larger patches of potential habitat tend to support more biodiversity than smaller patches and, structurally complex patches tend to be more important for habitat than homogeneous landscapes.

Fires do not burn uniformly across the landscape. The concept of patchiness and ecosystem complexity is seen in how wildfires, like this photo from the 1988 Yellowstone fire, burn across large landscapes. This mosaic creates opportunity for a diverse and uneven distribution of vegetation and habitat for a diverse range of creatures. The result is a dynamic landscape rather than one of ecological balance. This patchiness is one important part of maintaining biodiversity. (YNP photo)

Predator/prey relationships across and between trophic levels provide the necessary stability for almost infinite numbers of species to exist in ecosystems. Predators keep the size of species populations in check at supportable levels and so, encourage resource efficiency. When prey numbers are high, predators increase and reduce their numbers. When predator numbers are high, prey decrease and thus reduce the number of predators through starvation and lower fecundity. There is no true "balance of nature" rather, ecosystems are subject to active dynamic processes at all trophic levels.

Wolves, like other predators, are wary of taking on large and dangerous prey like this cow bison. In its weakened state the bison is attacked and killed by the cooperative behavior of the pack. (Doug Smith/YNP photo)

The Yellowstone landscape is powered by predator/prey interactions. Living organisms exist within webs of interactions with other living creatures, the most important of which involve eating or being eaten.

Complex interactions among several species are called food webs while simpler linear ones within a particular food web are called food chains. Sometimes, major disturbances can result in cascading effects, either positive or negative, between tropic levels.

The Greater Yellowstone Ecosystem is well understood to be ecologically complex but, in reality, no more so than other ecosystems such as Serengeti in Tanzania, the rain forests of Brazil, or even Central Park in the heart of New York City. In this respect Yellowstone is simply one of many spectacular ecosystems found on every continent. What sets places like Yellowstone apart is the mosaic of large numbers of predator and prey species resident on ecologically functional landscapes and credible institutions that allow for management decisions to play out on those landscapes. One reason land managers in places like Yellowstone can conduct large scale experiments with wildfire and wolves is that robust institutions exist. National parks operate under a Congressional mandate, courts and nonprofits monitor their progress, the science community is invited onto the landscape. These sometimes competing forces help safeguard the efficacy of ecological experimentation.

Wicked Problems in Yellowstone

Ask any person in America about their impressions of the American west and many will point to our national parks and public open spaces – the products of forward thinking and seemingly unlimited wild lands. In polls over several decades, support for national parks is unwavering. Visitation continues to increase especially in the natural parks like Yosemite, Acadia, and Yellowstone. The writer Wallace Stegner saw “geographies of hope” in our wild places and public lands. He wrote that “visiting them was good for us as vacation from our insane lives”. More broadly, he called national parks "the best idea we ever had. Absolutely American, absolutely democratic, they reflect us at our best rather than our worst."

The Best Idea. Various people are credited with the statement that the national parks are the best idea America ever had. In his stellar PBS series The National Parks: America's Best Idea, Ken Burns attributes the quote to Wallace Stegner. Others - Franklin and Theodore Roosevelt, John Kennedy, Steward Udall, virtually every director the National Park Service, and others have invoked the American ideal of national parks as reflecting the best of American values. The earliest source of the quote (and acknowledged by Stegner) is from Lord James Bryce, the British ambassador to America in 1912. However, a rereading of his speech to the American Civic Association, "National Parks: The Need of the Future" reveals that he never used the term "best idea". The source of the quote, according to Canadian park historian Adrian Hawkins, is still somewhat of a mystery. In any case, it has now entered our mythology and is most often attributed to Stegner as a uniquely American idea.

Management of our public lands is a continual process of weighing tradeoffs. Subject to political whims, we vacillate on what we want them to produce and how we should go about doing so. For example, in 1872 Congress passed both the

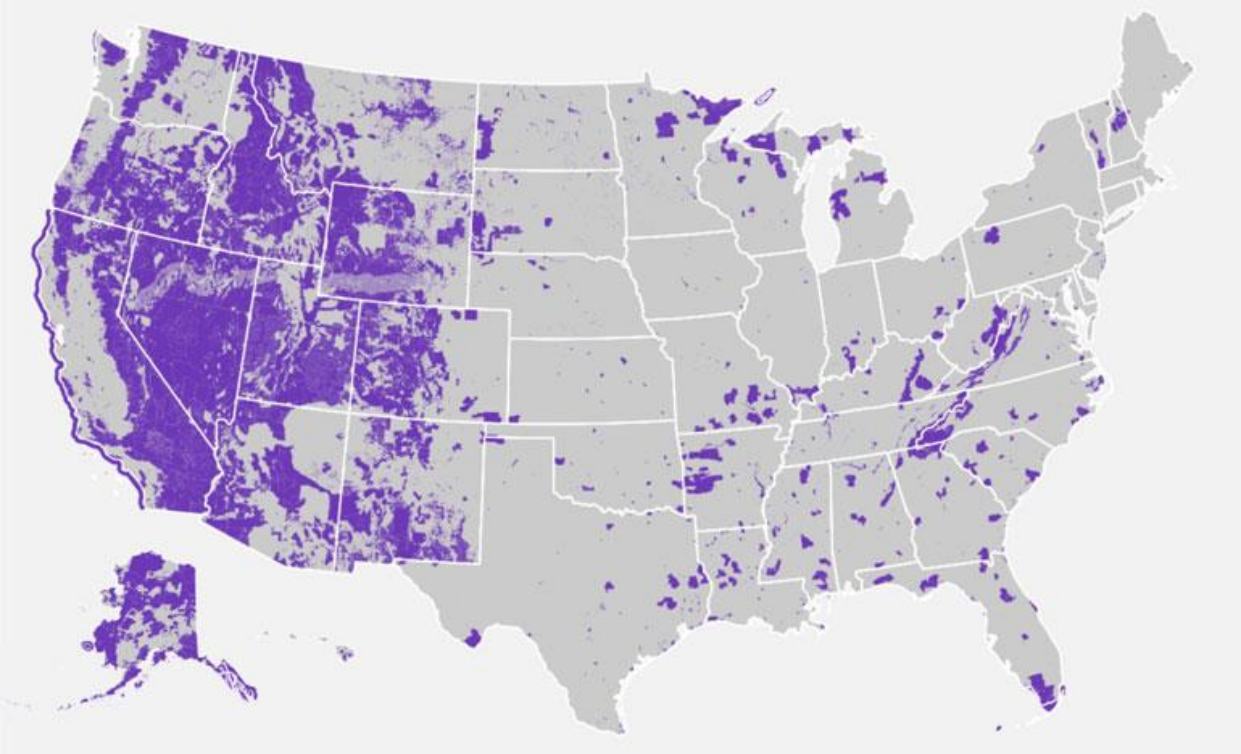
visionary Yellowstone Park Protection Act and, the General Mining Act. The first set aside public land from development in favor of conservation, the other codified the exploration and ownership for public resources in favor of economic development. Originally, our public forest reserves were managed to produce wood products and protect watersheds. Conservationists pushed back when the director of the U.S. Forest Service Gifford Pinchot supported building a dam in the Hetch Hetchy valley near Yosemite. Water would be diverted to the San Francisco Bay area to help spur the urban economy. John Muir, the Scottish-born mountaineer and founder of the Sierra Club, saw things a little differently. He considered the pristine valley as another example of America's cathedrals and opposed any development. The story is a classic in environmental studies programs.

Conservation vs. Preservation. One of the best sources of the story that recounts the history of the Pinchot/Muir/Roosevelt conflict over conservation vs. preservation is found in the first half of The Big Burn: Teddy Roosevelt and the Fire that Saved America by Timothy Egan. The fallout of Pinchot's vision has implications. In the second half of the book he chronicles the causes and consequences of the largest wildfire in American history in August 1910. In two days it burned an area more than three million acres, burned five towns to the ground, and killed nearly one hundred people. Remnants can still be seen in the black stumps of giant cedar trees still standing in the Northern Idaho panhandle. Pinchot's emphasis on utilitarianism of natural resources is directly linked to the legacy of continued fire control up through the last part of the 20th century.

Similar debates have pervaded public land management ever since. Should we continue to subsidize cattle grazing on public land or submit it to market forces, should we expand our system of wilderness areas and if so, what sorts of recreation is appropriate, should the federal government divest itself of public lands to the states? In recent decades public managers have shifted on a variety of positions in favor of the environment. They have moved from a default on predator eradication to predator conservation and their role in wildlife management. They have in some states changed the definition the legitimate use of public water from irrigation or power generation to leaving it in the stream for fishery preservation. After the fires of 1910 public lands managers sought to extinguish every forest fire they could, today we often let wildfire burn itself out without our intervention. After almost 150 years we are still debating questions of how to manage our public lands. Through all

these changes (and more) public lands managers face political and economic challenges, shifts in cultural norms, and changes to scientific knowledge as they oversee nearly 30% of the land mass of the United States.

The federal government currently owns roughly 635-640 million acres, 28% of the 2.27 billion acres of land that make up the United States. Most of it is west of the 100th meridian. Four agencies administer 609 million acres of this land: the Forest Service (USFS) (193 million acres) in the Department of Agriculture, the National Park Service (NPS) (80 million acres) and the Bureau of Land Management (BLM) (248 million acres), and Fish and Wildlife Service (USFWS) (89 million acres), all in the Department of the Interior (DOI). Most of these lands are in the West and Alaska. In addition, the Department of Defense administers 19 million acres in military bases and training ranges. Numerous other agencies administer the remaining federal acreage and they all do so according to different management goals and administrative intent.



The largest landowner in the United States is the American people through the federal government. Within the 48 contiguous states over 810,000 square miles of land is under federal management. About 90 percent of these lands are in the 11 western states. Some of the fastest growing counties in the western United States are those with significant amounts of high quality public lands. (Source: USGS)

The Greater Yellowstone region is a particularly interesting management problem because of the multiple legal jurisdictions that make up the region. This includes two

national parks, seven national forests, twenty-two counties across three states, and multiple other assorted entities including a good deal of high value private land.

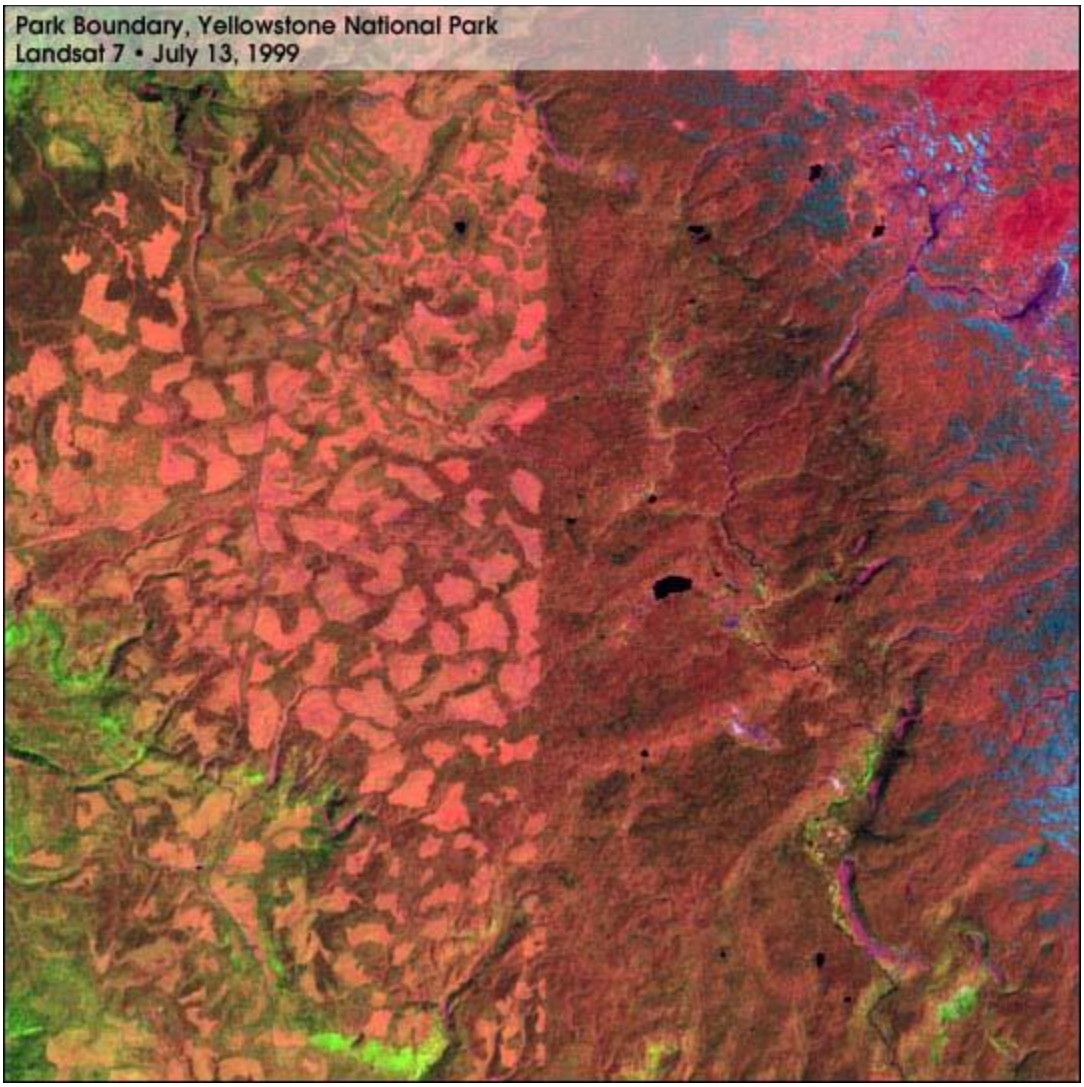
A Stark Boundary. In order to understand the complexity of multiple jurisdictions on the landscape consider the western boundary of Yellowstone and the Targhee National Forest. The Forest Service operates under a multiple use mandate is to produce timber for homes, protect watersheds, provide for recreation, control fires, and act as an economic base for rural communities. Only about 35% of Forest Service lands are available for timber harvest.

In the early 1970s, in the "Island Park" area of the Targhee, a massive salvage of lodge pole pine killed by the mountain pine bark beetle was begun. Forest planners predicted nearly 100% of the forest would die and that wildfire would sweep the area fueled by millions of board feet of dead timber. Over the next decade Idaho U.S. Senators put enormous pressure on the forest supervisors to keep cutting trees and provide local timber jobs until the forest was clear cut right up to the boundary with Yellowstone.

Just across a boundary the National Park Service will manage the same forestland for its preservation values. Where the Forest Service now spends upward of half their budget on fire suppression, the Park Service will often leave backcountry fires to burn naturally and they carry out no timber harvest. The photo below, taken in 1999 by Landsat 7, shows the stark contrast between the management of Forest Service and Park Service lands. To the west (left) of the delineation is the Targhee National Forest.

This area used to be good hunting but with the tree cover gone, the regional elk herd now lives in the Park where there is no hunting or timber harvest allowed. The boundary of Yellowstone Park is now physically marked by the many clearcuts and, seen as a straight line easily visible in satellite photographs.

Ironically, the North Fork fire, part of the 1988 complex of Yellowstone fires, started in one of the clearcuts that were meant to prevent the forest burning. A woodcutter dropped his cigarette in a pile of logging debris and the clearcuts burned as readily as the forest.



The boundary between Yellowstone National Park and Targhee National Forest is clearly seen in this Landsat 7 image. On the right side of the vertical line running through the center of the image is mature forest located inside the park. The forest to the left of the boundary is dominated by numerous clearcuts, shown as light orange/pink amidst the darker, greener forest. (NASA landsat image)

The complex administrative construction is at the heart of the region's intense political conflict over resource issues such as wildfire, timber harvest, recreation, and agriculture. These issues are grounded in deep cultural traditions, and resolution, if it comes at all, is usually short term and complicated. Those who study these particularly intractable issues call them "wicked problems".

Wicked problems seem infinitely difficult to solve. Politics and emotion frequently overwhelm good sense and often, good science and logic. The term wicked problem

is used in the context of public policies where a "purely scientific-rational approach cannot be applied because of the lack of a clear problem definition and differing perspectives of the affected public". Wicked problems often lack optimal solutions or definitive answers because the conditions that define the problem change over time; they are forever issues. Cultural bias, on the part of both the park service and area residents especially in the context of environmental policy, plays a key role in our inability to find resolution.

Ten characteristics of a wicked problem:

- There is no definitive formulation of the problem. The information needed to understand it depends upon one's idea for solving it. Formulating a wicked problem *is* the problem.
- There is no stopping rule. Because solving the problem is identical to understanding it, there are no criteria for sufficient resolution and therefore completion.
- Solutions are not true or false, but good or bad. Many parties may make (different) judgments about the goodness of the solution.
- There is no test of the solution. Any solution generates waves of consequences that propagate and spawn new problems.
- Every solution is "one-shot" -- there is no opportunity to learn by trial and error. Every solution leaves traces that cannot be undone. There is only another interation.
- No enumerable set of solutions.There is only one "good" solution and that is defined by your position on the issue.
- Every wicked problem is unique.There is nothing to learn from past solutions to similar situations.
- Every wicked problem is a symptom of another problem. It resides within a failed system.
- Wicked problems can be explained in many ways. There is no obvious cause.
- The policy maker has no right to be wrong. He is responsible for the well-being of many; there is no such thing as hypotheses that can be proposed, tested, and refuted.

Read more

In most instances, social values and conservation science share the same goals for the Greater Yellowstone Ecosystem. The public lands agencies are generally honest brokers in the policy of natural resource management for the region as they struggle to fulfill their agency mission. The source of policy conflict is not, as might be readily assumed, when we do not know enough science; the problem is that we often do not know enough about human values with respect to ecological science of complex ecosystems.

Today, the "most wicked" problem in the Yellowstone region is the continued disagreement over the reintroduction and subsequent management of the grey wolf. Conservation of large apex predators like wolves and bears is problematic for a variety of reasons. Such animals are potentially dangerous to humans and are often perceived to threaten private property as they prey on livestock on both public and private lands. Predator management has been a political issue in the region for almost 100 years and, in the case of the wolf, continues with no end in sight.

Public lands represent cultural and economic values across the political spectrum. The management of these lands is increasingly contentious as positions harden and social values change. (Jerry Johnson photo)

The administration of any public agency follows a well-understood script. Knowing how to help write the script is key to being an effective manager, or influencing them. It begins with framing a narrative or story line for the policy debate and ideally ends with a rational and measurable metric for success. Along the way, tactics are identified to help implement a process that fulfills agency and social goals. All institutions – agencies, media, advocacy groups, seek tactics to write their version of the script. The most successful administrators control the frame to their political advantage in order to help them win the support of decision-makers and clientele in the battle over resource allocation. For the National Park Service, shaping the script is problematic and it stems from the inception of the national park ideal.

The very nature and reason for our national parks sets up an institutionally generated wicked problem that makes park management particularly difficult. When

Yellowstone was created there was no institution to actually manage the new park and few had a vision for doing so. Yellowstone was set up as "pleasuring ground for the benefit and enjoyment of the people in order to protect for all time this outstanding natural area." By 1916 Congress has passed legislation creating Yosemite (California), Mt. Rainier (Washington), Crater Lake (Oregon), Mesa Verde (Colorado), Glacier (Montana), and Rocky Mountain (Colorado). They saw the need for an agency to administer the park system and after considerable political wrangling between Gifford Pinchot, director of the US Forest Service and members of Congress, the National Park Service Act passed in August 1916. The National Park System Organic Act, which created the Park Service, also set the purpose of the park system:

> *The service thus established shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations hereinafter specified by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations. (NPS)*

The two prong mission of the Service – conserve the resource but provide for human activities, does not do much in the way of instructing park service employees how to implement the mission or how they will be evaluated as an agency. The mission statement is, even today, subject to interpretation by superintendents across the system. Dan Wenk, the current superintendent of Yellowstone is presented with the challenge of the mission statement on a daily basis:

Balancing the two prongs of the core mission has and still involves dynamic political acrobatics as private economic factions and public interests are balanced, sometimes on a day-to-day basis. The result is that a good deal of park policy has devolved to the superintendent level in the form of a document called the Superintendent Compendium. The compendium is the de facto management document for each unit of the Park Service and lists the features of park management subject to the discretionary authority of the superintendent. Consequently, interpretation of the NPS mission is a personification of a superintendent's experiences, biases, and personal vision for the park.

Superintendent discretion results in different policies in similar parks. High-risk sports like climbing and mountaineering are actively managed in parks like Grand

Teton and Yosemite but not in Yellowstone. In Acadia National Park (Maine) and Glacier Bay (Alaska) kayaking and canoeing is encouraged as a way to experience the wilderness nature of the parks. In Yellowstone, except on one short segment of the Lewis River, river running is forbidden. Defensive pepper spray for bears is illegal in Great Smoky Mountain National Park, home to over 1700 black bears, but encouraged in Glacier and Yellowstone where grizzlies present an uncommon but very real threat. Luckily, by the time they are appointed superintendent of Yellowstone, most park managers have several decades of experience and leadership within the Park Service and historically, superintendents have largely steered clear of partisan politics that would be detrimental to the park. Until the 1988 fires, the Park Service managed to so as well. Today however, the service often finds itself at the center of political controversy especially in the large parks located in the American west and again, it comes back to wolves.

Wicked problems share traits beyond their intractableness. In some cases we are not sure exactly what the problem is except that people disagree. Is the problem with wolves a predator problem or political one? Is it steeped in danger to life and limb, or western culture? What would a resolution look like? In the case of large predators, for some the solution would be to have virtually none on the landscape, for others they represent the embodiment of nature and accommodation must be made in order for them to thrive. Is compromise possible?

Good wolf, bad wolf, which is it? Policy is defined by the frame or description of the problem. Frames are constructured to advocate to get a problem on the agenda, to aid in the analysis of the problem, and to provide the language or rhetoric used to discuss the issue. In this case, a simple photo of a wolf frames the animal as a noble creature of nature vs. a potential killer. How you percieve the wolf plays an important role in how you define the issue. (USFWS photos)

Because of their heated political nature, most wicked problems are easily manipulated by images and "frames" around which rhetoric and emotion are constructed. This is especially true in issues of the environment where competing narratives represent aesthetic, economic, and political wins and losses. Dramatic photos of wolf kills represent to some a loss of property and that will always supercharge the debate. For others, a hunting wolf pack represents nature at her finest. Doug Smith, the chief biologist for Yellowstone National Park helps us understand the roots of "the wolf problem" when he looks to the history of predator management in the park and what wolf reintroduction means to many resident westerners.

Cultural "stories" or narratives are often used as a form of proof by opposing sides. These stories sometimes take the form of "barstool biology" while others have basis in fact. That said, the reality is that scientists already understand the basic ecological dynamics of predator/prey relationships on large expanses of land. The issue is not the inherent complexity of the species and its habitat. The issue for managers, politicians and residents is that living with large predators on the landscape has costs both social and financial.

Land based apex predators are large, charismatic, dangerous, and rare. In most parts of the world, they are often the targets of government sanctioned extermination programs, illegal poaching for profit, and are frequently perceived to be a threat to private property. At best, many people find them difficult to live with. Hiking or hunting in grizzly country adds a dimension of excitement and trepidation when an encounter is potentially fatal. For many however, that sense of the unknown is why they visit wild places in the first place.

Others find them intolerable. Raising livestock in the presence of wolves and bears requires time and vigilance. The reason is that humans, especially those who make a living off the land, share habitat with creatures that can, and do, kill and maim private property. They force us to live differently simply because they exist. Area residents incur the costs of living with such neighbors each and every day and, even though the effects may be small, they add up over time. No matter the level of support one has for these large animals, one must admit they demand our attention in order to coexist peacefully.

The other reason we need predators is to ensure the health of the environment in which we live. Ecosystem health is well understood to be both bottom up – soil nutrients, grasses, and plants feed grazers who feed predators and, top down – predators in turn influence grazer behavior and so influence plant growth, etc. What was missing in Yellowstone up until the 1970s was the top down role of apex

predators like bears and wolves and as a result, some think the system was overpopulated and overgrazed.

Grizzly bear near Swan Lake, YNP (YNP photo)

Both grizzly bears and grey wolves, along with other threatened and endangered species are managed by a complex bureaucratic structure that lend to their wicked nature. Near the top of the administrative food chain is the U.S. Fish and Wildlife Service (USFWS) – part of the Department of the Interior and administrator of the Endangered Species Act (ESA). The ESA was signed into law by President Nixon in 1973. The purpose of the Act was to “protect and recover imperiled species and the ecosystems upon which they depend”. The ESA makes provision for two protective classifications: threatened and endangered. A threatened species is one that is “likely to become endangered within the foreseeable future throughout all or a significant portion of its range." The Act defines "endangered” as "any species which is in danger of extinction throughout all or a significant portion of its range." Within the provisions of the Act, threatened status provides for slightly more flexibility and agency discretion than endangered status.

The recovery of the American Bald Eagle under the Endangered Species Act began over forty years ago. In 1963 there were only 487 nesting pairs remaining. Today, over 10,000 nesting pairs live in the lower 48 states. (USFWS photo)

Each species listed for protection under the ESA is subject to a recovery plan that describes the steps needed to restore a species to ecological health. U.S. Fish and Wildlife Service biologists write and implement these plans with the assistance of species experts, other land management agencies, NGOs, and researchers. In the case of both the grizzly and the wolf, it was determined that Yellowstone National Park was so crucial to the recovery plan that the National Park Service would share the lead role with the USFWS. Central to ESA protections is the identification and preservation of critical habitat essential for the long-term survival of the listed species. Once critical habitat is identified, a plan is designed to recover the population. Recovery plans may include collaboration with private landowners, trans locating populations to formerly occupied habitat, captive breeding programs, and land acquisition for use as habitat. All have been used with success to both delist species and to prevent extinction.

The Act allows for some discretion for management of listed species. Under section 4(d), threatened (not endangered) species may be managed under restrictions for Distinct Population Segments in order to reduce conflicts between people and the protections; a 4(d) rule would be used in a situation where social conflicts would adversely affect recovery. Central to the recovery of listed species is the concept of "take" – harming or killing a listed species. Under section 9, a take permit can be issued to exempt private landowners to kill a member of a listed species on private property. In the case of wolves in Minnesota and Yellowstone that prey on domestic animals, the 4(d) rule was applied to avoid large numbers of wolves being killed by private citizens who might otherwise take wolf control into their own hands.

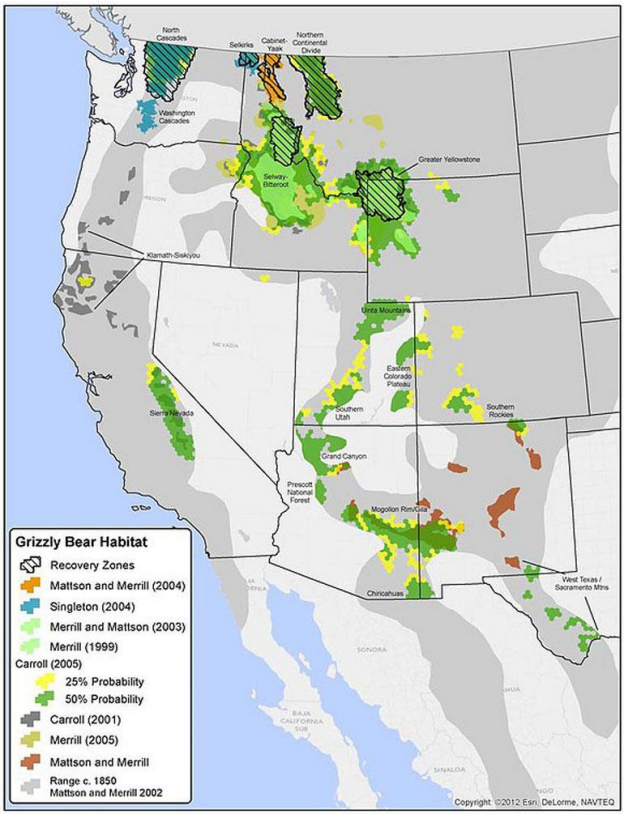
Section 10(j) rules allow for designation of an Experimental Nonessential Population. In this case, an experimental population is geographically isolated from other existing populations of the species - as Yellowstone wolves are from Alaskan wolves. Members of the experimental population are considered to be threatened under the ESA but often have special regulations written for them under section 4(d). If the experimental population is determined to be "nonessential" to the survival of

the species, it is treated like a species that is proposed for listing but is not given the full protections of the ESA. Conservation efforts of the two apex predators in Yellowstone – the Yellowstone grizzly bear and the grey wolf, are case studies in the efficacy of the ESA and how protection efforts are influenced by the variables that define the nature of wicked problems.

Resolution of the so-called "wolf problem" is in the future but, the recovery of the Yellowstone Grizzly bear is a model that gives some hope for progress.

Predator Recovery and Reintroduction

Between the 1920's and 1930's, the grizzly bear lost 98% of its habitat in the contiguous United States. By 1975, of the 37 known populations to exist in 1922, only six known populations of bears remained. These are startling statistics. Although no one knows what the population of bears was in 1872, by 1975 the population of bears in Greater Yellowstone is estimated to have been between 136 and 312 individuals. It was that year that the bear was listed as endangered.



The grizzly bear once roamed across most of the west. This map shows historic range (grey), present (hash) and, potential future range (green/yellow). Future range data is based on several population models. (Source: Center for Biological Diversity)

The history of bear and man is similar to that of most large predators. People move in and remove or displace the native animal population; the same habitat that is good for bears is frequently good for rural homesites, agriculture, grazing, and timber production. Sheep and cattle ranchers accounted for many bear deaths through the 1930s. Unlike wolves, there may not have been an all out war on the bear but the prevailing attitude was a dead bear was better than a live one. Most literature referencing the decline of the bear cites habitat loss to ranching, logging, and development as the most important factor in diminished bear populations.

The history of the bear's decline and eventual recovery in the Yellowstone region has received considerable attention in books, articles in the popular press, and in film. The most salient points are these: prior to the 1960s Yellowstone maintained open pit garbage dumps that attracted wild bears who lived in or near the park. The dumps were sources of entertainment for visitors and a significant food source for the bears.

Beginning in 1959, two brothers – Frank and John Craighead, began a long-term study of the bears. As visitation increased so did the amount of garbage. Security measures that separated bears from visitors were nonexistent and the inevitable human/bear conflicts began to rise. Breeding boars as well as mothers with cubs were observed in campgrounds and eventually, a decision was made by the National Park Service to close the dumps.

In 1973 a study by the National Academy of Sciences said there was no convincing evidence that the population was at risk of extinction but that a conservative policy of removals (killing) should be pursued. The policy of killing and relocating bears continued but at a lower rate.

In 1973, in reaction to the closure of the dumps, the Interagency Grizzly Bear Study Team (IGBST) was formed as an interdisciplinary group of scientists and biologists responsible for long-term monitoring and research efforts on grizzly bears in the Greater Yellowstone region. The IGBST would later become the model for the other ecosystem level study groups concerned with bear management and recovery. The core science focus of the IGBST is to study bear population trends as well as bear mortality and other survival issues. The best available science would be used to recover the bear in the whole of the Greater Yellowstone Ecosystem. In 1975, the U.S. Fish and Wildlife Service listed the grizzly bear as a threatened species under the Endangered Species Act in the lower 48 States. Under the guidelines of the act, the Service developed a grizzly bear recovery plan and hired a Grizzly Bear Recovery Coordinator. In 1983, the Interagency Grizzly Bear Committee (IGBC) was formed. The IGBC was created to coordinate management efforts and research

actions across multiple Federal lands and States within the various recovery zones and change land management practices to more effectively provide security and maintain or improve habitat conditions for the bear. Members of this committee include representatives from the U.S. Forest Service, National Park Service, Bureau of Land Management, Fish and Wildlife Service, U.S. Geological Survey, Parks Canada, the states of Idaho, Montana, Washington, and Wyoming, and the provinces of British Columbia and Alberta. The first Grizzly Bear Recovery Plan was released in 1982 the last in 1993. The recovery process has been slow but steady.

Habitat fragmentation is one of the issues complicating the conservation of grizzly bears and other species of wildlife that require large landscapes. The IGBS concentrates on six recovery zones for grizzly bears with the idea that if the bears thrive so will other species. Cooperation and coordination between public land managers, fish and game agencies, private landowners, and state and federal transportation agencies is required to maintain linkage zones through which bears and other wildlife will travel. (Source: IGBS)

According to Barbee, "policy is never forever" but, it is often guarded vociferously by the organization. This is especially true of long established time honored procedures such as putting out all wildfires or predator eradication. Major changes generally come from outside an organization, at least initially, and Grizzly bear politics was no exception. Both policies died hard in the national parks and the shift in policy came about from academia and members of the public.

The establishment of the Interagency Grizzly Bear Study Team follows a common bureaucratic strategy where the appointment of a "blue ribbon" committee that will bless a shift in policy sometimes expedites change. It is often in the manager's interest to cultivate bedfellows from outside the organization to help carry the water.

Grizzly bears are slow to mature and so conservation is a long term endeavor. At around 4-7 years of age, female bears begin to give birth to one to two cubs; cubs mortality in the first year is around 40-60%. Once they reach adulthood, mortality in the wild is around 5%. Females can produce a litter about every three years until age 28. In the GYE, the bear population has grown by 4-7% for the last two decades and they have increased their range by 11-34%. Thanks in part to the efforts of the IGBST and others, the bear population has recovered to a regional population of about 800 bears and is probably at the carrying capacity of the system. Delisting the bears from the ESA is anticipated in the near future.

Misunderstood Bears. Large predators of every stripe have a rich history of myth and legend built around them and bears are no exception. These myths are often used by opponents to frame the issue of bear management against the bear:

Once they taste human blood, predators crave it. Predators are opportunistic feeders and will often eat what is available. That said, humans in some locations are easy prey and are sometimes the target of big cats in India and crocodiles in parts of Africa and Australia. In Yellowstone there is no evidence of large predators acquiring a taste for humans. There is no evidence that grizzly bears hunt humans or acquire a taste for them. Very few attacks result in human mortality and in only a handful of cases has the bear fed on the remains.

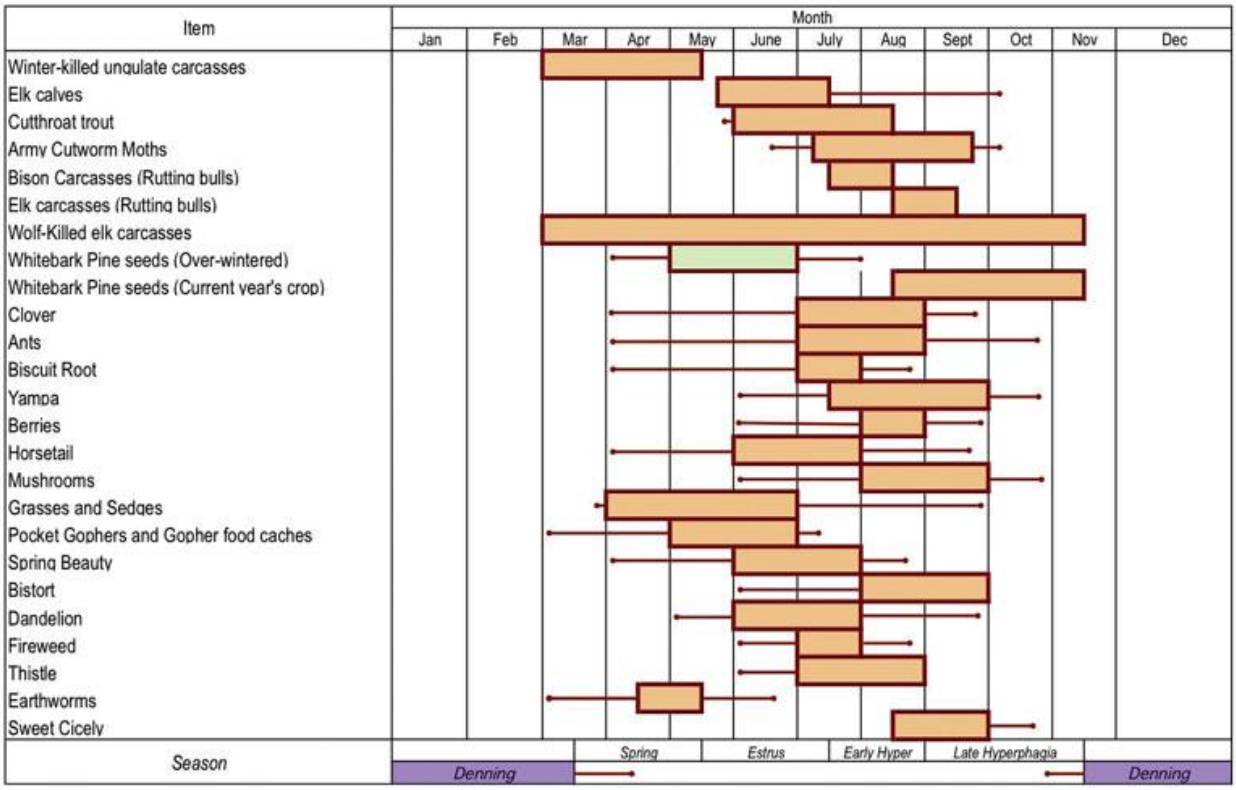
Bears are carnivorous. Research by the Interagency Grizzly Bear Committee found that in the GYE, the pattern of food sources vary in availability from year to year, and from season to season. Grizzlies move throughout their habitat looking for foods available at that time of year based on their experience. In spring they depend heavily on the use of ungulates, both scavenged and newborn, summer forbs, and root crops, fall they will seek out whitebark pine nuts, berries and army cutworm moths supplemented with some fish. Bears in the Yellowstone region eat meat if it is an easy meal but for the most part they rely on vegetation.

Bears that wander into inhabited areas such as campsites, rural towns or cottage

communities are dangerous. Most of the time they are simply moving through an area looking for an easy meal. They are not hunting humans and in fact, avoid them whenever possible. Bears are attracted to our garbage, bird feeders, BBQs, or any other food source and may feed opportunistically.

Hiking in bear country is inherently dangerous. Most bear encounters are accidental. Many occur during hunting season when bears are moving about looking for food and humans move quietly in prime habitat. Making noise, moving in small groups, and generally avoiding bear habitat is the best way to minimize encounters. Most encounters end with the bear and human quickly departing in opposite directions, without harm to either party. Camping in bear country can be an entirely different matter and every precaution should be taken to ensure food is kept away from bears.

Bears are seasonal animals and so is their diet. They are not particularly efficient predators compared to the wolf. In Yellowstone they feed opportunistically on winter-killed carrion in the spring, young elk and bison in early June, fish, grass, roots, ants, and most anything else they find during the summer months. They seek out high fat foods like pine nuts and cutworm moths in the months before hibernation in late November when they enter a physiologic phase of excessive hunger called hyperphagia.



The diet of the Yellowstone grizzly bear is remarkably diverse and varies throughout the year. It begins with scavenging winter killed carcasses in the spring to cutworm moths and white bark pine nuts in the fall. Bears will feed on anything that provides a high-caloric diet including human foods if available. This is why clean camps are imperative to prevent future conflict with habituated bears (Source: IGBST/NPS)

One of the most interesting grizzly feeding behaviors was described in 1994. Bears both black and grizzly will climb into high alpine talus slopes to feed on the common Miller moth. A single moth has a high enough fat content that it accounts for as much as a half a calorie. That means that 20,000 calories of just moths per day can be consumed by a rock-turning grizzly bear.

Grizzly bears are largely solitary animals, except for females with cubs. Their range varies along elevational gradients and may run to many square kilometers as they roam the landscape foraging for enough calories to sustain their considerable bulk; a large male bear in Yellowstone may weigh up to 700 pounds. Bears inside the national parks generally do very well, those outside less so.

Researchers know what bears eat, when they eat it, how much food they need, and how far they travel to find it. They know many bears by sight and, have developed sophisticated population models that allow them to account for bear mortality within the population. They investigate each mortality and maintain a database on causes of mortality. Twice each year the Yellowstone Ecosystem Subcommittee of the

IGBC meets with grizzly bear experts, representatives of advocacy groups, agency representatives, and others to discuss the current science and policy directions for the bear's recovery. They have an institutional culture that encourages discretion. They conduct their meetings and their work inconspicuously away from the public view. They publish in academic journals and do not actively seek media coverage. This helps explain, in part, why recovery efforts have gone well. The bears have effectively been non politicized by the agency charged with their recovery through their institutional culture.

Life with grizzlies as neighbors is not without complications. Bears prey on domestic livestock, although they do so at very low numbers compared to other threats such as spring snowstorms and competing predators like coyotes. Nevertheless, state and federal agents kill several bears every year when they become habituated to feeding on livestock. In the last decade, more than 80% of all documented grizzly bear mortality is human caused. The most common cause is simply getting crosswise with agricultural producers and "repeated nuisance activities" (i.e. in campgrounds, dude ranches, and rural subdivisions). This may not be a bad thing. By showing a willingness to remove a few bears from the population land managers reduce conflict between landowners, bears and, bear managers.

The culvert trap is still the safest way to trap and transport problem bears. This photo from 1962 shows that the technology has changed very little in nearly five decades. (YNP photo)

Bears do pose a threat, however remote, to humans. The best predictors of negative human/bear encounters are proximity to rural development, roads, and recreation. Most human/bear encounters are benign but dangerous encounters can and do occur. Many encounters with "nuisance bears" are usually the result of improper food management by campers or rural residents. These typically result in no management intervention other than a warning to keep a clean camp in bear country or to put the BBQ grill away. Hunters sometimes surprise bears and both often suffer the consequences because the bear reacts quickly and instinctively. The typical scenario is during elk hunting in the fall. Hunters move quietly and may startle a sleeping bear or leave gut piles that act as an attractant. In some regions of the ecosystem bears have keyed in on shots and will sometimes investigate in anticipation of an easy meal. Others have had encounters when recovering a carcass that was left overnight only to find a bear has claimed it. Most of these encounters are entirely avoidable with some common sense about bear behavior. In any case, mortality rates for humans if they encounter a bear are incredibly small - something like 1 in 2.5 million. There are dozens of ways to get hurt or killed in the outdoors - death by grizzly ranks near the bottom of the list.

Bear Spray or Gun? If you are starved for conversation while on holiday in Yellowstone, go to the local hangout and ask a local about using bear spray or a gun during a grizzly encounter. Be prepared to draw a crowd. The debate could rage on until closing time.

The use of "bear spray" as a deterrent goes back to research carried out at the University of Montana in 1977. Zoologist Gary Miller discovered that certain chemicals, when sprayed in the face of a charging bear, turned the charge into a retreat. The industry standard today uses capsaicin oil derived from hot peppers and delivered via a high pressure fog. Does it work? Here is a thought experiment:

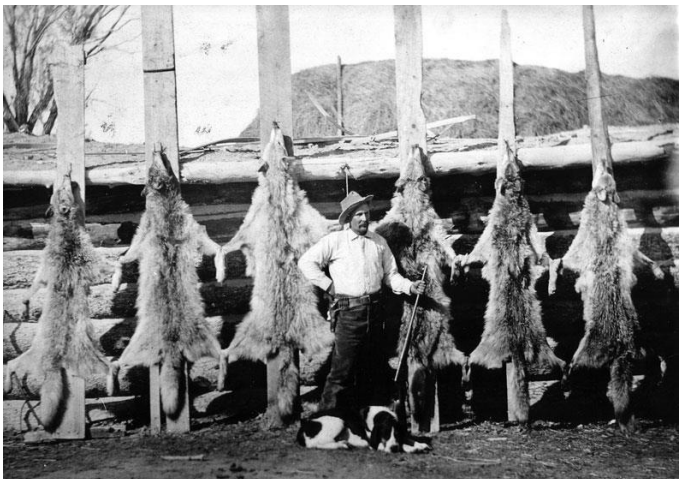
A grizzly can run in short bursts at 60 feet/second. You are out for a hike on a warm spring day and have just spooked a bear on a winter killed elk carcass. You have about two seconds to swing your gun up and hit a target the size of a cigar box bobbing around and running at you at the speed of a race horse. If you have the caliber to stop it could you hit it? How much practice would it take?

The short answer is that almost no one has that kind of skill with a gun. Pepper spray has been shown to turn charging bears and there is plenty of data to back that up. Here is a short video from the Interagency Grizzly Bear Committee.

Carrying and knowing how to use a can of bear spray is a last resort but at the end of the day chances are both the bear and human will come out of an extremely rare encounter alive.

Read more.

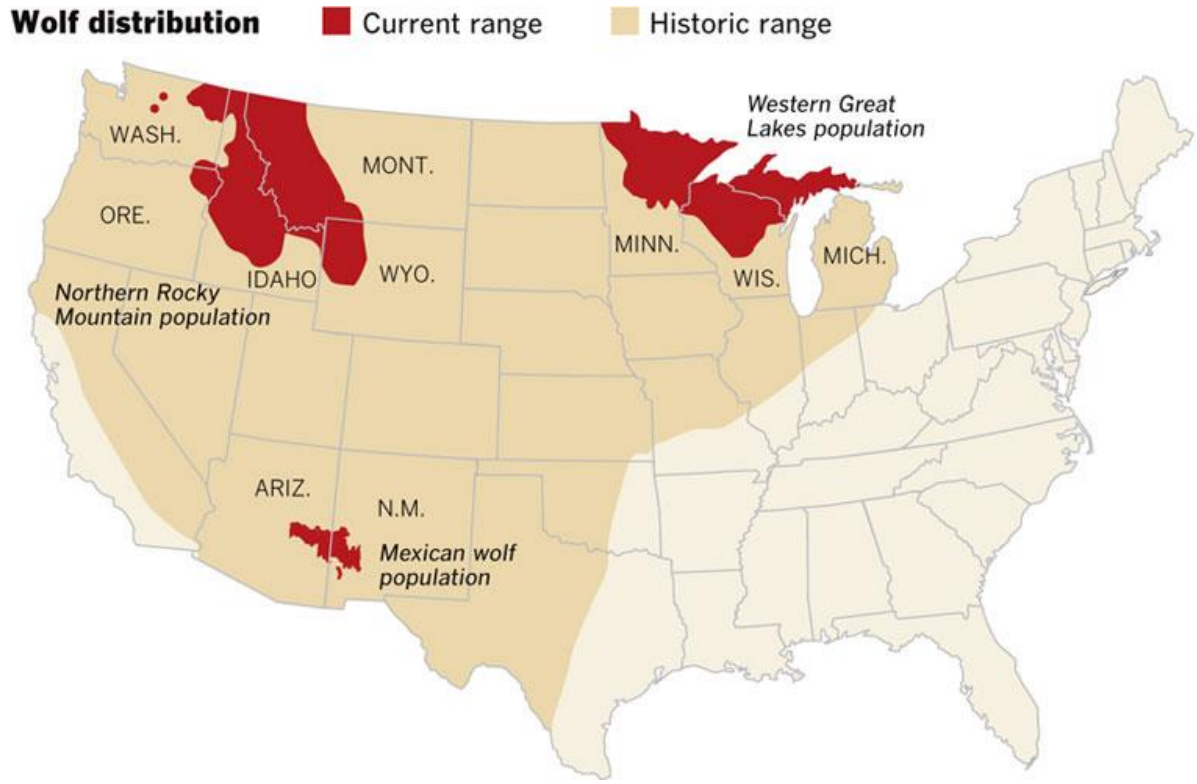
The grey wolf is a very different animal from the grizzly bear and our relationship with it is much more complex and nuanced. As a result, management of the wolf in Yellowstone is more problematic and highly charged politically. Like the bear, the grey wolf was widespread across the whole of North America and, like the bear; the wolf was all but eradicated in most of the contiguous U.S. by the 1930's. In 1926 park rangers killed two wolf pups near Soda Butte in the Lamar Valley; these are the last known wolves in the Park. In the Greater Yellowstone, it is generally accepted that the last verified wolf was killed in 1943 by Leo Cottenoir on the Wind River Reservation south of Jackson, Wyoming.



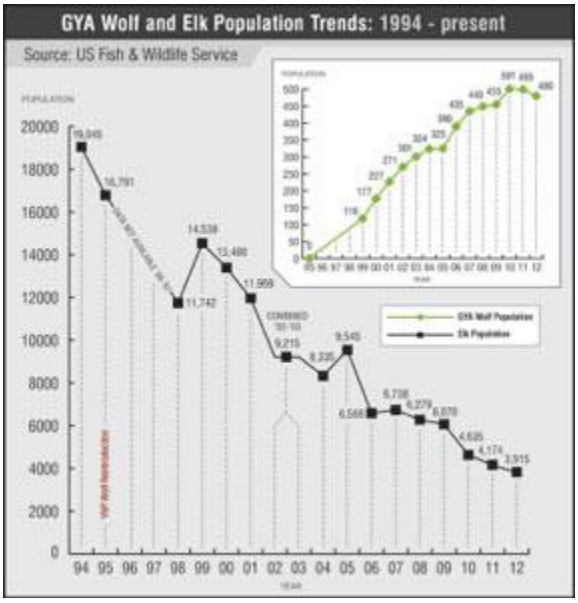
Roy McBride stands next to six wolves killed in the Upper Flat Creek area in 1902. Wolves were actively hunted in the Greater Yellowstone region in the early 1900s in order to protect livestock and were effectively eradicated from the region by the 1940s. (Source: Jackson Hole News)

The wolf population in the region is poorly documented before 1914. Habitat loss, government and private control measures, and shifting elk populations in the Yellowstone region made sightings of the wolf rare. Wolves were seen as direct competitors to humans for food production and for game species. As in other cases of westward expansion, those who produced tangible products dictated policy - often with government subsidy. After 1914 there was a focused effort to "exterminate" wolves in the park for the good of herds of elk, deer, mountain sheep, and antelope and that effort seems to have been a success when Cottenoir shot that large male in the Owl Creek Mountains of Wyoming. Two decades later, in 1963, a single wolf was seen near Porcupine Hills in the central region of Yellowstone.

In 1975, a rigorous campaign of fieldwork was conducted to determine the status of the wolf in the park. During 1,800 hours of aerial survey flights between 1964 and 1975, one wolf-like animal was reported. No wolves were photographed using time-lapse cameras mounted near bait in the winter of 1977 and no animals were observed in field visits or during 30 hours of flight surveys. It was concluded that there was no evidence that the Greater Yellowstone region supported any sort of wolf population. The war on the wolf had been won and it was successfully eradicated from most of its historic range in the lower 48. Today, it exists on less than 5% of its historic range.



The Grey wolf was one of the most widespread of the large predators in the contiguous U.S. Today, there are three distinct populations. Total population of grey wolves in the lower 48 is around 5,500. (Source: Los Angeles Times published 2013)



Wolves were reintroduced to the park when the Greater Yellowstone northern herd was at an all time high. Today, elk and wolves seem to have achieved a sort of stasis and in fact, most norther elk hunting districts in Montana are above managment goals. (Source: USFWS)

Unlike bears, wolves hunt all year around and do so efficiently and violently. They hunt in well-organized packs of between 3-16 members. Elk represent over 90% of their diet with moose and bison being important sources of meat protein in localized parts of the park at specific times of the year. Wolves adapt readily to changing food conditions and will take livestock as easily as elk. When food is abundant, the alpha male and female will produce large healthy litters of up to seven pups. Wolves are easily noticed on the landscape - especially in winter when their kills are frequent and easily found. When the wolves were reintroduced to the region in 1995, elk herds in the northern range of the park were near an all time high – around 17,000 animals. The wolves thrived.

Like bears, the grey wolf is an incredibly charismatic animal. Their obvious intelligence expresses itself in complex social behaviors and their care for the pups. The numerous vocalizations of the pack establish a clear vocabulary but it is the howl that most of identify as it as "WOLF!".

Misunderstood Wolves. Like bears, there are myths surrounding wolves and in particular the wolves captured in Canada for the reintroduction. Here are some common assertions:

The introduced wolves were a "superwolf" from Canada. The wolves introduced into YNP were significantly different physically and behaviorally from the wolves that were here before. The short answer is no. Forty-one wolves were introduced to YNP in 1995. There were 14 in 1995 from Alberta, and 17 in 1996 from British Columbia, and 10 in 1997 from near Choteau, Montana. The Canadian wolves were selected because they had experience hunting elk and bison. The wolves reintroduced are essentially identical to those throughout the Rocky Mountains. Variability in size is within the historical record of wolves in Yellowstone. The myth of the superwolf was the basis for an early lawsuit trying to block reintroduction.

T*here were already wolves in Yellowstone so they didn't need to be introduced.* There were no wolves Yellowstone prior to reintroduction. Some claim

there were specially adapted wolves that did not run in packs, or use trails or roads, that didn't howl. There are no recorded wolves like that anywhere in the world. In three years of intensive looking no wolves were found to live in or around the park. Single males may have occasionally moved through the area but there is no evidence they established a pack.

Wolves are particularly troublesome because they often kill for the fun of it. Predators run a high risk of being hurt when they hunt large prey and so don't do so for fun. Since 1995, elk, bison, deer and moose have killed at least 15 wolves. When hunting is easier in deep snow, they will kill more than they can immediately eat, but if left alone wolves always cycle back to finish the carcass.

Wolves are dangerous to humans. Any animal is dangerous to humans. There are between 20 and 30 human deaths each year by our pet dogs. Contrary to popular belief there have been two documented cases of human death caused by wolves. One was by a habituated wolf pack in Canada and in one case a jogger was attacked and killed in Alaska. There have been none in the lower 48 states.

In 1987, the US Fish and Wildlife Service proposed a recovery plan for the grey wolf to large and remote expanses of public land. After considerable political maneuvering by key senators, congressmen, the game management agencies in the GYE as well as conservation groups, a reluctant Congress funded an environmental impact assessment in 1991. When the Clinton administration took office in 1993, the science and more importantly – the people were in place to make reintroduction a reality. The process was as much a political event as ecological. Bruce Babbitt, the Clinton Administration Secretary of Interior, was a former governor of Arizona. He was a vocal proponent of environmental reform on issues such as mining; grazing; water and timber policies; land management and, endangered species. For him, the wolf represented his admiration for Aldo Leopold's essay "Thinking Like a Mountain" in which Leopold writes of his epiphany as he realizes that killing off predators carries serious implications for the rest of the ecosystem. Babbitt referenced that lesson as he helped release the first wolves into the park. Mollie Beattie was the director of the United States Fish and Wildlife Service under Babbitt. She led the agency that would navigate the regulatory maze of the ESA to ensure the wolf program would happen in spite of legal and political opposition from many quarters. Third, Renee Askins, a highly motivated articulate woman from northern Michigan, was the undisputed citizen champion of the wolf. Her nonprofit Wolf Fund, which was established solely to further wolf reintroduction into Yellowstone, was disbanded when the first wolves were released. She applied considerable outside pressure on government agencies to ensure the program would see

completion. Finally, there was President Clinton. He made sure reintroduction was on the political agenda and expended political capital to make sure it happened.

President Clinton took a real interest in Yellowstone during his administration. In 1996 he took a calculated political risk and announced a deal to end the New World Mine - a proposed massive gold mining venture on the edge of the park. His first of two visits he would make to Yellowstone coincided with his announcement to kill the mine proposal; to many in the environmental community he became a local hero. In 2001 he signed an executive order that imposed a ban on snowmobiling in the park but, it was overturned during the first few days of the incoming Bush administration. Clinton's political appointment of Bruce Babbitt as Interior Secretary made sure the right combination of people, at the right time, in the right offices, would ensure the reintroduction effort would happen.

Bob Barbee also likes to point out that two unlikely conservative politicians played important roles in the reintroduction. Senator Jim McClure of Idaho was a supporter of the effort - after a fashion. He also points out that not everyone was on board. Through it all though, Bob is able to separate political differences from personal.

Bob also tells a story of then Congressman Dick Cheney from Wyoming and the early stages of the reintroduction effort. The public opposition Cheney expressed for his constituents back home was for public consumption. Via meetings, hearings and, using agricultural groups he pressured the head of the Fish and Wildlife Service, the Secretary of the Interior, and the head of the National Park Service to quit the reintroduction effort. Politically, he told Barbee, he had to oppose the policy. Privately, he said the wolves were going to return to Yellowstone one way or another and that he knew that. Bob told him the reintroduction supporters would persist. Cheney replied simply “I know”. Cheney knew the politics were in favor of the wolf so while he would not do so publicly, he would not use his power and position as a western political leader to stand in the way of reintroduction process. Bob said that was the end of the discussion and still maintains that the most reasonable member of the western delegation in Congress was Dick Cheney.

The structure of the recovery was focused around establishing the wolf as a “nonessential experimental population” under a provision in the ESA – a designation that had been applied only six times in the history of the Act. The designation allows the FWS to relax the restrictions of the Act in order to encourage cooperation from those who might oppose the reintroduction program; in this case, the solution was proposed by Idaho Senator Jim McClure. The effect is that for nonessential species, critical habitat cannot be designated and, the full protections of the ESA are not applied outside of a National Wildlife Refuge or National Park. McClure's proposal was not purely altruistic. He knew that outside these protective zones, nonessential

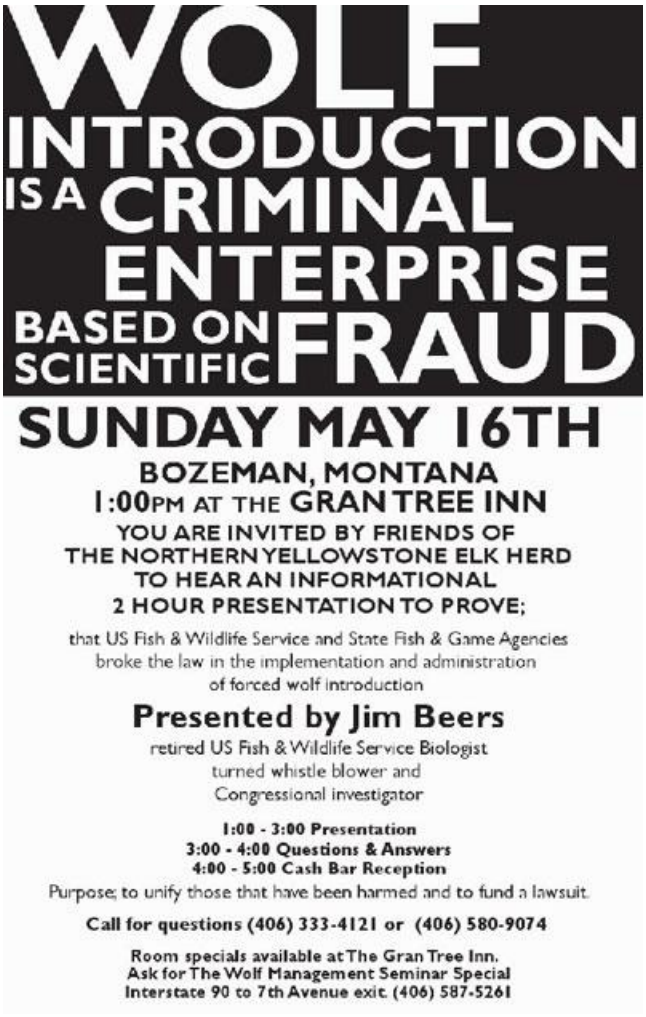
experimental populations are treated as “proposed species for listing” and are managed with fewer protections. For example, livestock predation would allow ranchers to shoot the offending wolf. It was a transparent piece of political maneuvering but it did make the reintroduction effort happen more quickly. Also included in the plan was a population threshold that when 10 packs and 100 individuals inhabited the park the wolves would be delisted as endangered and their management would pass from the federal to state governments.

The management effect of the nonessential experimental population decision was that the F&WS could move ahead with introduction and protection within the Park. The political effect was that advocates of reintroduction would have to build very strong communication bridges with other agencies and landowners outside the protected zones. In the case of the grey wolf, it was decided that reintroduction would move ahead faster if those bridges were constructed at a later time after wolves moved beyond park boundaries. This would have repercussions later.

Lessons from Two Cases of Predator Conservation

Presently, there are between 600 and 800 bears and over 1500 wolves in the Greater Yellowstone region. The populations of grizzly bears and wolves are doing fine and very likely, both species will continue to thrive and expand their presence. Politically, the wolf continues to elicit strong feelings of resentment from those in the traditionally conservative agricultural, ranching, and hunting communities who see wolves on the landscape as a form of public or regulatory takings. Supporters continue to express feelings of great admiration for the wolf both as a majestic animal and as a symbol of wild land. Supporters typically fall at the other end of the political spectrum and see the reintroduction as an important public good. For the pro-wolf crowd the success of the reintroduction is a symbol of conservation success in general. Those who are anti-wolf see government overreach. Meanwhile, the grizzly bear is generally accepted as an occasional problem neighbor but with almost no antipathy toward the animal itself. The difference in public perception may be found in the institutions that developed during their recovery.

First, and most obvious, the bear was never completely gone from the region; the wolf was. Bear management was always grounded in the science of recovery rather than the contentious political decision to reintroduce. The distinction is important. Humans in the region had continued experience with bears. One would infrequently see them or their tracks. Hunters would occasionally encounter them and sometimes they ventured into gateway communities to rummage through garbage. People in the region knew something of their habits and behaviors.



This poster for an anti-wolf talk is an effective framing tool. The speaker is a retired USFWS employee and so brings with him institutional credibility. Because so few people have direct experience with wolves but carry personal bias, advocacy groups can easily shape the conversation

.The last wolf in the Greater Yellowstone was killed in May 1943. By the time reintroduction efforts began in earnest almost fifty years later there were few people in the region who had experienced living with the wolf so no frame of reference existed. Like other wicked problems, myth and narrative about wolves frequently trumps science and rationality. For both sides the narrative was a blank slate upon which political statements took on the appearance of fact.

For the most part, the bureaucratic structure for bear management successfully avoids political controversy. Agency behavior at the federal and state level toward the bears has been aimed at mitigating human/bear conflicts and in reducing the mortality to each. A comprehensive science agenda was designed with the intent of knowing and understanding the habitat needs and feeding strategies, as well as bear behavior. Dozens of papers were published and, in the end, managers have a solid set of facts they use to manage bears and people. Technological fixes such as bear-proof garbage storage containers, the use of nonlethal deterrents – dogs, fireworks, rubber bullets, bear spray and, education programs helped minimize conflicts. These efforts are largely apolitical in nature. Most require little in terms of financial outlay or social cost. And they work.

> It could be that the lowly bear proof garbage can is responsible for saving more grizzly bears than any other management solution. When bear recovery was in full swing researchers noted that after the dumps were closed, human/bear conflicts were on the rise in nearby gateway communities and in park campgrounds. These

because “population sinks” for bears. Most of these incidents were the result of garbage-habituated bears looking for a meal.

Bears will travel long distances back to where they knew they can get a snack. This often resulted in a decision to relocate the bear or sometimes killing it. The problem was particularly acute when food supplies were scarce or there were cubs to feed. Management controls, a euphemism for dealing with problem bears, accounted for many deaths to bears up through the mid 1980s. After that, cultural change took place among managers that aimed at preventing encounters rather than dealing with them after the fact.

Bear-proof garbage bins (Jerry Johnson photo)

When faced with the problem, Superintendent Bob Barbee embarked on a new approach – design and use bear proof garbage containers. The logic was, if bears were not rewarded with food, they would quit looking. The park service worked on multiple designs for public and private garbage containers as well as dumpsters. Park policy replaced all the containers and convinced the gateway communities to do the same.

The number of bear-human conflicts as well as the number of bear management control actions declined significantly. During the first years of these reforms, most bear-human conflicts involved food-conditioned bears that aggressively sought human foods. In more recent years, management problems have involved habituated (but not food-conditioned) bears seeking natural foods within developed areas and along roadsides where they are hit by cars or pose a potential conflict when surrounded by large groups of tourists in Yellowstone's legendary "bear jams".

Lethal controls and relocation are slightly more political than other methods – especially when a bear is destroyed, but these measures are mostly reactive to “problem bears”. This is not to say political controversy does not exist for bear managers but, when issues arise they seek to manage it with quality scientific data and an administrative focus on mortality control.

Journalist Scott McMillion has covered most resource issues in his thirty-year career. His book Mark of the Grizzly looks for lessons from bear attacks. He is a keen observer of how our opinions of bears have changed.

Wolf reintroduction was, from the start, fraught with political conflict. The social perception of the wolf is inherently more polarized than that of the grizzly and the institutions reflect that polarization. Operation Wolfstock, the name given the process of bringing wolves back to Yellowstone, was inherently tied to the anti-establishment concert of 1969 and the politics of idealism. Secretary of the Interior Bruce Babbitt signed the Record of Decision for the final environmental impact statement on June 15, 1994. This was the formal start of the process for the FWS to write and publish the rules under which reintroduction would take place. By January 1995, several entities opposed to reintroduction filed for an injunction to stop the process but were denied in Wyoming U.S. District Court. Even the Park Service term for the reintroduction can be seen as political. Their term – Wolf Restoration, implies renewal of a broken ecosystem, something many wolf opponents disagree with.

The process of physically bringing wolves back was run like a high profile military operation. The Incident Commander oversaw the process from capture of wild wolves in Alberta and British Columbia and eventual transport to "soft release" enclosures within the park. The Operation Section included a media liaison, public education officer, a manager for the collaring and monitoring of each wolf, wolf care specialists, the transport coordinator, and many other functions deemed necessary for a successful program. By January 11 the first shipment of 12 wolves was on its way to Great Falls, Montana to clear customs and on to Gardiner, MT at the north entrance to the park. From there they were transported by pickup and horse drawn sled to the Crystal Creek enclosure in the Lamar Valley. In front of an army of media, the first transport boxes were personally carried to the acclimation pen by the U.S. Secretary of the Interior Babbitt and the Director of the USFWS Beattie and Yellowstone National Park Superintendent Mike Finley. The drama had began earlier though.

On the same day the wolves arrived in Great Falls, the Wyoming Farm Bureau had asked for an immediate injunction to stay the release. A judge of the Federal Appellate court in Denver, Colorado, placed a 48-hour "stay" on the releases to allow him time to study the motion. The wolves sat in their boxes and again the national media had a compelling wolf story. Both the American and Canadian national news networks aired an interview with Interior Secretary Babbitt in which he warned that the wolves could die inside their shipping containers because the boxes were not designed for prolonged holding. Animal welfare groups in both the U.S. and Canada

threatened to bring charges of animal cruelty against the U.S. government. In response, the USFWS filed an emergency request for reconsideration of the stay, citing the welfare of the wolves. On Janurary 12 at 6:00 p.m. the judge relented and allowed the release of the wolves to their new temporary home. A second group of wolves arrived on January 19. On March 21, 1995, 69 days after their arrival, the acclimation pens were opened and the now named "Crystal Creek" pack was released into the wild. In the end, In total, 31 wolves were introduced to the Greater Yellowstone, central Idaho, and northwest Montana between 1995-1996. The wolves in the Lamar Valley would go on to establish the Crystal and Rose Creek packs. By December 1996, the GYE population had grown to 376 individuals in 31 breeding pairs.

Release of wolves in Yellowstone. (NPS photo)

The legal battle over reintroduction is instructive and hinged on ecological science and the interpretation of the ESA itself. The two lawsuits (known as Babbitt 1 & 2 respectively) consist of Wyoming Farm Bureau Fed'n v. Babbitt, 987 F.Supp. 1349, 1372-76 (D.Wyo.1997) and the appeal - Wyoming Farm Bureau Federation v. Babbitt, 199 F. 3d 1224 - Court of Appeals, 10th Circuit 2000. Here are the facts.

The Wyoming Farm Bureau Federation, on behalf of its rancher members, asserted eleven claims for relief (one they later dropped). For our purposes we can summarize it into two main sets. Complaint 6 argued that the FWS failed to consult with affected landowners; complaint 7 argued that FWS actions violated plaintiffs' right to meaningfully comment on the proposed rules pursuant to the Administrative Procedures Act; complaint 10 argued that (a) plaintiffs were not provided an opportunity to comment; (b) defendants did not consider the plaintiffs' comments; and (c) defendants did not to respond to the comments submitted by plaintiffs. The court found these issues to be without merit.

Contrary to the Farm Bureaus' contentions, the court found that the FWS did "consult" with affected private landowners, as well as many members of the public, in developing the reintroduction rules. In fact, during the 32 months of public input on the EIS (the law requires only 90 days), over 130 public meetings were held,

about 750,000 EIS documents distributed, and over 170,000 comments were submitted by the public. Comments were received from every state in the U.S. and from more than 40 countries. In addition, 53 scientists who had worked with wild wolves were consulted. Further, when the final rules were drafted, the court found that many plaintiff's comments were incorporated into the substance of the final rules including those that allowed landowners to harass and kill wolves preying on private livestock.

The substance of the cases hinged, in part, on whether the introduction of the Canadian wolves (as an experimental population) represented a different species of wolf and if that new population impacted "native" wolves. Complaint 2 alleged the FWS failed to introduce the experimental population outside the current range of the species in violation of section 10(j) of the ESA. Complaint 3 argued the FWS introduced an experimental population that is not "wholly separate geographically" from nonexperimental (i.e. native) wolf populations in violation of section 10(j)(2) of the ESA.

Much of the debate is centered on what biologists knew about the resident wolf population – if there was one. As explained above an exhaustive three-year effort at finding wolves produced no results. There were no residents breeding pairs of wolves in the Greater Yellowstone. However, there were reports by some that wolves did live in the region if only temporarily and that given time, a population of wolves from northern Montana and Canada would likely establish itself. If there was the possibility of wolves in the region and the FWS could not keep the experimental population in Yellowstone from interacting with the natural populations in Wyoming and Montana, it would violate section 10(j) of the Endangered Species Act. The court agreed and ordered on December 12, 1997 (two years after the wolves were released) that establishing a nonessential experimental population of gray wolves in Yellowstone violated the ESA, the FWS must remove reintroduced non-native wolves and their offspring from the Yellowstone and central Idaho experimental population areas and, that the judgment would be stayed pending appeal by FWS. Meanwhile, the reintroduction efforts continued and wolves began breeding.

The appeal of Babbitt 1 by the Fish and Wildlife Service was overturned in the 10th Circuit on January 13, 2000 (Babbitt 2). This time the court (reluctantly) found no evidence that there was a current range of the species in the introduction area and so stayed the order to prevent reintroduction. At this point of course the decision was moot because it would be logistically impossible to round up the entire wolf population and besides, the political uproar would resonate nationally.

There were other unusual features of the Farm Bureau case.

Oddly, the argument against reintroduction by some conservation organizations hinged on the same argument Farm Bureau used, although likely for very different reasons. Whereas the Farm Bureau sought to prevent an establishment of a resident wolf population, the National Audubon Society and their co-signers disliked the lack of ESA protection of any possible wolf in-migrants (that the court said did not exist). When the case went forward on appeal most conservation groups dropped their role and joined the FWS.

The other peculiar feature involved plaintiffs James and Cat Urbigkits, residents of Pinedale, Wyoming and hosts of the web site: Wolf Watch. The Urbigkits are amateur researchers, who apparently had been searching for, studying, and reporting on naturally occurring wolves in the Yellowstone and Wyoming areas since 1988 on a recreational basis. They argue that the so-called "Canadian wolves" were so different from Yellowstone wolves as to constitute a distinct subspecies and so threaten their recreational pursuits with respect to the "native Yellowstone wolf". In essence, they claimed to be an "injured party", and so had standing in court, when the status of wolves changed. In reality their position was a sideshow to the larger question of interpreting the ESA but it does show that when ostensibly pro-wolf parties join with anti-wolf advocates sometime politics results in strange alliances.

Each state within the Greater Yellowstone Ecosystem issued statements of condemnation of the effort. A Wyoming state legislative committee approved a bill that placed a $500 bounty on any wolf that strayed from the park. Idaho Governor "Butch" Otter called the reintroduction a state emergency. The distant state of Colorado considered a bill requiring state permission if reintroduction was tried there; U.S. Representative Don Young (R-AK) held oversight hearings in Washington D.C. on the reintroduction efforts.

The Park Service did an outstanding job building institutional structures for the reintroduction effort. Well known wolf biologists were involved at every stage; radio collars were placed on each wolf; the public was educated and kept abreast of progress. Wolves became media stars. President Clinton and the first family visited one of the release sites in August. Private contributions to support the effort were encouraged and accepted. The Yellowstone Wolf Project Report is the National Park Service's report on wolves in the park and is a quality source of news and science for the program. Multitudes of pro-wolf nonprofit and for profit sites exist on the

Internet. Every major network in the U.S. and many from abroad have broadcast films and news stories on the Yellowstone wolves.

Perhaps the most effective political strategy designed by the Park has been the creation of the position of Biological Technician for the Yellowstone Wolf Project. The original and only owner of that position is Rick McIntyre. His job, in part supported by the Yellowstone Park Foundation, is to make daily observations that he contributes to the scientific body of knowledge that now exists on wolves, and to share what he knows with Park visitors. Rick meets with a steady stream of visitors, assists them in spotting wolves, and explains wolf ecology and behavior. In the first season wolves were released, he spoke to over 40,000 park visitors about the project and wolf ecology.

Unfortunately, the high profile of the reintroduction effort was also a convenient target for those who opposed the effort. The most vocal opponents included the agricultural community who run livestock near the park boundary and property right advocates who saw the reintroduction as yet another conspiracy to move publicly subsidized ranchers off public lands. In this respect, wolves serve as a values proxy across the political spectrum. Perhaps there is nothing the Park Service and FWS could have done that would have placated opponents. It seems true however that in the rush to pursue reintroduction some in the agricultural community felt slighted. The Clinton administration had lost control of Congress in the recent off year elections and Superintendent Mike Finley and Bruce Babbitt likely understood they had a narrow window of opportunity. During this sense of urgency the personal relationships that could have been developed regionally suffered.

Public lands in the Rocky Mountain west are often open to private business activities such as mining, grazing, and for profit recreation such as hunting and backcountry outfitting. Roughly, 2.5 million public acres are available for commercial grazing of cattle and sheep; this augments the 107 million acres of private land grazing in the region. It was believed that as wolves left the park, they would inevitably prey on domesticated livestock. In the intervening years however, wolf predation has accounted for relatively few livestock deaths but each one is political fodder for anti-wolf groups. On rare occasions wolves will attack entire flocks of sheep and the results can be devastating for that particular rancher. The more important consideration for most ranchers is their ability to manage problem wolves on their private land and public leases. In Wyoming, the wolf is considered a predator in most of the state and can be shot on sight. Montana and Idaho have yet to adopt a similar position although all three states have liberal hunting seasons on wolves.

Associated with public land grazing is a perception by some that wolves on public land will preclude other activities – notably recreational hunting. Wolves on the landscape have changed the behavior of elk and certainly made them more difficult to hunt in some cases but reintroduction has not stopped hunting in the region. State game management agencies kept elk herds artificially high as favored by hunting interests; when reintroduction took place, elk were at thier historical maximum in the region. In the original environmental impact statement on reintroduction, the FWS predicted a 5%-30% decline in the number of elk. By 2007, enough data was in to indicate a decline in the elk population in the neighborhood of 37%-60%. This number can be misleading however and in fact, in many hunting districts near the park elk numbers are above the preferred management goal.

Elk, like other animals, are subject to both direct predation effects as well as "risk effects". Wolves certainly kill elk but other factors also contribute to elk mortality. Weather, drought, nutrition, habitat, and behavioral changes – some due to predation, some not, are part of the complexity of large ecosystems. Unfortunately, sometimes public agencies and nonprofits fail to understand or chose to misrepresent those ecological realities.

Did Wolves Change the Yellowstone Ecosystem?

Trophic cascades. The phrase can elicit either overwhelming support or derision among scientists working in Yellowstone. A trophic cascade is where the behavior of an animal (predator) on another (prey) causes a "trickle down" effect on the plants eaten by the prey species. The result is a change in plant life, makeup, etc. Such cascades are widely recognized as important processes of top-down control of food web dynamics.

A behaviorally mediated trophic cascade (BMTC) is a condition where, for example, predators prey on herbivores, thereby decreasing their population and so impact plant life. In this instance, the cascade is due to indirect behavioral-level effects, in which herbivore prey shift their foraging behavior in response to predation risk. Such behavioral shifts can result in reduced feeding time and increased starvation risk or, they could change their herding behavior and so breeding outcomes. In any case, the impact on plants might be similar. The question was: are wolves causing a behaviorally mediated trophic cascade in elk?

When wolves were reintroduced to the park some areas were observed to have fewer beavers than before. The suspected problem was that too many elk had overgrazed the aspen and willow in riparian areas close to creeks thereby denying habitat to beavers, songbirds, etc. Elk felt safe to graze in the open because of the lack of wolves. After wolves established themselves a team of researchers at the University

of Oregon saw changes in the growth of aspens and an increase in residents of the riparian zone. The scientists referred to the return to balance as "the ecology of fear." Others took to the field to test the theory and found little evidence that BMTC released aspen from elk browsing pressure. In other words, aspen didn't respond to the hypothesized fine-scale risk factors in ways consistent with the current BMTC hypothesis. Some see the trophic cascade hypothesis it as a near perfect "just so" story and so use it to advocate for the wolf. Others think there is more to the ecology of wolves and that the cascade effect is being used to oversimplify ecosystem management of a highly complex landscape.

The debate went mainstream when this highly dramatized video went viral with over 19,000,000 hits and again, the narrative as defined by wolf advocates helps fuel the continued political debate.

Read more from researchers at: Colorado State University, Montana State University,University of Oregon

Symbolism and framing is important here as it is in most cases of a wicked problem. Early on the wolf took on the persona of the embodiment of nature in all its forms, and is still depicted as such by many wolf supporters. Pro wolf advocates insist reintroduction simply restored the ecosystem to its former condition. They often point to regional and national polls that show respondents favored reintroduction 3 to 1. Those who favor wolves on the landscape present them as a symbol of wild places, ecological harmony, and even as a regional political entity. They depict the wolf as the intelligent social animal it is. For these supporters wolves help bring nature into balance and the effect on humans is often a secondary concern. Conversely, wolves are also presented by some as unwelcome interlopers who have moved into our neighborhoods threatening our property and personal safety. They roam in packs and kill indiscriminately - especially the elk that locals hunt and outfitters depend on for their livelihood. Interestingly, for all the danger wolves symbolize, they are rarely implicated in conflicts with humans.

Bears are also depicted as symbols of wildness and empty spaces but usually as solitary inhabitants of unpopulated lands; they are often photographed alone or with cubs in the high country grazing on grass or insects. The fact that they occasionally attack and kill humans is because we chose to visit their space – not the other way around. The most radical trend in bear management in recent years is that fewer bears are killed after an attack on a human. More often than not the victim asks the bear to be left alone and management complies.

Those less supportive of wolves make a nuanced political argument. Wolves, they argue, threaten property rights when they cross over onto private land and kill livestock and even pets – sometimes viciously so. The inability of the landowner to easily control the trespassing wolf, because of ESA restrictions, is a usurpation of private property rights. In some ways, the position is difficult to refute. The rancher or rural resident often lives in wolf habitat and so incurs the direct costs of hosting wolves as neighbors. Early on in the reintroduction effort the Yellowstone wolves, and other regional populations, were designated as a nonessential experimental population under section 10(j) and so landowners received section 4(d) consideration. However, many ranchers felt that the rules that govern their ability to manage problem wolves were still overly burdensome and inflexible. The problem was is that few of these conflicts were worked out in advance of the reintroduction effort.

The reality is that both wolves and bears range from high wilderness where they encounter few people to lowland agricultural lands as they roam seasonally foraging for all manner of protein. Neither species is inherently violent toward humans and most encounters end in wonder and curiosity. Wolves are not bloodthirsty invaders of our space and bears are not defending their habitat against us. Both animals simply exist on the land, follow the food supply and mostly ignore humans.

In reality, the anti-wolf position is a proxy battle for the perceived "war on the west" that has raged since the sagebrush rebellion of the 1970s and the wise use movement that followed. The controversy is one grounded in state vs. federal control over public lands and resources and wolf reintroduction efforts are simply the latest incarnation of the struggle to recover the commodity economy of the west. If opposition to wolves is really an issue of regional sovereignty, continued institutional behavior that sets two groups of citizens against each other will not alleviate the problem. The problem of public land management is larger than a single species.

The difference between social perceptions of the grizzly bear and the grey wolf is grounded in biology and institutional tactics. Bears are fewer in number and so draw less of our attention. Bears live mostly solitary lives; wolves run and hunt in packs and are often observed during the day when most bears are sleeping. The bear's diet is broad and seasonal; they rarely kill for food. Wolves are meat eaters and must kill to survive. Wolf success rate is somewhere between four and eight percent so they act opportunistically when they can and will kill prey en mass; bears forage and scavenge. Wolves are particularly well-adapted to hunting in winter and if prey is in the lower elevation valleys, we may see them hunt on a regular basis. Bears are in hibernation during the winter months and so do not inhabit our consciousness for

much of the year. These differences help explain why wolves are often described as "cold blooded killers" when bears, even when they attack humans, are depicted as "bears being bears".

The institutional structure and culture that developed around the two animal conservation programs share similar differences. During the recovery phase, bear management agencies sought to "fly below the public radar" and did not seek out publicity or media attention; they still don't. The park service raised public awareness about the reintroduction of wolves to the level of a national media event feeding frenzy. Both groups of managers are grounded in quality science but wolf science has a very public face and federal agencies continue to draw attention to the success of the effort. It could be argued that wolf reintroduction would not have been possible without the high profile political effort conducted by the park service and FWS. It could also be argued that now that wolves are here, it may be time to seek to depoliticize the wolf through the use of institutions that place an emphasis on species maintenance and active management rather than a continued presence in the media attention cycle. This would likely include more killing of problem wolves.

Moving Forward

Wolves were introduced two decades ago and with the passage of time, it seems there has been no softening of positions. Supporters make their annual pilgrimages to the park to see new litters of pups in the spring and to see wolves hunt in winter. Their economic impact to the regional economy continues to grow. Wolf detractors continue to argue the social and economic costs they are forced to absorb. The symbols both sides use have changed very little. Entrenchment of their relative positions seems deeper and more "wicked".

Even as the numbers of individuals increases, the future of both bears and wolves is in no way certain. If bears are delisted, which seems imminent, there will be pressure for a hunting season in the region. That will result in the death of breeding age sows and cubs will lose mothers they depend on for their first 2-3 years. Climate change, a blister rust, and mountain pine beetles are threatening the whitebark pines (Pinus albicaulis Englm) whose seeds act as an important food source for grizzlies. Energy development in the GYE and the associated roads fragment habitat. Human caused mortality due to hunting conflicts is rampant in parts of Wyoming.

In the bear's favor however is our reorientation of how we think about them. The fact is, people of all political persuasions are increasingly tolerant of bears. This suggests that, if we leave them alone, these generalist feeders will probably get by and maybe even prosper.

For the wolf, Doug Smith is less sanguine. National parks are likely their last refuge from the rapid pace of rural sprawl.

One way to help resolve wicked problems is to understand the stories and who is telling them. In many cases, there is often a nugget of truth to most perspectives. As Doug Smith says – sometimes managers have to listen and then listen some more. Bob thinks this is perhaps the most important administrative skill for any public

official but especially one dealing with a wicked problem. Even if it is about the most pedestrian of issues – sand.

Bob's advice is important at multiple levels. Science and policy have a culture and language that is often a source of divisiveness. Policy wonks speak in terms of costs and benefits that can be quantified or in the legalistic terms of the Endangered Species Act. Non scientists often speak to issues of family, culture, change and, loss. Listening to locals speak in nonbureaucratic terms challenges the public land manager to think beyond the regulatory world in which they reside. Respect for others often results in respect back, and as Bob points out – sometimes they are right and sometimes they just want to be heard.

Lessons from the recovery of the Yellowstone Grizzly bear and Grey Wolf reintroduction efforts may be useful in the consideration of wicked problems. Clearly, with the right institutional structures, eventual resolution of the conflict can be achieved – as has been the case with bear recovery. Bears in the Greater Yellowstone Ecosystem have their detractors but most residents accept them as the neighbor we rarely see, one deserving of vigilance and respect. One rarely hears the sort of vitriolic language toward bears so often aimed at wolves. The institutions and attendant culture of science that recovered bears clearly played a role in how we perceive them today.

Wolves now occupy our space and until we realign institutional structures toward reconciling how to live with them, they will remain a wicked problem searching for a solution. The often overly sentimental attitude held by pro wolf advocates is qualitatively different than that held by those who internalize the true costs of having wolves as neighbors. Neither side listens to the other. It is the role of the manager as honest broker to foster that conversation.

Bob is optimistic that the managers of the future will be up to the task.

Further Reading

The literature on Yellowstone and the region is rich and deep. There is no way to represent the thousands of science articles, books, and films on the region. I have organized the resources below to include large holdings of materials, some of the most important books on the region, and some high quality general articles for each chapter. Please keep in mind that finding the most up to date articles is still probably faster and easier on Goggle Scholar. This page will be updated periodically. Yellowstone Science. Yellowstone Science is a Park Service publication that covers the Park's natural and cultural resources using research articles, conference reports, or other special events in the Greater Yellowstone Ecosystem. The entire collection since 1992 is on this site available for download. You can also purchase a subscription.

Holding Institutions

Yellowstone Heritage and Research Center. This is Yellowstone National Park's archive for videos, science papers, books, film and just about anything else related to the park. The entire center is in a newly completed building in Gardiner, MT. A good deal of the materials held are not yet cataloged but the staff is very helpful.

Yellowstone Research Library. Located on the first floor of the Heritage Center, the library houses a comprehensive collection of printed materials. Most are searchable. For in person visits appointments are strongly recommended.

MSU Special Collections for Yellowstone. The MSU Library has a good collection of mostly historical materials related to the people and history of the region. It is searchable but not up to date and not very user friendly for those off campus. MSU and the nearby Museum of the Rockies both have good photo archives of the region.

Articles and Papers Relating to Yellowstone National Park. This is exactly what is says. This link is a subset on the MSU Special Collections.

Greater Yellowstone Bibliography, University of Wyoming. The archives here are bit hard to sort through but are historically one of the largest in the region. It does not seem to be updated on a regular basis.

Books on Yellowstone. I have no idea how many books have been written about the park and region but here are a few of my favorites, some with a more academic emphasis:
Knowing Yellowstone: Science in America's First National Park - of course I have to put this in.

The Greater Yellowstone Ecosystem. Robert Keiter and Mark Boyce. This is a collection of science and policy chapters organized from a conference that took place in 1989 at the University of Wyoming. Many of the chapters are still very relevant today. This is a book worth reading.

Decade of the Wolf: Returning the Wild to Yellowstone. Doug Smith and Gary Ferguson. This is the definitive book on the reintroduction and the decade after. Heavy on the stories of individual wolves and packs. If you want to visit Yellowstone to see wolves read this book first.

Hawk's Rest: A Season in the Remote Heart of Yellowstone. Gary Ferguson. The author spends a good deal of time in the most remote part of the lower 48 states. His journal is an immersion into the Yellowstone backcountry.

Large Carnivore Conservation: Integrating Science and Policy in the North American West. Susan Clark and Murray Rutherford. This is a book of six case studies of conservation. A good place to start to begin to understand the problem of living with large predators in a variety of global settings – including Yellowstone.

Roadside Geology of Yellowstone Country. William Fritz and Robert Thomas. This is one volume of the popular "roadside" series. For the drive by geologist it is simply the best source you can find.

Playing God in Yellowstone: The Destruction of America's First National Park. Alston Chase. When this book came out it it created a furor among park advocates and ecologists. Viewed two decades later it is still controversial but well worth reading for the history and interpretation of events.

Taking Account of the Ecosystem on the Public Domain: Law and Ecology in the Greater Yellowstone Region. Robert Keiter. Strictly speaking this is not a book but a very long journal article from the University of Colorado Law Review. It is still the best source for understanding the legal setting for policy in the parks.

Bear Attacks: Their Causes and Avoidance. Stephen Herrero. This is the definitive book on the data behind the attacks and how to avoid them based on several hundred cases.

Further Readings by Chapter:

Introduction
Ecological Causes and Consequences of Demographic Change in the New West

The Elders

Yellowstone after the 1988 fires

The articles by Barbee and Varley give some good insights into these two men. Island in the Rockies

Science, expertise and the public: the politics of ecosystem management in the Greater Yellowstone ecosystem

A Multicriteria Assessment of the Irreplaceability and Vulnerability of Sites in the Greater Yellowstone Ecosystem

What is Conservation Biology?

Wicked Problems

Barriers to Effective Natural Resource Planning in a "Messy" World
Public opinion for sale: The role of policy marketers in Greater Yellowstone policy conflict

Reintroduction and Recovery

Wolf Recovery and Management as Value-based Political Conflict

Moving Forward

Yellowstone grizzly delisting rhetoric: An analysis of the online debate
Conservation Challenges of Predator Recovery